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SPREADING OF OPUNTIA IN OVERGRAZED PASTURES IN KANSAS<sup>1</sup>

The rapid spreading of buffalo grass, *Bulbilis dactyloides* (Nutt.) Raf., in overgrazed pastures in the transition prairie and the western part of the typical prairie has been known for many years. In Clay County, Kansas, which the writer has known almost continuously since its original settlement, some of the pastures which were primarily *Andropogon furcatus*-*A. scoparius* prairie now contain almost pure stands of buffalo grass with some admixture of *Bouteloua hirsuta* Lag. and *B. gracilis* (H. B. K.) Lag.

During the past summer (1937) the profound change which has taken place in a hundred acre, overgrazed pasture made a profound impression on the writer. One looking over the carpet-like, short gray-green *Bulbilis*-*Bouteloua* association now covering this pasture could hardly realize that only 55 years ago this area was covered with a tall, luxuriant yellow-green *Andropogon* prairie, with only tiny patches of buffalo grass here and there on spots of poor soil. Adjoining pastures show the same secondary succession, although to a less degree because they were less overgrazed. With the destruction of the *Andropogons* and the development of the buffalo grass and mesquite grasses (*Bouteloua* spp.) other profound secondary changes take place. These changes can be discovered by botanists, who have had no past acquaintance with the region, by comparing the vegetation fenced off in abandoned or little-used roads. In such areas almost typical *Andropogon furcatus*-*A. scoparius* associations can still be found as they existed in the original prairie. Along with the typical prairie grasses are numerous specimens of the shrubby *Amorpha canescens* Pursh., sometimes up to three feet high, *Meriolix serrulata* (Nutt.) Walp., *Psoralea floribunda* Nutt., *Helianthus maxiliani* Schrad., *Aster sericeus* Vent., *Salvia pitcheri* Torr., *Rosa arkansana* Porter, *Gentiana puberula* Mx. and many other prairie species, while just across the barbwire fence in the closely grazed buffalo grass pasture they are entirely absent on the general levels. Only on steep, broken ravine banks, which afford considerable protection from grazing animals, could a few specimens of several of these species be found. They vanish with the *Andropogons*. Another striking, western-prairie plant, *Lacinaria punctata* (Hook.) Ktz. is also practi-

<sup>1</sup> Papers from the Department of Botany, The Ohio State University, No. 395.

cally eliminated while *Aster ericoides* L. (*A. multiflorus* Ait.) survives well even with intense grazing.

But the most remarkable change in recent years is the very rapid spreading of the prickly pear in the overgrazed pastures, where formerly there were only a few colonies confined to especially favorable habitats. The only species of prickly pear in this immediate region is *Opuntia macrorrhiza* Engelm. The original occurrence and distribution of this species is also well remembered by the writer, who used to herd cattle on several square miles of unbroken prairie where several large contiguous pastures are now located. As stated, in the original prairie the *Opuntia* was rather rare. It occurred mainly in three types of habitats—on the tops of sandstone hills; in isolated patches of buffalo grass on “gumbo soil,” which frequently becomes extremely hard and dry and where it escaped competition with the *Andropogons* and the effects of the great prairie-fires; and in the third place, it also occasionally occurred in ravines in patches of buffalo grass covering “gumbo soil,” subject to extreme wetness when the ravines overflowed during a heavy rain. In these patches of “gumbo” rather deep depressions, several yards wide, were produced by buffalo and later by cattle and horses, which came to lick the earth when the ground was wet, thus carrying away mud on their feet and legs. Around these depressions, surrounded and partly covered by the buffalo grass, large colonies of *Opuntia* sometimes developed. In these habitats the *Opuntia* escaped competition because in general the ground was usually dry and very hard, thus preventing the development of the *Andropogons* and other tall grasses and plants.

A special study was made of a small pasture of 34 acres at the north end of the writer's farm, situated in the locality under discussion, in Bloom Township. This pasture is at present nearly surrounded by very large contiguous pastures of original but overgrazed prairie. The writer herded cattle on this prairie for six years. He knew every *Opuntia* patch in the area. Originally there were several small colonies on each of three little hill-tops and two or three colonies on a buffalo grass patch which was about as large as a small city lot. This spot also has “gumbo soil” and, although on rather high land, had in the past served as a buffalo-lick. This pasture was fenced up in the early eighties and pastured up to 1918, but was never overgrazed. In 1918 cattle were not put into it until August 1 and the following four years it was not pastured, but the grass on the more level areas was cut for hay. By 1921 the prairie had almost returned to the original condition with an abundance of big bluestem (*Andropogon furcatus* Muhl.). In 1923 cattle and horses were again put in the pasture and during the past few years it has been decidedly overgrazed. At present all parts of this pasture—hill-tops, general levels, and two deep ravines—contain *Opuntia* colonies. In one ravine, colonies were found growing within four feet of a surviving clump of slough-grass (*Spartina michauxiana* Hitchc.). A complete, although rather superficial survey of the *Opuntia* colonies, ranging from a single isolated plant to patches several feet in diameter, was made and 1655 colonies were counted in this 34-acre patch. Occasionally a colony was found dying out but whether because of tramping by horses and cattle or through some other cause was not discovered.

Three immediate causes for the rapid spread of the prickly pear were in evidence. First, the great destruction of the *Andropogon furcatus* Muhl., *A. scoparius* Mx. and other tall grasses and prairie plants and the development of a shortgrass (buffalo grass) prairie through intense pasturing; second, the distribution of joints of the plant by the feet of cattle; and third, the extreme drought of the past few years.

A small, high hill in a pasture several miles south has also been under observation for many years. This hill has only been overgrazed recently. Only a few years ago there were but a few small colonies of *Opuntia*; while at present, with intense overgrazing, the hill, especially the eastern, more gentle slope, is literally covered with large colonies.

The spreading of the prickly pear in the pastures is a serious farm problem, since the plants are not only a great nuisance to man and animals but cover much ground which should be occupied by nutritious grasses, and about the only way to control the trouble at present is to dig out the colonies and haul the plants away.

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*AGROPYRON SMITHII* RYDB. AND *CEPHUS CINCTUS* NORT.

ECOLOGY, Vol. 18, No. 4, page 547, contains an article by B. Ira Judd of Mandan, North Dakota, advocating the widespread use of *Agropyron smithii* Rydb. in the soil conservation programme. Undoubtedly the statements of Mr. Judd are very true and apply to the Canadian Prairies as well as to the northern Great Plains area of the United States. The ability of this grass to establish itself under unfavourable conditions has long been recognized, and there is every reason to believe that when handled as a cultivated crop it will do remarkably well.

Investigations on the wheat stem sawfly (*Cephus cinctus* Nort.) in Canada have shown that *Agropyron smithii* is an exceptionally favourable host plant for this insect. In fact, many instances have been recorded where severe losses to wheat crops have been traced to wheat stem sawfly migrations from small patches of *A. smithii*, which were serving as permanent reservoirs of the insect. One of the recommendations for the control of the wheat stem sawfly is that all the *Agropyron* growing along the roadsides and fence rows be cut with a mower between July 10 and 20 to prevent the insect from maturing in the stems.

To advocate the widespread planting of *Agropyron smithii* for seed production, particularly in a large portion of the Canadian prairies and some parts of western United States, is to invite a wholesale outbreak of *Cephus cinctus* Nort. This would be felt by the grower of *Agropyron* seed as well as by the wheat producer, since the sawfly larvae sever the stems of *Agropyron* even more readily than they do those of wheat. If the grass stems are inclined to be small, the sawfly larvae feeding on the inside frequently girdle the stems sufficiently to produce sterility in the head, even though the main portion of the stem appears uninjured.

Granting the value of *Agropyron smithii* in soil conservation work, it certainly cannot be safely recommended for use in the areas infested with the wheat stem sawfly, particularly in the Canadian prairie provinces. This insect is now causing losses to grain crops in these provinces amounting to millions of dollars annually, and the recommendation of soil conservation measures which ignore the interrelationship between the wheat stem sawfly and its host plants is likely to prove serious.

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AN EFFICIENT CONSERVATION ORGANIZATION

For more than twenty years an organization known as "The Conservation Council" has been functioning successfully in Chicago, Illinois. The initial step in its organization were taken by representatives of the Illinois Chapter of the Wild Flower Preservation Society of America, and among its charter members were representatives of the Illinois and Riverside Chapters of this Society, the Geographic Society of Chicago, the Audubon Society of Illinois, the Prairie Club, the Outdoor Art League, the Chicago