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Season-of-use and the new model| Rest-rotation grazing

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SEASON-OF-USE AND THE NEW MODEL: REST-ROTATION GRAZING

by

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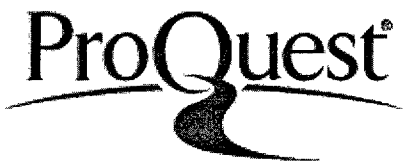

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CHAPTER I

INTRODUCTION AND DEFINITION OF TERMS

Introduction

Purpose

Fundamentally, the purpose of this paper is an exercise in the decision making process in the context of a resource management problem. It will attempt to define a resource problem in terms of certain objectives, establish a foundation for decision by development and analysis of data, define alternatives, establish advantages and disadvantages to the alternatives, and finally indicate a choice of alternatives within the limits of known objectives.

Introduction to the Problem

A new concept in the science of range management is emerging. It promises to revolutionize the manager's approach to obtaining the heretofore elusive "sustained yield" use of range lands.

Almost since its inception, range management has been approached on the basis of one system--the "proper use" model. Recently, however, a new model called "rest-rotation" grazing has been developed, and is being

adopted at an increasingly rapid rate.

Range managers, both public and private, have struggled with the problem of obtaining sustained forage yield together with economical long term livestock production under the old model for over sixty years. Even with relatively intensive effort under the old model, the problem of range deterioration still exists today on a vast majority of range lands. This suggests a general failure of the old model.

In attempting to solve the problem, much research has been conducted, some applied and some basic in nature. Almost all basic range research supports the precepts of the new model (discussed in Chapter III). The first formulation of the principles involved in the new model were introduced as early as 1913 by Sampson.[1] It was by combining the ideas of Sampson with supporting basic research that the new model was postulated and verified by Hormay and Talbot.[2]

Use of the new model introduces some problems of application. It is one of these problems that is the

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[1]Arthur W. Sampson, Range Improvement by Deferred and Rotation Grazing, U. S. Department of Agriculture, Bulletin No. 34 (Washington: Government Printing Office, 1913), 16 pp.

[2]A. L. Hormay and M. W. Talbot, Rest-Rotation Grazing, A New Management System for Perennial Bunchgrass Ranges, USDA-Forest Service, Production Research Report No. 51 (Washington: Government Printing Office, 1961), 43 pp.

subject of this paper.

The Problem

The establishment of season-of-use on summer ranges being managed under a rest-rotation grazing formula (the new model), can significantly affect grazing capacity and various other economic considerations of the rancher. The emphasis of this paper will be to show how capacity as well as management flexibility and various impacts on base land can be affected by the designation of season-of-use.

Scope

Except to establish a general basis of comparison between the old and new models of range management, the scope of this paper is limited to the development of a basis for and a subsequent analysis of four alternatives for designating season-of-use under a rest-rotation grazing system. An empirical example is used as an illustration.

Assumptions

For the purpose of this paper, the assumption is made that a rest-rotation system of grazing is the most appropriate management prescription for meeting public objectives. Rest-rotation grazing is predicated on ecological factors, hence within the system biological cues limit the establishment of alternative courses of action.

In the case of the example illustrated in this paper, apparently management based on natural ecological factors is currently the most economical. Political response suggests no apparent tendency on the part of the public to deviate from economic or ecological management cues. However, to firmly establish the relevancy of this assumption, a thorough examination of the alternatives to ecological management in general, and rest-rotation in particular, would be necessary. Also, both national and local political attitudes should be carefully assessed. To do this is beyond the scope and purpose of this paper; however, it is important to recognize necessity of the eventual careful examination of the assumption.

Definition of Terms

Following are terms defined as they are used in this paper:

Actual Use. The use made of an area by livestock without reference to permitted or recommended use. It is expressed in terms of number of animal units for a specified time.

Allotment. An area of public land designated for use by livestock belonging to specified permittees under a prescribed plan of management.

Animal. Used in this paper synonymously with

"animal unit"--considered to be one mature cow with calf or equivalent.

Carrying Capacity. The maximum stocking rate possible without inducing permanent damage to vegetation or related resources. Synonymous with grazing capacity.

Commensurability. Capacity of a permittee's base ranch property to support permitted livestock during the period such livestock are off public land.[3]

Commensurate Property. Land which qualifies a person for a grazing permit on public land, and on which the permittee's livestock are held during the period such livestock are off public land.

Commensurate. Reference to a permittee's commensurability status.

Deteriorated Range. A range which has regressed or may still be regressing from its ecological production potential.

Ecology. That part of biology which deals with the relationships of organisms to their respective habitats.[4]

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[3]Donald L. Huss (ed.), A Glossary of Terms Used in Range Management (Portland, Oregon: American Society of Range Management, 1964), p. 11.

[4]W. A. Dayton, Glossary of Botanical Terms Commonly Used in Range Research, United States Department of Agriculture, Misc. Pub. No. 110 (Washington: United States Government Printing Office, 1950), p. 12.

Key Species. Forage species on which management is based.

Permittee. One who has the privilege of grazing livestock on public land.

Primary Range. Area which animals prefer to use and over which they will naturally graze when distribution measures are limited. The areas on which overuse will occur before secondary range is used when animals are allowed to drift at will.

Secondary Range. Range which is normally only lightly used or unused by freely drifting livestock. It ordinarily will not receive significant use until the primary range has been heavily used or during spring and fall seasons, when livestock naturally drift more extensively.

Stock. A term meaning livestock.

Stocking Rate. The number of animal units on a specific area for a specific time.

Sustained Yield. The continuation of desired animal or forage production.[5]

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[5]Huss, op. cit., p. 29.

CHAPTER II

THE OLD MODEL

The old model of range management is predicated on the concept of "proper-use." In a very general context, the "proper-use" model has come to mean something like this: use that is proper in that grazing and other resources will not be destroyed. This is an acceptable abstract definition; however, the means and assumptions which have been associated with the model can be looked at with some degree of suspicion.

Huss has further defined "proper-use" in this way:

> The degree and time of use of current year's growth which, if continued, will either maintain or improve the range condition consistent with conservation of other natural resources.[1]

Implicit in the definition, ". . . and time of use of current year's growth," is the assumption that the model makes reference to the time of use <u>within</u> any given year. It has usually failed to consider any inter-temporal distribution of use, i.e., how often the plants receive a given degree of use and the length of rest periods (or lack of) in between times of use.

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[1]Donald L. Huss (ed.), <u>A Glossary of Terms Used in Range Management</u> (Portland, Oregon: American Society of Range Management, 1964), p. 23.

A common limit to degree of use has been fifty (50) percent use of annual plant growth. This common guide is epitomized by the cliché "take half and leave half." Various other degrees of use are occasionally established, depending on the range site and the objectives of management. The particular degree of use established is called a "proper-use factor."

Management prescriptions under the proper-use model have often allowed season long use, year after year, using only the so-called proper-use factor as a guide to the degree of allowable use. The assumption that a plant can sustain itself and produce a maximum total forage when repeatedly clipped and trampled, throughout the grazing season, year after year, is tenuous at best. This can be verified by studies which indicate range plants cannot sustain full production and be continually defoliated during the growth period, beyond rather moderate limits of use. Hormay and Talbot point this out in their clipping studies[2] (i.e. Idaho fescue dropped from 4.16 to .83 square inches basal area after being clipped for only four years at the seed-in-milk stage).

Of more significance is the false assumption of

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[2]A. L. Hormay and M. W. Talbot, Rest-Rotation Grazing, A New Management System for Perennial Bunchgrass Ranges, USDA-Forest Service, Production Research Report No. 51 (Washington: Government Printing Office, 1961), pp. 22-25.

the old model, that a uniform degree of use is attainable. Although it is widely recognized that livestock are highly selective in their grazing habits, and as a consequence use some plants much more than others, the problem has not been effectively faced under the old model. Distribution efforts, at best, cannot completely protect the most accessible and palatable plants from too heavy use.[3]

It has been common practice under the proper-use model to average the degree of plant use in arriving at total use figures. This "average use figure" is compared to the so-called "proper-use factor" to arrive at the difference between actual and proper-use. This procedure fails to take into account the importance of the extremes of difference uses averaged in the total use figures. Within the average figures some plants will have been used relatively heavily and some relatively lightly.

When the amount of average actual use exceeds the proper-use factor over a period of years, it has been common practice under the old model to use this data as a

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[3]Because of the selective grazing habits of livestock, the most accessible and palatable plants inevitably receive heavy use; use that exceeds a plant's physiological limits under season long use, year after year. Thus, even with relatively low stocking rates, plants in primary range areas will be destroyed, and some degree of range deterioration is inevitable under the proper use approach as it has been conceived and practiced.

basis to adjust stocking. Adjustments are made on a percentage basis, often either by reducing numbers of livestock or length of the existing season-of-use. When the length of the grazing season is reduced, often the reduction has been made by cutting time off the end of the season. Since the most significant plant damage occurs during the early part of the growing season, cutting time off the end of the grazing season is of little value. (Note that the more accessible plants would have received heavy use during the beginning of the grazing season.) This procedure is sometimes called a "paper reduction," and is usually the easiest kind of "cut" to make administratively, since grazing permittees using public lands tend to give least resistance to this procedure. Whether or not an adjustment is a "paper reduction" is of little importance when considering the over all failure of the old model to solve the problem of continuing range deterioration on primary range areas.

"Proper-use" seems of little value unless defined in terms of "proper" with respect to a specific management objective. Certainly, it must be more specifically defined than in terms of a "proper-use factor," and the assumptions made by the concept must account for all of the important variables. It can be effectively argued that "proper-use" has not been operationally defined and verified and in common usage remains an abstract concept based

on the following rather invalid assumptions:

1. Inter-temporal distribution of use is most significant within grazing seasons.
2. Plant maintenance can be accomplished with season-long use year after year.
3. Uniform use is attainable.
4. Average degree of use will account for protection of those plants used heavily.

CHAPTER III

THE NEW MODEL

The new model is relatively uncomplicated. Rest-rotation grazing simply focuses on providing a reproduction capability for desired range plant species. To accomplish this, Hormay and Talbot propose a four-step procedure: (1) graze the range for maximum livestock production, (2) rest the range until plant vigor is restored, (3) rest the range until seed ripens, then graze for maximum livestock production (seed is consequently planted by being trampled into the soil), (4) rest the range until reproduction becomes firmly established.[1] The number of years required to apply each step depends on the particular growth requirements of the one desired plant species with the most exacting requirements. By providing the reproduction of the specie with the most exacting growth requirements, all other species will be maintained, in addition to obtaining maintenance of plant vigor and the maximum continuous livestock production possible without modifying natural ecological processes.

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[1]A. L. Hormay and M. W. Talbot, Rest-Rotation Grazing, A New Management System for Perennial Bunchgrass Ranges, USDA-Forest Service, Production Research Report No. 51 (Washington: Government Printing Office, 1961), p. 32.

To accomplish the four steps, since each takes one or more years to complete, the range must be divided into units equaling in number the number of years required to complete the cycle. Each unit pasture must be relatively equal in grazing capacity.

Seed-Ripe-Time and Season-of-Use

The requirement of resting the range until the seed ripens, outlined above in step four, is the important limiting factor of the new model in establishing season-of-use. This relationship can be explained as follows: In a rest-rotation grazing system, two pastures are used in sequence during the summer season. The first pasture holds the stock during the early part of the season, until seed has ripened in the second pasture. The stock are then moved into the second pasture, in effect, planting the ripened seed by trampling it into the soil. Season-of-use is determined from seed-ripe-time, since half the season must be spent in the first pasture and half is spent in the second pasture (only after seed-ripe-time). Whatever the stocking rate, stock are held in the two pastures for the time it takes to utilize the forage. The time is divided at the date seed ripens.

Divergence from this balance will limit the total. For example, consider a four-month summer grazing season from June 1 to September 30. For this example, let

seed-ripe-time occur, on the average, on August 15. In this case the first pasture grazed must be stocked with just enough stock to graze on the area for two and one-half ($2\frac{1}{2}$) months (from June 1 to August 15). Since the two pastures are equal in capacity, the second pasture will also have enough forage to hold the same number of stock for two and one-half ($2\frac{1}{2}$) months. The problem is that the season ends September 30, or one month short of two and one-half months (August 15 to September 30) or full use of the second pasture. (Full use of this pasture is important to provide seed planting from trampling.) This division of use is illustrated in Figure 1:

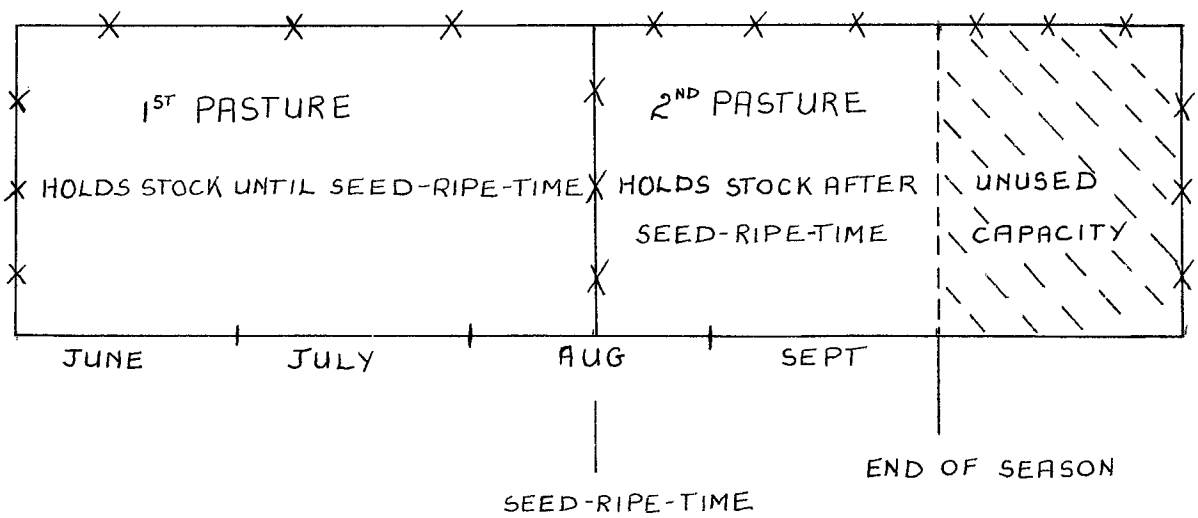

Figure 1. Unbalanced grazing season, ending prematurely

This example illustrates the case of an unbalanced season, in which the season is relatively longer before seed-ripe-time and too short after.

To illustrate the relationship of stocking rate and season-of-use, consider the same established grazing season as in the first example, June 1 to September 30, with the average seed-ripe-time occurring again on August 15. However, in this case the stocking rate is so heavy that all available forage is removed and stock are forced to move to the second pasture by July 15, thus not allowing time for seed to mature in the second pasture (seed-ripe-time occurs August 15). This indicates that stocking is too heavy for a two and one-half month season in the first pasture. This relationship is illustrated in Figure 2:

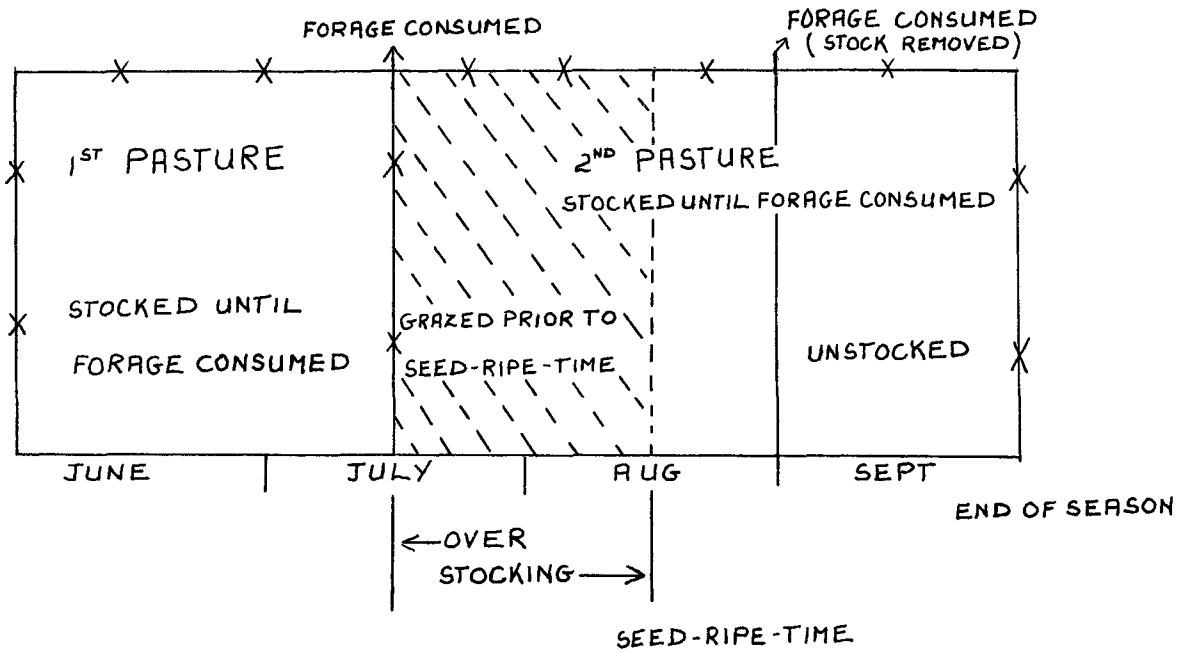

Figure 2. Overstocking in relation to the beginning of the grazing season and seed-ripe-time

Solutions

Solutions to the problems posed by the above examples illustrate how seed-ripe-time affects the designation of season-of-use under any given stocking rate.

In the case of an unbalanced season-of-use, there are two solutions. The first, and perhaps the more obvious, is to simply extend the season to allow time for complete use of the second pasture. This is illustrated by Figure 3:

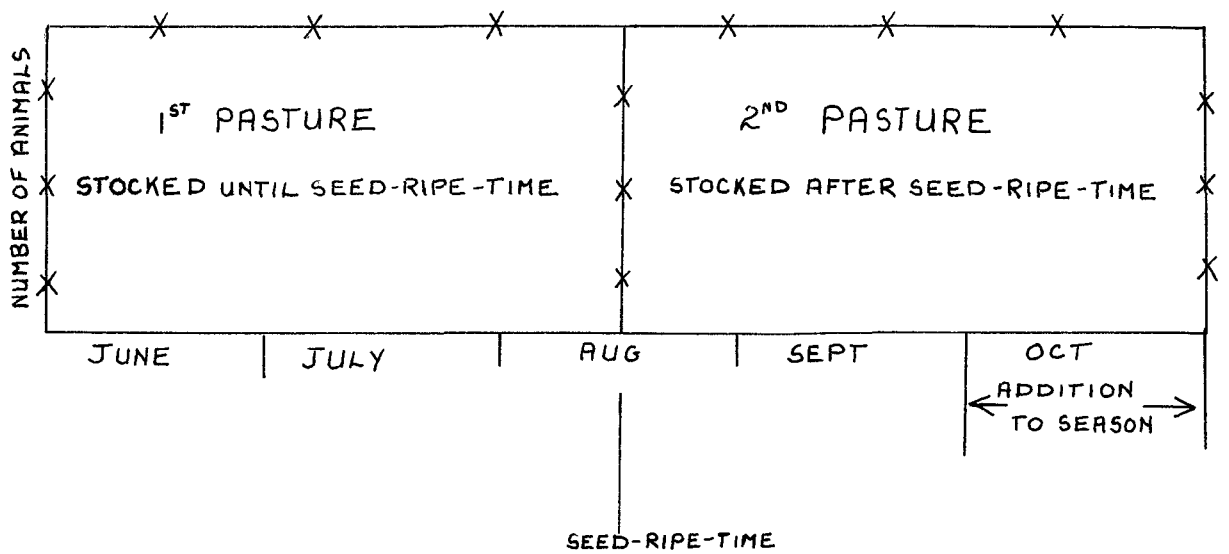

Figure 3. Balanced grazing season due to season extension (relatively fewer animals)

In this case the season would be extended from September 30 to October 31. Since stocking is presently correct for both pastures, the stocking rate remains unchanged.

The other solution to adjusting an unbalanced

season-of-use is to shorten the grazing season at the beginning of the season to equal the time remaining in the second pasture after seed-ripe-time, and increase the stocking rate to the capacity of the second pasture. This is illustrated by Figure 4:

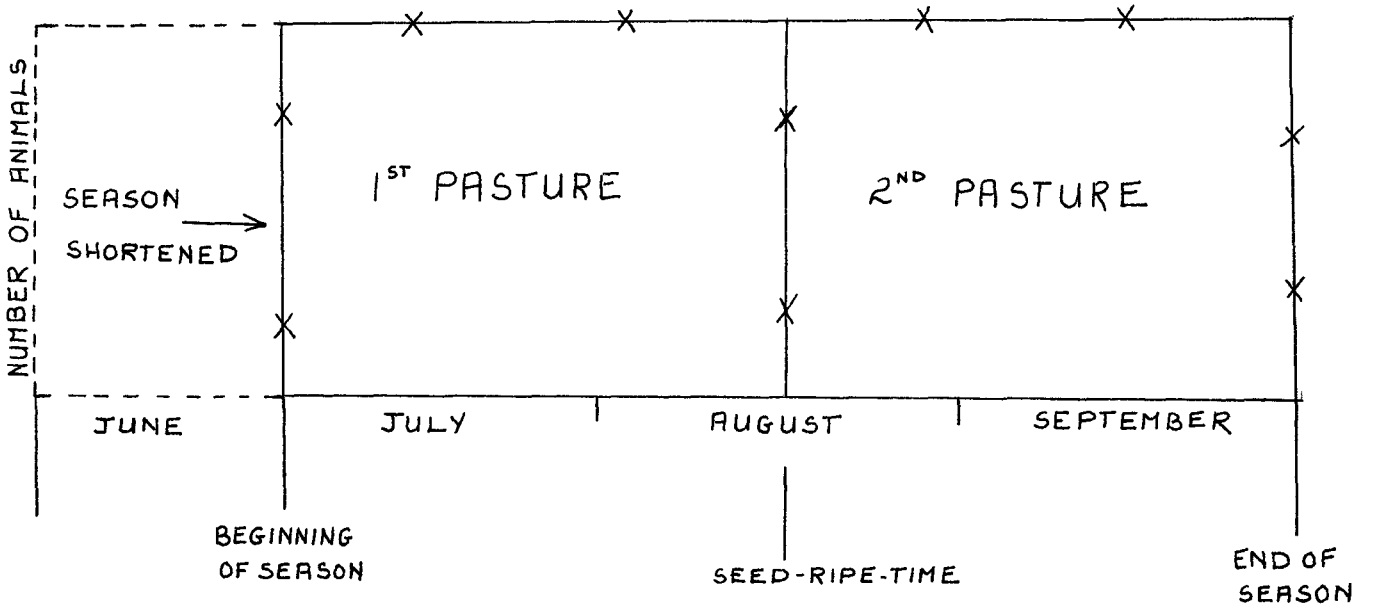

Figure 4. Balanced grazing season due to shortening of season (relatively more animals)

In this case the season is shortened from June 1 to July 1, and the stocking rate increased to the capacity represented in the second pasture for a one and one-half month period (August 15 to September 30). The balance point is seed-ripe-time, August 15.

In the case of overstocking, there are also two solutions which are corollary to solving the problem of an unbalanced season-of-use. Again, the first is to adjust

the season-of-use. Only in this case the season must be shortened at the beginning to allow only enough time for this particular number of stock to graze until seed-ripe-time on August 15. This is illustrated by Figure 4, page 17.

In this case the season would begin on July 1 with the same number of animals giving the same total number of animal months use. The important difference here is that the critical seed-ripe-time has been met.

The other solution is to cut the stocking rate to the capacity of the first pasture for a two and one-half month period (June 1 to August 15), and to extend the season-of-use. This is illustrated by Figure 3, page 16.

In this case the season would not end until October 31, with less livestock, giving the same total number of animal months use.

All of the proposed solutions make it possible to accomplish range maintenance and improvement. Plant reproduction is made possible, because seed is matured and planted. Seedling establishment and plant revigoration can be accomplished through appropriate rest periods by varying the number of pastures in the grazing cycle. There are certain advantages and disadvantages to the different alternatives, depending on the objectives of the

particular range management program. These are discussed in the following chapter.

CHAPTER IV

AN EMPIRICAL EXAMPLE[1]

To illustrate the effects of the designation of season-of-use as a factor in determining grazing capacity and management flexibility, data from a grazing allotment on national forest land will be used. This example is one of several allotments presently undergoing conversion to a rest-rotation system of management and represents a typical example of the problems faced on most allotments being converted to the new model. The sample allotment is the French Creek Cattle Allotment on the Custer Ranger District, Black Hills National Forest, in western South Dakota. A thorough discussion of the allotment and the management prescription is well beyond the scope of this paper; for this reason, only those facts pertaining to the designation of season-of-use will be presented.

Allotment Data

Statistical

Present season-of-use: June 1 to September 30.

Stocking rate: 200 animals.

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[1]Summarized from the official French Creek Cattle Allotment files, Custer Ranger District, Black Hills National Forest, Custer, South Dakota, December 1965.

Use record (compiled from two years use under rest-rotation plan):

Season opening: June 1.

Date stock removed from first pasture:

Avg. July 15 (due to maximum practical use)

Date of seed maturity for key specie:

Avg. August 15.

Date stock removed from allotment:

Avg. September 15 (due to maximum practical use).

Range Type and Weather Pattern

Usable range on the allotment consists of a combination of blue-grass, bunchgrass, and open timber types. Average rainfall is 18 inches, with the majority occurring during the growing season. As a result, plant regrowth occurs throughout the summer and fall seasons.

Management Plan

Pastures are divided so as to be relatively equal in grazing capacity. The management prescription calls for the use of two unit pastures during the season. One pasture holds the stock until seed-ripe-time (or until maximum practical use is made of the pasture, since plan is still exploratory), and one pasture is subsequently stocked until forage is removed or until the end of the

season.

Historical

The present season-of-use was established in 1956 after a permit adjustment cutting the season from October 31 to September 30. For the most part, permittees have acquired private holdings which are more than commensurate to their permitted numbers. Although the permittees are generally cooperative, they are reluctant to change the present season or numbers of livestock.

For the most part private holdings consist of narrow bottom lands, used to carry stock during the period they are not on the allotment, and to raise both native and domestic hay for winter feeding. Gainstuffs are purchased and shipped in from other areas.

Management Objectives

As a public service agency, the Black Hills National Forest has the responsibility of administering the allotment in the public interest. Servicewide range management objectives are described in the Forest Service manual:

> 2202 - Objectives of Grazing Regulations.
>
> 1. Perpetuation of the organic resources on both National Forest and related land through wise use, protection and development.
>
> 2. Social and economic correlation of the use of National Forest range with adjacent land.

3. Stabilization of the part of the livestock industry which makes use of the National Forests through administrative policies and management practices which conform to the requirements of practical operations.

4. Cooperation with users through a decentralized administration organized and authorized to settle local problems in accordance with local conditions.

5. Protection of the established ranch owner and home builder against unfair competition in the use of the range.[2]

These objectives are broad and unspecific, but place emphasis on "perpetuation" of the resources and on filling the needs of the local users. The rest-rotation grazing model meets these requirements, and any alternative falling within the limits set by the new model can be considered acceptable.

It can be assumed that the objectives of the permittees are to maximize the profits of their respective operations. How this can be done with respect to the grazing season on the allotment is not actually defined, and is beyond the scope of this paper; however, since the allotment is a common operation, the aggregate benefit, whatever it is, must be considered. This can be determined only by the permittees as a group, and does not negate the importance of an objective determination of the relevant courses of action and a review of the advantages and

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[2]Forest Service Manual, Amendment No. 84, October, 1962, p. 3.

disadvantages of the alternatives.

Analysis of the Problem

As indicated from the Use Record on page 21, with the present permitted number of animals (200) and the season-of-use (June 1 to September 30), forage in the first pasture is not adequate to hold the stock until seed-ripe-time (August 15). Stock do not have sufficient feed to remain in the first pasture beyond July 15. Some adjustment in season-of-use or stocking rate is needed in order to allow stock to remain in the first pasture until August 15. (This meets the important criterion of allowing seed to mature in the second pasture before it is grazed.)

On the basis of actual use as illustrated by the Use Record, the pastures can carry the present stocking rate of 200 head for 45 days (from June 1 to July 15, date of removal from the first pasture due to lack of additional forage). Expressed in animal months:

200 animals X 1.5 months = 300 animal months.

Since, on the basis of actual use experience, 300 animal months is the capacity of each pasture (pastures are divided equally) and the first pasture must hold the stock from June 1 to August 15 (seed-ripe-time), the intertemporal distribution of numbers is determined by:

300 animal months ÷ 2.5 months (June 1 to August 15)
= 120 animals.

Thus, the capacity of the pastures limits the stocking rate to 120 head with the season-of-use in the first pasture from June 1 to August 15. However, when the stock move into the second pasture after August 15, under the present season, there remains only one and one-half months until the end of the presently designated season, September 30. Expressed in animal months:

120 animals X 1.5 months = 180 animal months.

Instead of obtaining full use of the second pasture (300 animal months), the ending of the season on September 30 limits use to only 180 animal months or a net loss of 120 animal months, forty (40) percent of the total capacity of the second pasture.

In summary, the present stocking rate exceeds the carrying capacity of the range with the presently designated season-of-use, in that it does not allow enough time for seed to mature in the second pasture grazed. The above calculations indicate a reduction in stocking rate from the present 200 animals to 120 animals is needed with the present season beginning June 1. With a stocking reduction and the present season-of-use ending September 30, the second pasture grazed will be only sixty (60) percent utilized.

This situation is inconsistent with the economic

objectives of the permittees and violates the public objectives of livestock industry stabilization and resource perpetuation.

In the following chapter, four alternative solutions to the problem are discussed.

CHAPTER V

FOUR ALTERNATIVES

Chapter three provides the basis for arriving at alternative courses of action for meeting the requirements of rest-rotation grazing on the French Creek Cattle Allotment. It illustrates how seed-ripe-time is the balance point between two pastures and that maximum grazing capacity could be obtained within the limits of the new model by adjusting two factors: season-of-use and stocking rate. For the sake of brevity, alternatives will be limited to the four most relevant courses of action.

In addition to maximizing grazing capacity, there are other accompanying advantages and disadvantages to each alternative which in some cases may themselves be the more important or at least all the various advantages of an alternative in aggregate may be overriding, depending on the objectives of the permittees.

Alternatives

No Change in Season-- Reduce Stocking

The first alternative to be considered is to leave the present season of June 1 to September 30 unchanged. However, since stocking must not exceed the capacity of

the first pasture being grazed to hold stock until seed-ripe-time on August 15, the stocking rate must therefore be reduced to 120 animals. (See page 25, Chapter Four.) The season-of-use would then be June 1 to August 15 in the first pasture, and August 15 to September 30 in the second pasture, leaving it unbalanced by one month's time. The stocking rate would be reduced from 200 animals to 120 animals. Thus, there would be 300 animal months use in the first pasture and only 180 of a possible 300 animal months use in the second pasture.

The obviously important disadvantage of this solution is the loss of one month of grazing time due to the imbalance of the season-of-use. See Figure 1 on page 14.

The second pasture is simply not being grazed to its capacity, amounting to a loss of:

120 animals X 1 month (October 1 to October 31)

= 120 animal months.

Another important disadvantage to this approach is that since the second pasture is not being heavily utilized, the matured seed may not be sufficiently trampled into the soil.

Hormay and Talbot point out the importance of planting thus:

> Provision for this third step /deferrment until after seed maturity and subsequent heavy use/ is exceedingly important, not only because it insures seed, but also because trampling

> associated with grazing after seed-fall is needed to get as much seed as possible worked into the soil. Seeds buried in the soil have a much better chance of germination and producing strong, well rooted seedlings than seeds lodged on the soil surface.[1]

This lack of seed planting would seem especially true on secondary range areas. Failure to plant, may in the long run, reduce total capacity, since plants would not be reproducing by seed.

An advantage of this alternative is that it provides a convenient opportunity to meet the early market, since stock will normally be coming off the range by the end of September. Early markets generally provide higher prices. Another advantage is that if stock are to be placed directly on a feed lot for fattening, there is some advantage in removing them from the range early, since during this period the animals' rate of gain diminishes significantly when left on dry pasture.

The disadvantages of this alternative seem overriding, because it would provide the least total grazing capacity. It would appear to not really be a relevant solution. However, the permittees in this case are, for various reasons, reluctant to change either the stocking rate or season-of-use. Because the decision making

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[1]A. L. Hormay and M. W. Talbot, Rest-Rotation Grazing, A New Management System for Perennial Bunchgrass Ranges, USDA-Forest Service, Production Research Report No. 51 (Washington: Government Printing Office, 1961), p. 33.

responsibility ultimately lies with a public agency rather than the permittees, it is for ethical reasons and by tradition that every possible alternative with an advantage be considered. This solution represents the least degree of change. It is only through examination of all advantages and disadvantages that the most desirable solution can be recognized and understood.

No Change in Season--
Variable Stocking

In this case, the present season of June 1 to September 30 would not be changed. However, the stocking rate would be varied thus: 120 animals would be grazed in the first pasture from June 1 to August 15 (seed-ripe-time), and the second pasture would be stocked with 200 animals from August 15 until the end of the season on September 30. The two stocking rates are calculated as follows:

First Pasture: 300 animal months (carrying capacity determined from actual use, see page 24) ÷ 2½ months (June 1-August 15) = 120 animals.

Second Pasture: 300 animal months ÷ 1½ months (August 15-September 30) = 200 animals.

The most apparent disadvantage of this alternative is in the necessity for holding the extra eighty animals (200 minus 120) on private or leased land until seed matures on the allotment. This system would involve a degree of unnecessary handling and would complicate management of

commensurate lands. Also, there is some doubt as to whether, even under this heavier degree of stocking, full use of all available secondary range would be made without the benefit of the cool, moist fall season, when animal distribution is naturally better.

The advantage of this alternative appears mainly in the heavy stocking and concentration of the area after seed-ripe-time. Theoretically, this would accomplish thorough seed planting and then provide some time for minimal regrowth and plant recovery during the fall season (October-November). The advantages of convenient early marketing and feed lot fattening of the first alternative also apply in this case.

Shorten Season--No Change in Stocking

With this alternative, the present season of June 1 to September 30 would be shortened to July 15 to September 30. The present stocking rate of 200 animals would remain unchanged. As was illustrated in Chapter Four, page 25, the present stocking rate is too heavy to carry the stock for more than one and one-half months, or a total of 300 animal months. Stock should not be moved from the first to the second pasture prior to August 15 (seed-ripe-time), hence:

August 15 minus 1½ months = July 1 (opening date).

Expressed in terms of 300 animal months grazing

capacity of each pasture:

300 animal months ÷ 200 animals = 1½ months.

Early plant growth stages which occur during June are the most nutritious and therefore provide the period of most rapid livestock gain. Loss of livestock use during this period would represent a significant disadvantage of this alternative. Another disadvantage of this choice is that permittees seldom have enough private spring pasture. In cases where stock must be held on crop lands until turned onto the allotment, the opportunity costs in grazing these lands are great. To use crop lands during the spring and early summer growing seasons seriously limits their total output needed to produce crops and provide later fall and winter pasture. Also, when animals come off the range as early as September 30, some forage may go unused on the secondary range areas due to poor natural distribution during the hot dry summers.

The most apparent advantage of this alternative is delaying plant use for one month during the maximum growth period (June) would provide for greater plant vigor and possibly greater total forage production. At least this would represent a "protection factor." Another, and sometimes significant advantage is that this alternative provides for larger total numbers of animals permitted on the allotment. In cases where permittees have adequate private capacity, particularly for seasons other than summer grazing,

additional summer permits may be an important factor in rounding out the ranch operation. The advantages of convenient early marketing and feed lot fattening of the above-mentioned alternatives are also applicable in this case.

Extend Season--
Reduce Stocking

The final alternative would be to extend the present season to October 31, and reduce stocking to 120 animals. Since the capacity of each pasture is limited to 300 animal months and it is imperative to not graze the second pasture until after seed-ripe-time (August 15), a June 1 opening date must be accompanied by a reduction in the present stocking rate thus:

300 animal months ÷ 2½ months (June 1 to August 15)
= 120 animals.

In order to balance the season-of-use between the first and second pastures with a uniform stocking rate, one month must be added to the season, thus making it June 1 to October 31.

This alternative has the disadvantages of not providing a convenient early marketing or fattening capability, and does not allow for fall regrowth.

An important advantage of this choice is that it provides livestock use during June, the time when plant nutritive qualities are at a peak. Livestock gains are

most rapid during this time. Another advantage is that with the longer allotment season less private capacity for holding stock during the spring and fall is required. Often permittees are short of both spring range to hold stock after spring growth begins and fall pasture to hold them until fall regrowth ends. Another, and perhaps the most significant, advantage is that it is during the October season that the fullest use of secondary range occurs. Livestock distribution is naturally better when the weather cools off enough to cause a decrease in fly activity and when there is an increase of moisture in pot holes and condensation on forage. In this season, stock have less need for shade and developed water facilities. Land in the steeper areas farther from water can be used at this time without undue pressure on stock. Use of plants is less damaging since most of the food storage process has already taken place.

Choice Among Alternatives

Before a choice among the alternatives can be made, the preferences of the permittees as a group must first be determined. Since all of the alternatives fall within the sustained yield requirements of the new model, in this case either would be acceptable from the standpoint of the public objectives, provided the choice gives the greatest long-run advantage to the majority of permittees.

Table 1 gives a condensed summary of the advantages and disadvantages of the alternatives. Upon close review of the possible choices, it can be seen that the fourth alternative gives what appears to be the greatest combination of advantages. However, the other alternatives all fall within the limits of a "sustained yield" and could be considered in establishing a management policy. The choice must then be made on the basis of maximum return within the limits of the permittee's total ranch management plans, the objectives of which are presently unknown.

Problems Faced by the Rancher

Adjustment to the new system, depending on which alternative is chosen, is made in one or a combination of two ways: by grazing less stock on the allotment for a longer time, or by grazing present numbers of stock on the allotment for a shorter time. If the choice is to graze less stock on the allotment for a shorter time (first alternative), additional private pasture would be required if the permittee's current level of operation is to be maintained. Under the fourth alternative, an additional month of grazing time is provided for 120 animals, thereby requiring the same amount of private pasture (300 animal months) that it presently required. If the choice is to graze the present numbers (200 animals) on the allotment (third alternative), additional private pasture would be

TABLE 1

SUMMARY OF ADVANTAGES UNDER THE DIFFERENT ALTERNATIVE SEASONS-OF-USE AND STOCKING RATES

Alternative	Maximum Livestock Growth Capacity	Adequate Seed Planting	Fall Distribution and Grazing	Spring Grazing	Minimum Stock Handling	Maximum Season-Of-Use	Maximum Stocking Rate
1	No	Partial	No	Yes	Yes	No	No
2	Yes	Yes	No	Yes	No	No	No
3	No	Yes	No	No	Yes	No	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes	No

required to hold the stock during the spring growing season (June). Impact will depend on the amount, variety, and type of ranch land held by each particular permittee.

Not to be overlooked, is the fact that under the new model plant physiological requirements are effectively met. This means that a sustained maximum grazing capacity is the result. It will provide a greater long-term yield than management under the old model, and in many cases a change to rest-rotation may involve some significant increases in stocking rate,[2] particularly after the range has been built up to the desired ecological condition. Increased stocking of the summer range, consequently, changes the requirements for commensurate lands on which the stock are held during the remaining part of the year. In order to meet this additional requirement, a rancher

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[2]Statistics are not yet available; however, in calculating an estimated stocking rate when converting from season long grazing to a five-pasture rest-rotation system designed to improve range conditions, it is possible to carry, under the new system, the number of stock represented by 20 to 30 percent use of total available forage under an old model system. When use is less than this amount, an increase in stocking rate may be possible. When use exceeds this amount, some decrease in stocking may be necessary at the beginning of the new plan. However, when converting to a five-pasture rest-rotation system designed for maintenance only, it is theoretically possible to increase the stocking rate to twice the numbers represented by a 20 to 30 percent indicated overstocking under the old model. A complete explanation of this can be gained only by a thorough study of the new model. The theoretical basis is beyond the scope of this paper.

may find it necessary to increase his total holdings, either through purchase or leasing arrangements. Another possibility to facilitate increased stocking on summer range is to purchase stock in the spring, hold them during the summer, and then sell in the fall. This approach introduces an element of speculation and is usually not encouraged under federal permits or leases. Again, the particular type of operation will influence the possibility of this as a practice.

Perhaps one of the more important adjustments to the new model is simply adjusting to a new method--overcoming the resistance to change. It is often difficult to put aside a method of operation which has been used for years. In many instances it may take some time in a period of incremental adjustments, both from the standpoint of psychological and economic adjustment.

Problems Faced by the Public Administrator and the Range Technician

The limiting nature of season-of-use as it fits into the new model places the administrator in a position in which he must face the problem head on. The alternatives are much more clear (provided the requirements established by the new model are recognized) and well defined as regards actual, and once elusive, grazing capacity. At times there is little doubt that implementing change to the new model

will be difficult, but no longer is a tangential approach by simply taking the path of least resistance acceptable.

Overcoming resistance to change is perhaps of equal difficulty both among land owners and among public administrators. To explain this problem is much beyond the scope and purpose of this paper; however, much resistance to change can effectively be overcome when it is demonstrated that parties to the change can cope with the new method without difficulty. It would appear that a full explanation of the reasons why the new model is necessary and more specifically how it works would go a long way in helping to overcome a problem of resistance. This may seem obvious; it is often overlooked.

Another problem that would appear common is that often the traditional administrative allocation of allotments may not lend itself to management under the new model. In some cases allotment boundaries should, most logically, be adjusted to accommodate practical pasture divisions in which it will be possible to take full advantage of seed-ripe-time in each pasture. A management prescription should, most advantageously, be considered on an area without regard to present allotment boundaries.

Since there are a range of acceptable alternatives under which public objectives can be met, it would appear the best approach is for public administrators and grazing permittees to jointly develop a choice, taking into

consideration the particular ranch operations involved.

CHAPTER VI

SUMMARY

Even though much earnest effort and expense have been put into the time-weathered "proper use" approach to range management, it has not been successful in maintaining or improving range condition along with maximum livestock production under an ecological system of management. However, the effort has not all been in vain. Experience and research developed through trying to find an answer to the problem of "sustained yield" have, over the years, produced a solid foundation for the new model. The new model, rest-rotation grazing, makes provision for the two basic plant physiological requirements: vigor and reproduction. In doing so, it provides adequate periods of rest, strategically timed, to revigorate plants so they can produce seed, to protect seedlings so they can become well established, and to protect plants until seed matures. Among numerous facets of the new system, it is the latter, seed-ripe-time, which affects the designation of season-of-use, that has been the subject of this paper.

The approach has been within a framework of a resource management decision making process. The public management objectives, it is assumed in this case, can best

be reached through an ecological management system. This does not rule out the possibility that at some time in the future economic or political needs will not alter this approach. Indeed, technology may well provide the tools to economically modify ecological requirements. Social wants could demand production without regard to monetary cost-return relationships.

Because the appropriateness of the new model in meeting public objectives has been assumed, and the relevant alternatives presented are all within the limits of the new model, choice among the considered alternatives is, in the final analysis, dependent on which one will more fully meet the objectives of the permittees involved in the empirical example. These objectives can only be determined by the permittees themselves.

From a summary of the advantages and disadvantages of the alternatives, it seems apparent that the last alternative gives the more aggregate benefit considering only the "best" choice from the standpoint of the range resource allotment alone. However, when considering the aggregate year-round operations of the permittees, the other alternatives may represent a valid choice. It becomes, then, the job of both the public land administrator and grazing permittee to determine together the most advantageous season-of-use for their particular problem, but <u>within the confines</u> of the limits set by seed-ripe-time under the new model.

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