Farming Range Pastures

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IT is always a pleasant assignment for me to talk about pasture and grazing. It is an exceptionally happy event when the audience is international, because pasture is an international crop. Although we may associate the production of tea with China, dates with Arabia, and coffee with Brazil, nevertheless pasture is an important crop in these countries also. In New Zealand, Australia, Argentina, as well as in many other lands, pasture is the principal source of agricultural wealth. Not only is pasture of universal interest, but it is one of the world's largest crops.

The title of this talk is "Farming Range Pastures." It was chosen because the basic principles of good farming apply to range pastures as much as to any other crop: good land management returns high yields and reduces soil erosion; crops adapted to a climate produce higher returns; careful decisions about dates of harvesting ensure high quality crops; and reserves of moisture, fertility, and feed assure continuity of production. These are the principles which the title considers; these are the points I hope to develop as my talk progresses.

Pastures of the Northern Great Plains

Pastures throughout the Great Plains of North America, and particularly within its northern section, consist largely of native grasslands. In the Province of Saskatchewan, over 90 percent of our grazing comes from this source, as well as over 60 percent of all fodder consumed by livestock. The land which produces this wealth is largely nonarable, being either arid, stony, steeply rolling, or saline. In all probability, this land will remain as an unimproved resource for many generations, and the care we give it now will determine its productivity in the future.

Let us examine the characteristics of our native grasslands. It will be appreciated by all that they vary in composition from district to district. In the shortgrass country blue grama grass is the most abundant. Speargrasses and wheatgrasses dominate the cover in the mixed grass prairie area, while fescues and oatgrasses are the principal species in the foothills of the Rocky Mountains. But, despite the fact that different grasses occur from region to region, the vegetation has certain characteristics in common—some of which are valuable and must be preserved, others are weak and thus need care and help.

Strong points of native grasses

Our native grasses have five valuable or strong characters:

1. They recover rapidly from drought.
2. Production is maintained when good management is practised.
3. Many grasses cure on the stem, thus retaining a relatively high total digestible nutrient content for many months after growth ceases.
4. Different species of the grass cover commence growth at different dates during the spring, thus there is

young leafy fodder available during a fairly long growing season.

5. Nearly all have high nutritive and palatability ratings.

Recovery from drought—This is a remarkable quality possessed by native grasses. Many of us will remember the dry years of 1937 and 1949 when native grass production was only about 10 per cent of average. During those years, the grasses and the weeds appeared to be dead, and the covers were reduced greatly. Yet many stockmen cut hay on those same fields in 1938 and 1950, and not only was the yield satisfactory, but the cover was back to average. The ability of our native grasses to recover rapidly from drought is a blessing we often forget when native grasslands are discussed.

Good management—Although range pastures recover rapidly from drought, they do not recover quickly from overgrazing. Overgrazing accompanied by drought, or overgrazing alone, depletes stands and reduces yields. Overgrazing can be prevented by knowing the carrying capacity of a pasture and stocking it accordingly. Although we usually state carrying capacity as so many acres per animal, my definition of carrying capacity is as follows: "The amount of grass required to produce a gain of at least 325 pounds of beef on a 2-year-old steer between April 1st and November 1st." Good management of range pastures will maintain this yield year after year, as well as the composition and stand of the grass cover.

Curing on the stem—There have been many words spoken and written about the ability of range grasses to cure on the stem. Curing is hard to define, but there are two points which help to describe this phenomenon. Firstly, curing is a process which prepares the grasses for the long winter dormancy; secondly, the process seals nutrients within the plant cells so that the food supply is not lost by leaching. From the viewpoint of the plant, it is growing its winter coat; from the viewpoint of the animal, the cured forage is a source of palatable feed which has a high T.D.N. rating—although low in protein and phosphorus. When we consider that most grasses dry up or even disintegrate when growth ceases, the curing character must be considered another blessing.

Growth seasons and nutritive value—Figure 1 illustrates the association between the growth periods of selected grasses and the approximate rate of gain of 2-year-old steers on mixed grass prairie. The spearheads represent the spring growth season of six grasses—five native and one cultivated. The wide part of each blade indicates their seasons of rapid growth, the points the beginning and end of their growth periods. In certain favourable years, growth continues to a later date and, in any year, it may recommence in the autumn. However, it is the spring growth which provides the seasonal forage and the carryover; autumn production is variable and uncertain.

It will be noticed that different grasses commence and end growth at different dates. The majority mature in about 100 days, but because some start early and others later in the season, the period of growth is extended to nearly 120 days.

Throughout their growth periods, the grasses are palatable and nutritious, and livestock will make rapid gains while pasturing them. Two-year-old steers will gain from 1.5 to 2.5 pounds daily during this season. By September, the rate of gain will be less and, by mid-November, the daily gains are small. However, gains will still be made at this late date, whereas on many other grass associations, livestock will lose weight after mid-October.

Recovery from drought, productiveness

under good management, the curing character, and high nutritive ratings during the growing season are the strong properties of native grasses. These must be preserved to maintain livestock production throughout the northern Great Plains.

325 pounds each summer. This is the driest part of the province, and fewer acres will produce the same gain in more favoured districts. However, even under our best conditions, it will require at least 8 acres to grow enough feed for one steer.

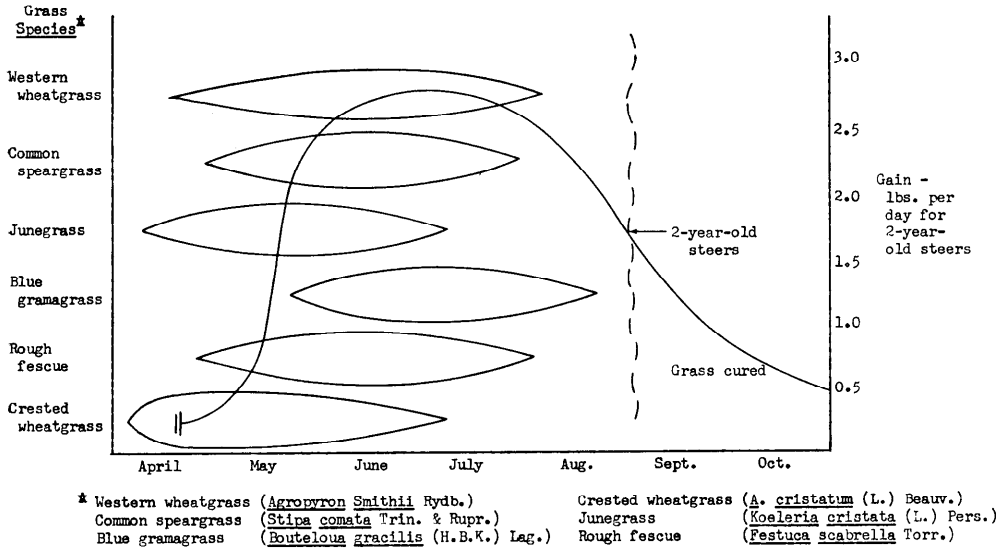

FIGURE 1. Growth periods of selected grasses, and gains of two-year-old steers on mixed grass prairie.

Weak points of native grasses

Unfortunately, few things are perfect, and our native grasses have weaknesses which we must pamper:

1. Their yields are relatively low, thus large acreages are needed to produce a summer gain of 325 pounds on a 2-year-old steer.
2. A "carryover" of the current season's growth is required to maintain a productive stand.
3. Growth is slow for 4 to 5 weeks after the leaves emerge in the spring.
4. Protein and phosphorus contents drop as the summer progresses.

Low yield—Native grasslands are not high producers. It requires about 35 acres in southwestern Saskatchewan to provide enough feed for a steer to gain

Carryover—Even this low rate of grazing cannot be practised unless a carryover is maintained. I define carryover as the amount of grass which should not be grazed. During years of average growth from 40 to 50 percent of the season's total production should be left at the end of the grazing period. None may remain during poor years, while most of a good season's growth may not be eaten. Carryover holds snow, reduces erosion, and provides a bite for the animal the following spring. Carryover is a pasture reserve as much as a full stockyard is a hay reserve.

Slow spring growth—Our native grasses grow slowly during the spring. This slow growth continues for 4 to 5 weeks after the grasses show their first green leaves.

Relatively rapid growth commences in late May and continues until mid-July, after which very little growth occurs. Reference again to Figure 1 will indicate the growth curve of certain species—slow at first, relatively rapid during late May and June, and ending sharply at maturity.

Heavy use during the period of slow growth reduces production later in the season as well as the total yield for the year. However, if protection is practised until date of range readiness, greater mid-season growth is secured as well as a much higher yield. Our investigations show that heavy spring use is as responsible for overgrazing as is heavy stocking throughout the year.

Loss of nutrients—The fourth weak point exhibited by the native grasses is the loss of protein and phosphorus. Their percentage contents decline rapidly from early June until late August. The loss continues after curing is completed, but at a considerably slower rate. Reference to Figure 2 will indicate the average percentage contents of both nutrients throughout the summer.

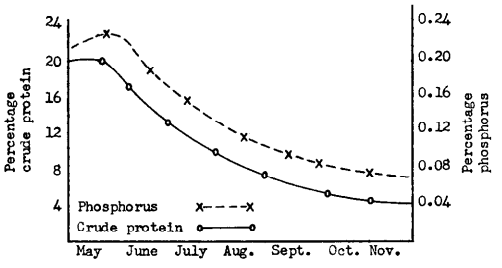

FIGURE 2. Average crude protein and phosphorus contents of mixed grass prairie from May through November.

How Can We Manage These Weak Characters?

So far, I have said little about "Farming Range Pastures". Instead, I have attempted to show that grasses have characters as has every other crop. If all characters were strong, we would have few grass problems, but because a few weak ones occur it is necessary to manage our rangelands. Thus, the question before us can be stated as follows: "How can we manage or improve the weak grass characters so that full use will be made of those which are strong?"

The first weak point is low yield, and overgrazing may reduce it to even lower levels. Attempts to increase yields by rotations have not been encouraging, although small improvements in the grass cover have been demonstrated in three field rotations. Thus, on fields containing native pasture only, we recommend that they be grazed continuously throughout the summer at a moderate rate.

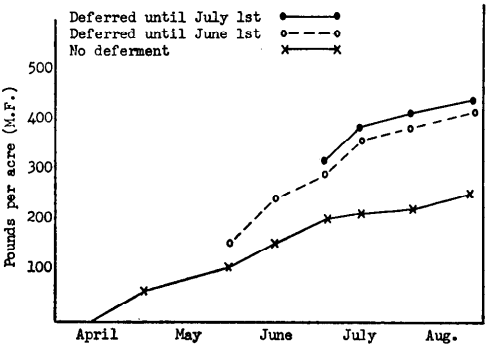

FIGURE 3. Yield of mixed grass prairie under deferred clipping at Swift Current, Sask. (Four-year average 1948–51 inclusive.)

However, increased production is possible as reference to Figure 3 will indicate. The results presented are selected from a clipping experiment which deferred harvesting of mixed grass prairie by two-week intervals. Plots protected until early June produced 65 percent more forage than those clipped from late April through September. A further small increase resulted from protection until July.

In practice, we cannot wait until early or mid-June to commence grazing. We have to choose between two alterna-

tives—graze early and accept a lower yield, or provide supplementary pasture for the spring season. Fortunately, we have a grass which grows rapidly during the spring and which can be grazed at that time, namely, crested wheatgrass. Crested wheatgrass used as spring pasture in a two-crop (spring-summer) rotation with native range, can nearly double the grazing capacity of mixed grass prairie in southwestern Saskatchewan. Increases of 60 to 90 percent have been obtained, the highest being on land with sandy soils.

early in the season, there is little increase in carrying capacity; if made too late there is a marked reduction in the amount of both forage and protein available. In order to practise the number 3 rotation, it is necessary to provide from two to three acres of crested wheatgrass per animal unit.

In a Community Pasture of 18,000 acres near Swift Current, Sask., where cattle follow naturally the rotation recommended, the grazing capacity is 12 acres per animal unit for a six-month grazing season. On adjacent range where no

TABLE 1

Possible rotations of crested wheatgrass and mixed grass prairie based on clipped plot yields 1948 to 1951 inclusive

POSSIBLE ROTATIONS			SUMMER YIELD LBS. PER ACRE			
No.	Grazing dates		Forage (M.F.)		Crude Protein	
	Crested wheatgrass	Mixed grass prairie				
1	Apr. 15–May 16		270		44	
		May 16–Sept. 1		240		58
2	Apr. 15–June 5		395		64	
		June 5–Sept. 1		385		64
3	Apr. 15–June 20		430		69	
		June 20–Sept. 1		410		73
4	Apr. 15–July 5		455		71	
		July 5–Sept. 1		440		55
5	Apr. 15–July 20		460		70	
		July 20–Sept. 1		360		36

The results of a second clipping experiment are summarized in Table 1, and demonstrate some practical aspects of a two-crop rotation. Five possible combinations are presented. We recommend the one listed as number 3 as being the most satisfactory. These data show there is very little increase in the yield of crested wheatgrass after mid-June, and that the stand is not adding protein. Mixed grass prairie adds to its annual production until early July, but protection after that date adds little to pasture reserves. If the change from crested wheatgrass to native range is made too

supplementary pasture is provided, some 22 acres are needed to produce the feed required for the same period.

Although we can nearly double the carrying capacity of rangelands by grazing crested wheatgrass during the spring, this improvement is not enough. Our aim should be to triple our pasture resource. Our soil is sufficiently fertile and we have enough rainfall to produce higher yields, providing we can find the right plants. Insofar as the spring season is concerned, I do not believe that a much better perennial grass than crested wheatgrass can be obtained. Consequently, we

will have to look to other seasons and other plants to achieve a three-fold or greater increase in pasture production.

Another weak character suggests a possibility for increasing grazing capacity, namely, the loss of protein during the summer. As pointed out previously, the loss of protein is associated with smaller livestock gains and thus a lower carrying capacity. Supplementing range pastures with high protein feeds during this period has increased the yield of beef per acre at a reasonable cost. Unfortunately, this practice does not improve pastures nor does it provide a permanent protein supply.

A permanent protein supply has to be grown. Grasses and legumes are needed for this purpose. From the multitude of plants tested in Saskatchewan, four new grasses establish satisfactory stands and have characters which are useful for range regrassing. Streambank wheatgrass (*Agropyron riparium* Scribn. and Smith) develops an excellent bottom and is drought tolerant. Intermediate wheatgrass (*A. intermedium* (Host) Beauv.) produces well, but is insufficiently drought tolerant and winter hardy for the drier sections. Green stipa grass (*Stipa viridula* Trin.) retains its protein content later in the summer than mixed grass prairie. Russian wild ryegrass (*Elymus junceus* Fisch.) retains a relatively high protein content into late fall and is hardy and palatable; it is recommended for late summer and autumn grazing throughout the mixed grass prairie area in Western Canada.

But even more than the need for grasses is the need for legumes. Our native grasslands contain few palatable legumes, in fact many contain poisonous properties. Our ambition is to obtain an alfalfa or other legume which will persist under grazing, which will live in our environment, and which will add protein and other nutrients to summer pasture. Plant breeders are making excellent progress to secure such a plant.

Thus, I forecast that the carrying capacity of range pastures will be increased beyond the 60 to 90 percent level which we can achieve today. I do not expect that a single crop or even half a dozen will meet our needs. But the intelligent use of those we have and those we obtain soon will repay our industry. The group of plants we select must possess the following characters:

1. Provide greater yields of forage and nutrients.
2. Retain a high protein content throughout the summer.
3. Possess the ability to cure on the stem so that pasture reserves can be maintained.
4. Be able to recover rapidly when good growth years follow periods of drought.

Summary

The native grasses form the base of the grazing resource in the northern portion of the Great Plains. They have certain strong characters as well as a few which are weak. Unless it is possible to supplement native ranges with seasonal pastures, it is better to graze continuously at moderate rates than to practise rotations. A summer gain of at least 325 pounds on a two-year-old steer should be maintained year after year, while a 40 to 50 percent carryover is not too much during an average growth season.

Protection of native grasslands until dates of grazing readiness is another very important practice to follow. A supplemental pasture of sufficient size to carry an animal until early or mid-June is recommended. In southwestern Saskatchewan, from two to three acres of crested wheatgrass pasture per animal provide feed during this period, and increase the

carrying capacity of native range by 60 to 90 percent.

Further increases of carrying capacity will be secured when crops are available to provide protein supplements for autumn pasture. Russian wild ryegrass is the best grass available at present for this purpose. Progress is being made to obtain improved alfalfa strains, suitable for late season grazing.

Finally, and most important, "Farming Range Pastures" in the Northern Great Plains is most successful when substantial reserves are provided. Reserves of pasture for all seasons of the year are essential, while reserves of hay for at least two winters are not too much.

Rudyard Kipling describes the luckless life of the rice farmer of India with the following words:

"His speech is mortgaged bedding,
On his kine he borrows yet,
At his heart is his daughter's wedding,
In his eye foreknowledge of debt.
He eats and he has indigestion,
He toils and he may not stop,
His life is a long drawn question
Between a crop and a crop."

Undoubtedly, Kipling never knew about "Farming Range Pastures." Had he been acquainted with that phase of agriculture, I am certain that his poem would have been a happier one. With apologies to Kipling, I present my parody of his serious composition, and attempt to describe the more fortunate position of those who are "Farming Range Pastures":

"His land is not eroded,
His cattle he fattens yet
On soils which are fertile and stable,
His worries are not of debt.
His crops are safely garnered,
He fears neither cold nor rain,
He farms for pasture and profit
With reserves of fodder and grain."

RANGE MANAGEMENT FOR HUMAN WELFARE

The ultimate objective of range management, as of forestry or crop agriculture, is of course human welfare. Conditions in thousands of communities and even great metropolitan centers reflect adversity or prosperity on the range. All too frequently; improper management or abuse of the range has resulted in reduced livestock production; in far-reaching damage from floods, erosion, and siltation, in impoverishment of peoples and weakening of nations. Production from the range land can be increased, the lot of peoples dependent upon the range resources can be improved, and the economy of communities and nations strengthened and stabilized when improved range management is applied.—*Lyle F. Watts*, Chief, U. S. Forest Service, In Unasylva, April-June, 1951.