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GRAZING MANAGEMENT SYSTEMS

IN

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New Mexico Inter-Agency
Range Committee

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Agricultural Research Service
U. S. Department of Agriculture
P. O. Box 698
Las Cruces, New Mexico 88001

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PREFACE

This study represents an inter-agency field evaluation of special or intensive grazing management practices recently initiated in New Mexico. The need for such a review was felt necessary in order that various organizations which furnish technical guidance in range management may benefit from the findings and recommendations of the committee:

Agricultural Research Service	
*Dr. Carlton Herbel, Range Scientist	Las Cruces
Bureau of Indian Affairs	
*Wilson Gutzman, Area Range Conservationist	Albuquerque
Elmer Holmes, Soil Conservationist	Dulce
Earl Pettingill, Range Conservationist	Dulce
Bureau of Land Management	
Fred Wyatt, Area Manager	Roswell
*Dale H. Kinnaman, Resource Development Specialist	Santa Fe
Charles E. Shannon, Area Manager	Roswell
*Myrvin E. Noble, Leader, Soil & Watershed Staff	Denver, Colorado
William Campbell, District Manager	Roswell
William Lefeiste, Chief of Operations	Roswell
U. S. Forest Service	
*Bill Currier, Range Staff	Albuquerque
Jack Bohning, Range Staff	Prescott
Carl D. Warrick, District Ranger	Carlsbad
*Wayne Hickey, Range Staff	Albuquerque
R. M. Williamson, Range Staff	Albuquerque
B. H. Starkey, District Ranger	Ruidoso
Robert Cook, Forest Supervisor	Alamogordo
Charles Wright, District Ranger	Cuba
Rocky Mountain Forest & Range Experiment Station	
*H. Wayne Springfield, Range Scientist	Albuquerque
Department of Game and Fish	
*Sam Lamb, Federal Aid Coordinator	Santa Fe

*Members of Interagency Range Committee

New Mexico State University

*Jesse Gerard, Assistant in Agriculture	Las Cruces
Don D. Dwyer, Professor	Las Cruces

Soil Conservation Service

Dick Barber, District Conservationist	Bernalillo
*Dan Merkel, Plant Materials Specialist	Santa Fe
Larry Nunez, District Conservationist	Cuba
Jeff Hulse, District Conservationist	Fort Sumner
Jim Reeves, District Conservationist	Carlsbad
*Don Robertson, Range Conservationist	Albuquerque

Ranchers

Hi Overton, New Mexico Association of Soil and Water Conservation Districts	Yeso
Phelps White, New Mexico Wool Growers Association	Roswell
Harry Lee, New Mexico Cattle Growers Association	San Mateo
Roy Skipworth, New Mexico Association of Soil and Water Conservation Districts	Fort Sumner
Paul Jones	Ruidoso
Waldo Stephens	Jemez Springs
Jack Patterson	Roswell
A. S. Patterson	Roswell

It is the feeling of the committee that special or intensive grazing practices will help to bring about improvement of range and livestock management, provided the following items are taken into consideration:

1. That any system devised be flexible.

2. That each operating unit be considered as an individual entity.

3. That the system be considered and evaluated from the standpoint of (a) physiography, (b) weather conditions, (c) plants, (d) animals, (4) ranch characteristics, (f) ranch management, and (g) continuous technical assistance.

*Members of Interagency Range Committee

INTRODUCTION

Much of New Mexico's rangelands have become depleted of their natural and desired vegetative cover due to past management, drought, encroachment of undesirable plants, and other factors. These conditions or factors have seriously affected runoff, sediment, aesthetics, wildlife habitat, and forage production. Increases in undesirable plants also have caused problems in recreational and highway areas.

Ranchers and land managers are making ever increasing use of a variety of grazing management systems. Although the systems may vary a good deal, they have as their goal making the most efficient and proper use of the renewable grazing resource. They look toward a sustained yield, high level, regular output, combined with soil protection and multiple use considerations.

Ranchers are finding that more intensive management is becoming essential to economic survival. Thus, more sophisticated systems of grazing serve to speed up range improvement and increase forage production.

This report reviews the objectives, principles, and procedures involved in developing grazing systems.

1. Objectives of a planned program of range and livestock management.

   a. To maintain or improve range condition.

   b. To provide for soil and watershed protection.

   c. To improve forage production on the range.

   d. To recognize and provide for multiple use* of the grazing land.

   e. To provide for the most efficient management practical.

   f. To increase net returns to the operator.

   g. To integrate range improvement with livestock management.

   h. To provide for a high level of livestock production.

2. In developing a grazing system advantage must be taken of already existing operating procedures and schedules for calving or lambing, shearing, branding, breeding, feeding, weaning, and shipping.

3. The systems allow for adjustments made necessary by drought or above average moisture, by changes in market conditions, and breeding programs.

*Multiple Use - Harmonious use of range for more than one of the following purposes: grazing of livestock, wildlife production, recreation, watershed, and timber production.

BASIC PRINCIPLES

To insure maximum forage for livestock and wildlife production and maximize soil and watershed protection, an area of rangeland must be producing under moderate use a plant community at or near its potential. To achieve this, the management system must be designed to provide for:

1. Vigor
2. Reproduction
3. Litter (in some instances)

A thorough understanding of (1) the basic fundamentals of how and when plants grow, store food, and use stored food; (2) how they relate to their environment; and (3) how they respond to grazing, is essential in designing an improved grazing management system.

1. Natural Plant Succession

Climax is the native plant community best adapted to the particular site. It is found on the site in the absence of abnormal disturbance and significant physical site deterioration. It is the highest type of plant community the soil and climate will support.

A climax plant community is not a precise assembly of species with a composition that is the same from place to place and from year to year. Variability is the rule rather than the exception.

Most western ranges are presently at some dis-climax level. Range deterioration has resulted from destruction of climax species and losses of soil. Changes in the management to improve soil stability and species composition should be initiated. The rate of recovery will be controlled by the condition of the soil, the competition that prevails at a given time and weather conditions. Each range site has a different potential for production and a different rate of recovery.

The objective of range management is to maintain range condition or, where deteriorated, to speed its recovery; and to bring the operator the greatest net returns from his range resource consistent with adequate soil protection and multiple use considerations.

The goal for each range site will normally be less than climax, but should be one of the upper successional stages. Climax condition is impractical to maintain under a commercial livestock operation in many situations.

The same management principles apply for areas seeded to introduced species as those used for native grass areas. The objective in these areas, however, is to maintain the seeded species in a vigorous state. In a few cases, management must be changed from managing for introduced species to native plants that have moved into the seeded area.

2. Forage Plant Structure and Grazing

A grass plant (the most common forage plant in livestock grazing) has a sheath at each node with the leaf blade at the upper end of the sheath. Growth tissue is located at the nodes in the stems and at the base of the sheath and blade. Growth is by division and enlargement of the cells in the growth tissue. Thus the internodes, sheaths, and blades issue out of the growth region much as a pencil lead extends from a mechanical pencil. The grass stem has all its nodes and leaves in embryonic form when it emerges from the seed. Growth starts first in the basal node and leaf pushing the rudimentary stalk upward. As the node and leaf approach full size, growth starts in the next node, then on to the next, and so on until the stem reaches its full length.

The physical structure of grasses may be as important as palatability, nutritive value, and other factors in the effect grazing has on the species. Species of grass vary in the number of short basal nodes, and also in the ratio of fruiting stems to vegetative stems. The number of basal nodes influence how soon the growing point is thrust above the ground and within reach of livestock. Little bluestem and sideoats grama have 10-15 very short basal nodes totaling 1/2 to 1 inch in length. Thus the growing point is not pushed above ground until after the first 10-15 nodes are mature, which may be mid-growing season. On the other hand, such grasses as switchgrass and Indian grass have only 2-4 short basal nodes. The growing point is thrust above ground soon after growth starts and is within reach of grazing animals. This supports the consideration of thesetwo grass species as strong decreasers.

Buds at the short basal nodes may develop new shoots, and these may again develop new shoots at their nodes, the process known as tillering. Upon removal of a growing stem, growth hormones are developed at the bud scales at the nodes, which stimulate new growth. Grasses with short basal nodes like sideoats grama or little bluestem have many buds from which to tiller. Indian grass and switchgrass with very few buds are less able to spread or even maintain growth under intense grazing.

The ratio of fruiting stems to vegetative stems is a factor in response to grazing. Blue grama, which is tolerant to heavy grazing, has about 6 vegetative stems to each stem producing a seed head. Switchgrass, which is much less tolerant of grazing, has more than 2 fruiting stems to each vegetative stem. It can be concluded that those grasses producing mostly fruiting stems, being less tolerant of grazing, are included as the decreasers of our range condition guides.

Certain stoloniferous and rhizomatous species are classified as increasers because of their ability to continue to spread under grazing use.

3. Plant Growth and Utilization

The root develops well ahead of shoot development. When the root is 90% developed, the shoot is only 50% developed. This usually allows for storage of plant food in the root. If the plant is clipped or grazed in the early part of the growing season, these stored nutrients will be available for new growth. Studies with several grass species showed a single clipping that removed 40% or less of the foliage but did not stop root growth. But after 1 clipping resulting in 90% top growth removal, there was no root growth for 17 days. After 70% top growth removal, 48% of the roots stopped growth for 17 days. With 50% top growth removal, approximately 3% of the roots stopped growing for 14 days. When too much top growth is removed, the food producing process is curtailed and the plant draws on food stored in the roots to produce new leaves. If clipping or grazing is repeated frequently, the plant continues to drain the food stored in the roots and the root system shrinks. With a depleted root system, the plant can produce only a minimum of top growth and may die during drought, winter, or continued over-grazing.

Plants start making food when the first green cells appear and stop when the last green cell disappears. The maximum amount of food is produced when the plant begins to dry up, provided "dry up" is not due to moisture shortage. Some production continues several weeks after seed is ripe. The plant starts to store food when growth starts to slow down. The plant is most vulnerable to grazing whenever rapid growth coincides with minimum nutrient reserves.

The least damaging period for defoliation of herbaceous plants is after food storage stops (the dormant period). This same period, however, can be most damaging for shrubs where food storage is in the twigs and stems. Food for twig growth is in the twig - just below the growing point.

Food storage for shoot growth of a herbaceous plant is just below the growing point. For root growth, it's just above the root growing point.

Grasses are efficient forage producers because of (1) the protected location of the growth or meristematic tissue and their growth habits, and (2) the ability of the plant to produce new shoots from buds at the nodes, the process known as tillering.

4. Growth and Carbohydrate Trends

During slow growth, plants depend almost entirely on plant food stored during the end of the previous season in its roots, crown and lower stems. Food reserves are depleted during this period. When moisture and temperature become favorable, the plant begins to make food. As the leaf growth increases, so does the size and production capacity of the plant's food

factory. As the production curve rises sharply, food reserve is partially replenished. Plant nutrient storage is completed during the relatively short period at the latter part of the growing season.

Except for early season growth of bud tissue, growth of shoots is little dependent upon stored food reserves. Food reserves are largely depleted before the start of growth. It has been found that when food reserves are at their minimum, not over 10% of the annual height growth has been made. The other 90% is made on food synthesized as current growth proceeds. However, bud tissue and much of the root tissue are entirely dependent on stored food for early season activity and growth. This requires food out of proportion to the actual measurable growth made. Heavy food use is characteristic of active meristematic tissue because it is adding a proportionately large amount of intensely active living tissue to the plant body. This activity, together with root growth, which requires large amounts of food at the same time, causes the early and rapid food reserve reduction.

Plants use food even during the winter season, when above ground parts are dormant, because they are carrying on the normal processes of plant life. They also use food to make concentrations of soluble sugars to protect living protoplasm from low temperatures. Sugar in solution lowers the freezing point of the cell contents. A cell with higher sugar concentrations will not freeze as soon as those with lower concentrations.

The annual food cycle as a whole is a succession of stages each of which depends on the rather normal operation of the preceding stages. Annual growth depends on early season bud and root growth. Bud and root growth depends on food storage accumulated during the previous summer and upon the survival of buds and roots through the winter. Winter survival also depends on previously accumulated food storage. Food storage depends on adequate synthesis of food by the shoots of the preceding summer and fall. Shoot growth of one season is dependent on proper growth and functioning of the shoots of the preceding season.

5. Effect of grazing on the Food Cycle.

One stage of plant growth is more susceptible to grazing interference than any other stage. This period occurs when the processes of food synthesis and storage are easily interfered with by grazing animals.

A grass may be so adversely affected by grazing in one year that it will fail to store adequate reserves to pass through the winter and make good root and bud growth the following spring. The result is that its general welfare and shoot production the following summer is seriously curtailed. The obvious remedy for such a condition is to regulate grazing time and intensity so the food cycle is not seriously interrupted.

Grazing also reduces seed yield by removing the flowering bud, or upper leaves from which most of the manufactured food comes for developing seed.

A grazing system should be developed that will allow the plant to replenish its root reserves fully, grow new root material for water and nutrient uptake, and produce seed. When this is done, the first goal of a grazing system, improving the range while grazing is fulfilled. By improving the range, increased forage will fulfill the next goal - producing foliage in excess of plant and animal needs thus making it possible to increase production from the range resource. By improving the physiological vigor of the forage by some grazing scheme, its nutritional value is improved. Animals in good condition gain faster, conceive easier, wean more and heavier offspring. These first three goals are reached when the proper number of livestock are placed on the proper amount of land with the proper range improvements for the proper length of time. A fourth goal must be fulfilled by the system, and this is to improve livestock distribution with proper allowance made for game.

Plant physiological requirements should be identified for each range unit or ranch and a management formula designed to meet these requirements. In so doing, consideration will be given to desired plant species so they will have an opportunity to grow and reproduce satisfactorily.

The length and sequence of non-grazing periods to meet these requirements is dependent upon conditions found on each particular operating unit, such as:

(1) Need to restore plant vigor.
(2) Need to maintain plant vigor.
(3) Need to establish young plants.
(4) Need to maintain or improve plant species composition.

MANAGEMENT OBJECTIVES

A range management plan is a program of action designed to accomplish the objectives that have been spelled out for a given range area. No management system will be successful unless the time and effort are exerted to accomplish the detail planning that coordinates all of the various phases of the proposed program. The task of planning must be a coordinated effort with emphasis upon both the grazing and animal management. Where the range contains lands of mixed ownership, the plan should be a result of a joint effort by all parties concerned.

The major components of any plan are stocking rates, season of use, grazing system(s), distribution tools, range improvement practices, kind and class of livestock, marketing objectives, special events

(breeding, calving, and branding) and followup action. All action programs must be structured with the overall range management plan with sufficient flexibility to accommodate unforeseen and unplanned interferences that will occur during the plan period. A range management plan can assume many dimensions and still serve as a coordinating medium for achieving the predetermined objectives.

In short, a range management plan is a result of considering, weighing, sifting, and validating; then meshing together the many variables of grazing and livestock management and other key uses on the range into a planning nucleus.

Objectives

Livestock and grazing objectives should be spelled out in detail. They must be basic, realistic and all-inclusive of both the forage resource and livestock management needs. When other primary uses of the land, such as wildlife, recreation and timber are involved in determining range objectives, these too must be coordinated.

As progress is achieved toward the ultimate objectives, plan revisions can become more sophisticated. However, it is extremely important that initial objectives be kept basic and simple.

Specific grazing management aspects that should be considered and possibly spelled out in a management plan are:

1. Stocking Rate

The basic range inventory has indicated the stocking rates for the range. In most instances, this may coincide with the number that is presently being grazed on the range. In some cases, the current stocking rate may be below or above the desired level of stocking. When this occurs, the management plan must then establish the action required to achieve the desired stocking rate.

An adjustment action on stocking rates may be temporary or permanent. Each and every range presents a different approach to this problem. However, the continual success of the management plan hinges on this action being understood and agreed to during the early phases of planning.

2. Season

Seasons of use are extremely important when designing grazing systems. By determining vegetative potential and existing plant phenology, the proper grazing season can be determined. Intensive grazing systems will allow for a wider range in the period of use. Where the existing grazing period is determined to be in error, corrective action should be outlined.

INVENTORY

An adequate inventory is essential to all grazing management plans.

1. The inventory must include an appraisal of:

   a. Soil

      (1) Parent Material
      (2) Texture
      (3) Structure
      (4) Litter, Rock, etc.
      (5) Depth
      (6) Special Problems

   b. Climate

      (1) Precipitation

         (a) Amount
         (b) Seasonal Distribution
         (c) Spatial Distribution

      (2) Temperature

   c. Topography

      (1) Exposure
      (2) Slope

   d. Elevation

   e. Erosion

   f. Size and Arrangement of Pastures

   g. Structural Improvements

      (1) Fences
      (2) Water Developments
      (3) Livestock Handling Facilities
      (4) Roads

   h. The total vegetation resource and its potential

      (1) Average forage production
      (2) Season of forage availability
      (3) Range readiness
      (4) Range trend
      (5) Protective Cover

i. Wildlife food and cover.

j. Kinds, classes, and numbers of livestock.

k. Number of separate herds of livestock.

l. Other feed and forage available (hay, irrigated pasture, etc.)

m. Landownership patterns.

n. Rancher objectives (entirely livestock production or combination of livestock-wildlife-recreation)

2. With these data such needed basic information as follows may be determined:

a. Initial stocking rates.

b. Forage - livestock - big game balances.

c. Season of use.

d. Key management areas.

e. Key management species.

f. Critical wildlife management areas.

GRAZING SYSTEMS

There is no one best grazing system that can be applied on a state-wide basis. Each and every range has its own identity that makes it different from other ranges. Grazing systems vary from the simplest one unit system to a many unit system with several separate herds of livestock involved.

When considering a grazing system, all variables associated with a given range must be evaluated and weighed. Many systems have been devised. It is not practical to review each of them here. Examples of some common basic systems that have been previously defined are listed.

1. Yearlong Grazing - Continuous grazing for a twelve month period or calendar year.

2. Continuous Grazing - Continuously grazing the same area year after year.

3. Seasonal Grazing - Grazing restricted to a specific season.

4. Deferred Grazing - Discontinuance of grazing by livestock on an area for a specified period of time during the growing season to promote plant reproduction, establishment of new plants, or restoration of vigor by old plants.

5. Deferred Rotation Grazing - Discontinuance of grazing on various parts of a range in succeeding years, allowing each part to rest successively during the growing season to permit seed production, establishment of seedlings, or restoration of plant vigor. Two, but usually three or more, separate units are required. Control is usually insured by unit fencing, but may be obtained by camp unit herding.

6. Rotational Deferment - A grazing system in which one or more parts of the range are rested during the growing season each year; and rotational use of other segments of the range are not necessarily planned for.

7. Rest-Rotation Grazing - An intensive system of management whereby grazing is deferred on various parts of the range during succeeding years, allowing the deferred part complete rest for one year. Two or more units are required. Control by fencing is usually necessary on cattle range, but may be obtained by herding on sheep ranges.

8. Best Pasture System - Highly flexible system which provides for always moving to the best pasture in the system.

9. Rotation Grazing - Orderly sequence of use when each subdivision is both grazed and deferred during the same grazing season or calendar year.

Rarely is it desirable, or practical, to use one of these systems in its original form; rather the better aspects of one or more systems are interwoven to fit the needs of the given range.

In establishing a grazing system and stocking plans on an operating unit, it is very important to consider distribution of precipitation, both from place to place on the ranch and differences from season to season and year to year. It is also important to consider the nutritional requirements and species perference of livestock by season and to recognize differences in preference by kind and class of animal. Thus, if a pasture scheduled for deferment has some precipitation while the remainder of the ranch remains dry, with the result that some ephemeral species develop on that pasture, oftentimes that pasture can be grazed to use the ephemeral growth while in fact still deferring the perennial plants on that pasture. Thus, there must be flexibility within a system so that livestock can be moved to take advantage of ephemeral forage that may develop.

It must also be recognized that the annual forage crop is highly variable from year to year. This necessitates some adjustment in stocking rate which can be accomplished by having a low ratio of breeding animals to more readily saleable animals.

The occurrence of poisonous plants in certain pastures during certain seasons or certain years must also be considered in planning pasture stocking.

Once a system has been designed, it should be described in the plan in detail. Graphical illustrations of the system sometimes simplify the presentation. The transition period, confusing at best, should be clearly described in detail. Much can be achieved in providing a suitable grazing system where little development exists, if it is planned and then followed on the ground.

Tips for Planning Grazing Systems

The following tips may be considered in working with a grazing system plan. The inclusion of any of these ideas in developing a plan should follow all the principles stated earlier in this report.

1. Usually plan the system to rest the best grazing unit first. Response to deferment will be greater than on poorer units. This will aid in building confidence in the system and provide the greatest increase in usable forage. (This does not apply to the best pasture system).

2. Group pastures of unequal carrying capacity into grazing units of needed capacity. Besides making rotation between units easier, some rotation within units is possible.

3. Leave a small percentage of the operating unit out of the major rotation systems. A small part of a unit is usually needed for special use pastures (shipping, hospital, and horse). A grazing system may be established for these pastures.

4. It is desirable to utilize forage produced by annuals in following a grazing system. The use of such forage may fit into the system or it may be necessary to move out of sequence for a short period. After the annual forage is used, one should return to the planned grazing schedule.

5. The numbers of livestock and their forage and water requirements vary from month to month, even in a rather stable breeding herd. This should be recognized in planning a grazing system and developments.

6. Any grazing during a rest period reduces the benefits of a grazing system. Rest means no use by domestic livestock - not light use.

7. A meaningful set of records must be kept if a grazing system is to function properly and be improved as experience is gained.

8. Some degree of rotation of grazing may be accomplished by closing waters within large pastures.

9. At the beginning of all planning, areas best suited for wildlife should be considered and a management plan for their use and protection should be written up and adhered to as closely as conditions justify.

DISTRIBUTION

Tools to assist in reaching the ultimate in livestock and wildlife distribution and how they will be applied on the range are a key facet in the planning sequence. Some of the most important, as well as successful ones, are:

1. Water

Water, its location, dependability and availability can be a distribution aid of great value. Key water factors that must be evaluated and substantiated are:

There must be a dependable supply in each unit to insure that water will be available for the maximum stocking rate. Achievement of this is variable and depends upon the accessibility of water on each range. Wells, pipelines, trick tanks, dirt stock tanks, natural waters, and hauling are among the many means of providing water.

Where it is possible to control access to water, livestock distribution and rotation can be regulated by opening and closing waters.

2. Fences

Fence location can aid or hinder distribution. In many cases, the difference between aiding and hindrance is very small. Knowing and understanding livestock and wildlife habits is extremely important.

3. Salting

Salting is a technique of dispersing livestock from concentration areas.

4. Herding

Movement of livestock for relocation purposes can be accomplished. However, this is a time-consuming practice that has varied success.

5. Burning

Spot burning can be used to attract animals to areas of light use. Burning should be restricted to 5 acres or less to provide the desired results to attract livestock and wildlife.

6. Spot Fertilization

By applying fertilizer to small areas within zones of light use, grazing animals can be attracted. These should be held to 5 acres or less and rotated each year so as to break up the heavy use that will occur on the fertilized areas.

7. Spot Seeding

Spot seeding of highly desirable forage species can be used as a distribution tool when conditions present the opportunity.

RANGE IMPROVEMENTS

Upon determining the desired grazing system for a range, the needed range improvements should be listed and priorities set. Priorities should coincide with the initiation of the grazing system as defined above. Programs that could be included are:

1. Non-structural

   a. Plant control
   b. Seeding
   c. Land treatment practices

2. Structural

   a. Fences
   b. Water development
   c. Corrals
   d. Holding pastures

The range improvement summary can show in addition to priority, type of improvement, estimate of units, estimate of cost, and responsibility for completion.

LIVESTOCK MANAGEMENT

Livestock management objectives, when coordinated with grazing management objectives, will provide a sound base for the development and initiation of a management plan. It is impractical to separate these. In many cases, it will be possible to improve an operator's livestock management program with the development of a grazing system.

Kind and Class of Livestock

The kind and class of livestock which are to graze the range must be determined. In some cases, provisions will need to be made to handle two or more kinds or classes of livestock. Normally, this is the case only on larger ranges and with larger operators. Different kinds or classes of livestock that could be encountered in an operation are:

1. Cow-calf
    a. Commercial herd
    b. Registered herd
2. Replacement heifers
3. Bulls
4. Yearlings
    a. Steers
    b. Heifers
5. Sheep
    a. A herd
    b. B herd
    c. C herd
    d. Grades
6. Horses
7. Goats

Kind and class of livestock will have a bearing on the stocking rate. When changes are made, the management plan must be changed accordingly.

Marketing Practices

By predetermining marketing objectives, it may be possible to structure the grazing system so that handling of livestock is kept to a minimum.

In New Mexico, it is common to be confronted with a variety of marketing situations on any given range. A variety of marketing opportunities allow for maximum flexibility in the stocking rate. The most common market practices associated with ranges are:

calves (fall)
yearlings (spring)
long yearlings (fall)
dry cows (yearlong)
cull cows (fall and spring)
sheep (fall)
wool (spring)
horses (yearlong)
young goats (spring)
old goats (fall)

Special Events

It is necessary to consider the following events: Lambing, calving, weaning, shipping, breeding, shearing, branding, etc. By being aware of these and developing plans accordingly, a more coordinated action of all events can be accomplished. The give and take approach can offset many of the problems encountered in activating grazing systems.

Where a pregnancy or performance testing program is being initiated and developed, it is desirable to describe it in the management plan.

FOLLOW-UP ACTION

It is possible to predict certain problems that may arise during the initiation of a management plan. By anticipating these problems and providing the flexibility required for immediate correction, it is possible to keep their impact at a minimum. In many cases, the ultimate success of the plan is related to follow-up action and, in no case, can follow-up be ignored. Factors that can be expected to require follow-up action as a management plan is initiated are:

1. Forage Utilization - Mapping of grazing use patterns and relative production can be a great aid in correcting distribution problems.

2. Additional water.

3. Balancing of stocking rates by grazing unit.

    a. numbers
    b. period of use

4. Evaluation of erosion and watershed protection.

5. Review of plant response.

6. Evaluation of wildlife use.

As follow-up action occurs, it is essential that it be documented. This is especially true when the stocking rate and grazing system are affected.

As a minimum, the plan should have complete updating at the end of the first grazing cycle.

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