

NOTICE



[The Botanist would be glad to receive communications from all parts of the Territory in regard to weeds, grasses or native plants of any kind. Specimens should always accompany the letter of inquiry. As full a description of the plant in question as possible should be given, always giving the time and place of collecting.]

In sending plants through the mails, wrap them securely in a newspaper, or better still, in oiled paper so that a minimum of air will reach them.

Send flower and fruit if possible and if not too large, the entire plant, including root.]

Arizona Agricultural Experiment Station

INTRODUCTORY.

The few facts of this Bulletin are based upon my personal observations during the latter part of July and the greater part of August, over a considerable portion of East Central Arizona. Before and since that time, being located in Tucson, I have been able to judge to some extent of the ranges in this immediate neighborhood. I have gleaned much in regard to the condition of Northern Arizona as to the prevailing grasses and the general condition of the range through personal talks with D. T. McDougal, U. S. Botanist, who spent the spring and early summer in that region.

As there yet remain large areas of the Territory that I have been unable to visit or otherwise get any authentic report from, in regard to the most important of the range grasses, this Bulletin can only be considered as a preliminary report on a few of the most important of these grasses in Arizona. It does not consider the great number of species growing on wet places, along rivers, etc. It is only the more important of these found growing on the open mesa, in valleys and on mountains, that are here briefly considered.

Arizona Grasses in General.

THE country embraced in what is known as the "Great American Basin," in which the whole of Arizona is included, has a vegetation in most respects entirely different than elsewhere in the United States. The soft and succulent grasses of the Eastern and Central States have given place to a great variety of grasses, mostly with short, rigid leaves and hard stems or culms. Experiment has already demonstrated that the lack of moisture makes it impossible for the Eastern grasses to succeed here, hence it is to our native grasses we will have to look in the development of grasses in this Territory.

It yet remains to be determined which of these grasses will be of greatest value under cultivation or will succeed with the least amount of water. Although a large number of our native grasses are hard and rigid, as a rule, they are eagerly eaten by cattle and horses, and many of them contain much more nutritive matter than the more succulent grasses of the East.

The physical conditions of Arizona are such that only a comparatively small per cent. of her lands under present conditions can be brought under cultivation. Much of the remainder is valuable grazing land, but still there are areas, which from their lack of accessible watering places for stock, are of little value except for their mineral deposits.

Of the vast region supporting thousands of head of horses, cattle and sheep, the better part of the grass forage consists of less than a dozen indigenous species. It is true that during the large part of the year the cattle pick about, in many places feeding mostly upon the foliage of shrubs, only getting a dainty bit of grass here and there, but it is the few species of grass that spring

into rapid growth after the late summer rains and cover the mesa for miles about that the stockmen depend upon to put their stock in fit condition for the Kansas and California markets. The meagre rains during the past summer have done much to shorten the fall feed ; and in general throughout the Territory the feed is much more scant than usual at this season of the year.

RANGE GRASSES.

We can well divide the grasses of the range into two general classes, both of these classes being purely artificial.

1st. The large number of species growing along rivers and creeks, in the close vicinity of tanks and springs and in other moist places. These grasses, although of great variety, are, with the exception of *Distichlis maritima*—an almost worthless forage grass—and a few others, only found in isolated bunches. In fact, nowhere in Arizona do we find a continuous natural sod.

Altogether these grasses furnish but a small part of the forage of the range as they only grow in the vicinity of water, where their roots evidently reach moisture throughout the year. Many of them are excellent forage plants so far as they go, but they cover a very small per cent of the entire range. Ordinarily they are kept cropped short by stock as they congregate about the watering places to drink.

2nd. The second class, and by far the more important, are the grasses that find a foothold on the mesa, along the sides of mountains and in valleys. Covering large areas they furnish the greater part of the grass forage of the Territory. These grasses are of but a few species and include the grasses known among stockmen as "Mesquit," "Grama," and "Saccato." Many of these grasses have hard and wiry leaves and culms, but are very nutritious and generally well liked by stock. They grow rapidly after the Summer rains, furnishing fine forage for the Fall and Winter months.

The "Boutelouas," generally known as "Grama Grass," are the most important of the proper range grasses of Arizona. A number of species of this Southwestern genus can be found on nearly every range of the Territory. So far as I can learn all of these grasses are readily eaten by cattle and are excellent forage.

Bouteloua eriopoda, Torrey.—This grass, the common "Black Grama" of Southern Arizona, is probably the most valuable range grass south of the Gila and Salt rivers. I have seen it growing in the valleys of the Rillito and Santa Cruz and occasionally out on the open mesa, especially where protected by the

Mesquit, or creosote bush. It is a strongly rooted perennial with few leaves. The culms are about one and one-half feet long and seldom erect, more frequently bending to the ground and rooting at the lower joints.

Bouteloua oligostachya, Torrey.—The name generally applied to this grass is "White Grama," although in some localities I have heard it called "Mesquit Grass," and in a few places "Buffalo Grass." This species is widespread over the Western plains where, with the true "Buffalo Grass," *Buchloe dactyloides*, Eng., it forms the vast sodded areas of that region. Although indigenous to many parts of Arizona, it is most abundant in the Northern part, where, in some localities, it forms considerable feed of good quality. It most frequently grows in little tufts, the numerous leaves close to the ground. The culm is very slight and slender, bearing at the top one to three densely flowered spikes, projecting from the main stalk at nearly right angles.

In many places, common with other grasses of the mesas and valleys, this valuable grass is dying out, chiefly from the effects of overfeeding. Although growing on the mesas, it does the best on rich bottom land, where, in some places, it approaches a sod. In the Agua Fria Valley, where, several years ago, much of the grass was of this species, it is gradually disappearing. This is one of the best winter grasses, and in its dried condition, long after it is withered and dead, it furnishes a food for winter feeding.

Bouteloua racemosa, Lagasca.—This beautiful grass is generally known to ranchmen as "Tall Grama," although in some localities it is known as one of the Mesquit grasses.

It is a valuable grass, but not eaten as readily by horses or cattle as the species previously described. It is widely distributed throughout the Territory and is easily distinguished from the other *Boutelouas* by its taller growth and its long raceme of twenty or more slender pointed spikes about one-half inch in length, and standing out from the stalk at nearly right angles.

During the months of July and August I frequently found this species on the ranges of West Central Arizona, nearly always cropped close to the ground. Flowering culms were observed only among cacti and in other protected places.

Several other *Boutelouas* add something to the forage of Arizona. They are less abundant and closely allied to the ones above noted. Of this number, *B. hirsuta*, Lagasca; *B. aristoides*, Therber; and *B. Harvardii*, Vasey, are by no means rare.

Next in value to the *Boutelouas* are two or three species of *Hilaria*. These are very hard, rigid grasses, generally growing in bunches and known in Southern Arizona as "Gietta Grass."

Further North they are not so abundant and are known to ranchmen as "Black Grama"

Hilaria mutica, Bentham and *H. Jamesii*, Bentham.—Of the genus *Hilaria*, probably these two species are most abundant and are recognized as being among the best forage grasses of the range.

They are perennials with long creeping root-stocks and will withstand the drouth to a marked degree. The leaves are short and rigid with little surface exposed to the dry air. The stems or culms are hard and woody. They are nutritious grasses, and with the exception of the hard culms, are eaten eagerly by cattle.

The *Hilarias* are bunch grasses, generally growing in dense clumps a foot or more in diameter, and for the greater part of the year have a dull, grayish, dead appearance. After the rains, in one or two species the old culms continue in growth, put forth new leaves and produce an abundance of excellent forage. In a number of places between the Agua Fria and Verde rivers I have seen large areas covered with these grasses. Even in the driest part of the season cattle eagerly feed upon the dried leaves and sheaths that remain upon the culms for the greater part of the year. Of the remaining species of this grass in Arizona, probably *Hilaria rigida*, a very hard and rigid grass with something of the characteristics of the above species, is the most important as a range grass.

Aristida Arizonica, Vasey.—The *Aristidas* as a rule are of inferior value as forage grasses, but from their wide distribution furnish considerable food, especially in their early growth. Of this genus, *Aristida Arizonica* adds considerable to the early spring feed over large parts of Southern Arizona. This species is not a large grass, never growing very dense; it is found, a few culms in a place, under nearly every mesquit and creosote bush.

Long before summer is past it dries out, and in this condition is of little value for forage on account of its few leaves and sharp, rough awns,

This grass, together with others of the same genus, may be known by the persistent triple awn surmounting the linear grain. As a rule, the species of this genus grow in dry sterile soil.

Aristida purpurea, Nutt.—Of several other species grow-

ing in the Territory, *Aristida purpurea*, found throughout the eastern part, is of some value as a forage grass. Before it is dried out by drouth it is readily eaten by cattle. It is generally found as isolated plants here and there over the hills.

Pappophorium Laguroideum.—Of the two or three species of *Pappophorium* in Arizona, probably this species is of the greatest value for the range. It grows an abundance of leaves which are not as harsh and hard as with many of our indigenous grasses. In valleys it will sometimes grow two feet or more in height, the narrow leaves sometimes a foot or sixteen inches long. I have only seen it growing in a few places and then not in any great quantities. At the Station during the past season this grass has made better growth than any of the Eastern grasses growing here.

Panicum lachnanthum, Torrey.—Of the *Panicums* found on the range this species is probably the best, so far as the amount of forage is concerned. It is most frequently found on the mountains, where it furnishes considerable early feed. It is a slender grass, growing from one to two and a half feet high, with a contracted, hairy panicle on a long slender culm.

Two or three other species of *panicums* are of more or less occurrence on the range. Of this number *P. Bulbosum* is one of the best. This species may be distinguished from the other *Panicums* by the enlargement of the culm just above the ground. It is not very abundant but stands the drouth well, and when of sufficient quantity makes an excellent forage grass.

Muhlenbergia distichophylla, Kunth.—This is a strong, firmly rooted grass, with culms from three to four feet high, and long and rigid leaves. The panicle sometimes exceeds a foot in length. It is sometimes found growing in rocky cañons, and frequently in rich valleys it forms considerable of the forage. I have never seen it growing on the open mesa. It is probably the most valuable species of this genus in the Territory. In South-eastern and Eastern Arizona it is known as one of the "Saccato" or "Saccatone" grasses. On rich bottom land it is sometimes cut for hay.

There are many other grasses that add more or less to the feed on the open ranges of Arizona, but as a rule they are less

abundant than the species noted, and are not as likely to be observed by ranchmen or others interested in the grasses of the Territory. Without the use of drawings illustrating the species under consideration, it is almost impossible to describe a grass so that ranchmen will be able to recognize it by the description. If you wish to know something of the grasses growing on your range, it is best for you to send them to the Botanist for identification.



Overstocking the Range.

In nearly all cases, overfeeding a range has a tendency to kill out the better grasses. On the vast ranges of Western Kansas and Nebraska, and in fact all along the eastern slope of the Rocky Mountains, this condition is most apparent. In this region, where formerly the dense prairie sod was mostly of two species of fine forage grass, viz: *Bouteloua oligostachya*, Torrey, and *Buchloe dactyloides*, Eng., now the places formerly occupied by these two grasses are being usurped by less valuable ones or by none at all. This condition is especially true of regions that for a number of years have been supporting large herds of stock. This same condition is true, only to a less marked degree of many of the ranges of Arizona. Here we have no vast sodded areas such as we find on the western prairies, and the gradual extinction of a number of our best grasses is not so apparent. However, this condition is recognized by many stockmen. They have commented upon the fact of the gradual disappearance of certain grasses that but a few years before were a major part of the forage, but now are nearly gone. As elsewhere this is only true of regions supporting more stock than the food supply will justify.

A cultivated grass pasture when overfed for any length of time will be injured by it. Weeds and other worthless plants will gradually take the place of the best grasses. The same is true, in a degree, of the open range for even the hardiest grasses when continually eaten close to the ground will, as a rule, in a few years become extinct. I am told that in many places where ten years ago late fall would find a rich growth of grass, now it is of inferior quality, of less quantity or none at all. It is true this is not entirely the effect of overfeeding. This year, the exceptionally dry season has done much to bring it about, where drought and overstocking both combine, and the grass that does not burn out from the effects of the hot sun, is continually eaten close to the ground by hungry cattle, the range is in poor condition to produce feed for the following season. The repetition of this process year after year cannot help but decrease the supply of grasses on the range.

The present condition of stock in many parts of the Territory requires no argument to prove that the supply of food is not

adequate to the needs of the cattle. During July and August in many localities the cattle were feeding almost entirely upon the foilage of oak and other shrubs. In these regions the few grasses were either dried out by the drought or eaten so close to the ground that they were scarcely noticeable to one driving over the country.

There is a limit to which any range can be profitably stocked. If we go beyond this limit it will not only be a detriment to the permanency of the range but will be detrimental to the stock as well. It is but natural that a growth of top is necessary to a growth of root, and also to the life of the plant as well. If the top be continually eaten to the ground or even very near it, the roots will gradually become extinct. This is especially true of grasses growing in isolated bunches or scattered about here and there with only a few culms in a place. As it is this class of grasses that largely furnishes the forage over our ranges, it is safe to make the assertion that the deterioration of range pasturage is to a great extent due to close feeding. In many places the grass is fed so close that but few plants mature seeds. It is only those growing among cacti and in other protected places that produce flowers and ripen seeds; hence, as the old plants disappear there are fewer young plants to take their place. There are valleys over which one can ride for several miles without finding mature grasses sufficient for herbarium specimens without searching under bushes or in other similar places.

Much grass is killed out by trampling of horses and cattle. This is most apparent in the vicinity of springs and other watering places.

These causes combined—the direct effect of overstocking—are in many localities gradually decreasing the supply of our best range grasses. The result is much grass has been killed and a less amount of forage is sustaining a greater number of stock than formerly.

J. W. TOUMEY,

TUCSON, ARIZONA, September 15, 1891.