OVERGRAZING FROM AN ECOLOGICAL POINT OF VIEW

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INTRODUCTION

The object of this paper is to present a few facts concerning the condition of pasture land in Central Oklahoma, along with some evidence bearing out the statements and suggestions for the improvement of the conditions.

The pasture lands as a whole present an attractive appearance in the spring because of the moist soil and the new growth of the vegetation. In the summer and fall the pastures are dry and dusty, due to the weather conditions. Most of them are also closely cropped and weedy. The green color of the spring vegetation is due not only to the growth of good forage plants but to the presence, in many cases, of plants of little forage value. As the season progresses the cattle seek out the more palatable species and allow the others to grow. This favors the devlopment of weedy plants and tends to destroy the most valuable forage plants. Pastures are of two sorts as to purpose. Not uncommonly the pasture is a few acres of poor or untillable land kept more for the purpose of allowing room for farm animals to exercise than for grazing purposes. Horses are turned out when they are not being worked and cattle are allowed to run in relatively large numbers on just a few acres. There is of course little or no grazing and they are fed in racks or on temporary pastures of cultivated forage plants. Such lots, improperly called pastures, are becoming more numerous as more and more of the tillable soil is broken up for the raising of farm crops. It is needless to say that these lots should be kept free from weeds to encourage the growth of such grasses as can withstand close and continuous grazing. The conditions of the grasses in such lots is obvious, yet since the purpose is not to supply forage, they are mentioned only to distinguish them from grasslands set aside for the purpose of supplying food for stock during the grazing season.

The Development of the Plant

The essential parts of the grass plant are the same as of the other flowering plants; roots, rhizomes, steams, leaves, and re-

productive structures. It is necessary that all of these organs be given a chance to develop if the plant is to complete its life cycle properly. The roots absorb water and mineral mutrients. The stems support the leaves and provide a path for the transportation of water and foods. Underground stems and rhizomes are important as reproductive structures in many grasses and also as organs of food storage. The leaves are the food making organs. In them the food forming materials are changed into sugars from which all other plant foods are built up.

It is obvious that the development of the roots and stems as well as flowers and seeds are dependent upon the development of the roots and stems as well as flowers and seeds are dependent upon the development of adequate food laboratories in the form of green leaves and that any thing that results in a smaller vegetative growth hinders the development of the leaves and the production of seeds and endangers the life of the plant.

The reserve food stored in the rhizomes of the perennial grasses serves to start the growth of the dormant bud in the spring. If the food supply is plentiful a vigorous early development of early shoots will appear. Normally this vigorous vegetative growth provides leaves for the manufacture of food for the summers growth, for the development of the flowering stalk, flowers and seeds, and finally a supply to be stored in the underground parts to start the growth the following year.

The removal of leaves by cropping or grazing checks the vegetative growth of the plant reducing in a reduced forage yield for the remainder of the season. A continued removal of the leaves retards the development of the flowering stalk, reduces their number and vigor, and results in the formation of a small number of less perfectly formed seeds having a low percentage of viability. The final result of close cropping is an inadequate reserve food supply in the under-ground parts, resulting in a slow developmnt of forage in the spring.

Results of Grazing

Plants under normal conditions naturally build up rich fertile soils and maintain them in a condition of maximum productivity. This is true chiefly because all plant remains are returned to the soil. Even removing the vegetation in the fall after growth is nearly completed as in removing the hay crop diminishes the vigor of the hay crop.

Few hay meadows do not show this to be true. Correct data

on original yields as compared with the present yields cannot be obtained but comparisons can be made with the hay meadow as it is found today and the conditions in the fence rows and road sides where the hay can not be cut. Even though it is a common practise to mow the road sides one can usually find a few square rods where it has been impossible to mow and the prarie is in a virgin state. When meadows are observed with this point in view one is impressed with the vigor of the vegetation in the part of the meadow which has not been mowed. A comparison of the yields of the clipped quadrats shows an average yield of 337 g. per square meter in a hay meadow as compared wtih 503 g. in protected spots. These figures are somewhat misleading since the grass outside of the meadow fence contained many coarse flowering stalks which indicate vigor in growth of the vegetation, but since the stems are not palatable these figures do not represent the difference in the value of the hay per unit area. The hay from the mowed meadow was leafy and much finer in texture and therefore more valuable for hay. Mowing for hay does not ordinarily cause any serious deterioration of the grass land or any marked change in the flora. Hay meadows are in fact most typical of natural conditions.

Even light grazing interferes somewhat with the development of the grass plant but the difficulty comes in knowing how much a pasture may be profitably grazed. A comparison of a few pastures typical of Central Oklahoma throws light on the subject.

Pastures on Clay Soils

Pastures on clay or "tight" soils when continuously overgrazed showed more of the soil occupied by the short grasses and fewer tall grasses. Where grazing was heavy and where it had been long continued almost all of the tall grasses had been killed out The few that are present are seldom able to support flowering stalks, the only seed being developed by the short grasses. Where pastures are in this condition weeds are usually conspicuous. Amphiachyris dracunculoides is the most conspicuous of them. Such a pasture gave an average yield of 54 g. per square meter, while the more moderately grazed pasture gave a yield of 190 g., a portion of the heavily grazed pasture yielded 102 g. in a spot protected for a period of one year. These figures represent about the amount of grass that the cattle would be able to crop from the area. Where no protection was given only about half of this amount (54 g.) could be secured by clipping.

The most severely over-grazed pastures on tight soils showed short perennial grasses being rapidly exterminated and a weedy flora having very little forage value taking its place. Amphiachyris dracunculiodes was the most common weed and in many places there were 150 to 200 of these plants per square meter. Hordeum pusillum which is palatable for only a very short time in the spring was also very abundant. Other plants of little or no forage value were Achillia lanulosa, Vernonia missourica, Dichrophyllum marginatum, Chloris verticillata and Schedomnardus paniculata.

The presence of these plants indicates overgrazing. Clipped quadrats were not made in such pastures since the native grasses were obscured by the weedy vegetation and figures would not represent the forage yield. Such pastures usually contained spots of native grasses sufficient to revegetate the soil if they were given a chance. The valuable tall grasses however were entirely absent.

Pastures on Sandy Soils

Sandy grass lands are very easily damaged by grazing, several such pastures were observed. The soil is easily loosened and grasses are replaced by such weedy plants as: Argemone intermedia, Cnidoscolus stimulosus, Aphanostephus skirrobasis, Plantago purshii, Croton texensis, Helianthus petiolaris, and others. These plants are indicators of over-grazing in sandy soils. Pastures in all stages of deterioration were observed. Observations in one meadow however, were especially interesting. In 1923 this meadow was allowed to develop normally and a luxuriant type of prarie grass accompanied by the usual societies of dicotyledonous plants occupied the soil. The dominant grass was Andropogon chrysocomus. During 1924 the meadow was grazed quite heavily. Large bare spots of sand were exposed between the clumps of sod forming grasses. The soil was loosened by trampling and by fall the plant cover was one half to two third destroyed.

Pasturing was discontinued in 1925 and by June the vegetation appeared to have recovered completely from the overgrazing.

Other pastures similarly located showed all stages of deterioration, not infrequently the grass cover was completey destroyed and replaced by one or more of the weeds previously mentioned.

Partly Wooded Pastures

There is a tendency to overgraze partly wooded pastures be-

cause their carrying capacity is greatly reduced by the presence of the woody plants. The results of over-grazing such pastures presents no new difficulty. The remedy lies in keeping wood and pasture lands separated and in not allowing shrubs and trees to reduce the carrying capacity of the land by choking out the grasses. A few shade trees in a pasture are of course desirable.

Summary

The results of over-grazing may be summarized as follows:—

1. Early spring growth as well as the time of flowering and fruiting is retarded. This results in the development of fewer seeds having a low viability. It is also disastrous to the seedling.

2. The grasses do no develop sufficiently to cover the soil and weedy plants are able to get a start.

3. This disturbance in the plant cover results in several important changes in the habitat. Little humus is returned to the soil and its fertility is not maintained. The lack of humus increases the run off since decaying plant remains absorb large quantities of water. Moreover the lack of organic matter causes the soil to dry and bake. High soil temperatures prevail because plants do not shade the soil and because of lack of humus and moisture. These conditions are accompanied with a high rate of evaporation and transpiration and a low relative humidity in the plant layer.

4. Finally, the lack of a good plant cover promotes the erosion of the steeper slopes and gullies are frequent.

The remedy lies in watching for changes in the plant population of native praries and pastures, and in grazing in such a manner that the native forage is maintained in a vigorous condition. Over-grazed pastures must be built up gradually by grazing the pastures in such a manner that the forage plants are allowed to develop normally.