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THE PRAIRIE LEGUMES OF WESTERN MINNESOTA.

By Lycurgus R. Moyer, Montevideo, Minn.

It may seem presumptuous in one whose knowledge of field botany is only that of an amateur to come before this Academy with a paper on so threadbare a topic. The general subject of the Minnesota flora has already been ably discussed by Dr. Upham in his "Catalogue of the Flora of Minnesota," published as Part VI. of the annual report of progress of the Geological and Natural History Survey of Minnesota, for the year 1883. This scholarly work, while admittedly incomplete, was contributed to by botanists from all parts of the state, and represented at the same time the field observations of Dr. Upham himself while engaged in the actual field work of the geological survey. Eight years later, in 1892, there appeared the much more elaborate and pretentious work of Prof. Conway MacMillan, entitled "The Metaspermae of the Minnesota Valley." Of this work it may be said that it was based on insufficient field work, and so abounds in conclusions not warranted by the facts. Valuable papers on the Flora of Minnesota appeared from time to time in the "Minnesota Botanical Studies," particularly the papers by Sheldon, Heller and Wheeler. The only special report on the flora of western Minnesota, is a paper by William A. Wheeler, entitled "A Contribution to the Knowledge of the Flora of the Red River Valley in Minnesota," (Vol. 2 Minn Bot. Studies 569), in which there are enumerated twelve prairie plants and shrubs belonging to the Leguminosae. The second volume of Britton & Brown's "Illustrated Flora of the Northern United States and Canada" appeared in 1897, and covered western Minnesota in a more satisfactory way than any other publication. It seems likely, in view of the Vienna agreement, that its system of nomenclature will soon seem antiquated. Robinson & Fernald's "Gray's New Manual of Botany" is a very helpful book, but its plant descriptions are too brief to be entirely satisfactory, and it already appears that it omits some Minnesota plants. Coulter & Nelson's "New Manual of Rocky Mountain Botany" is a disappointment in that it is quite locally confined to a small part of the Rocky Mountain region with Wyoming as a center, and does not purport to cover the plains and prairies at all. It has been the hope of western botanists when they found that the "New Gray's Manual" was limited to the regions east of the western boundary of Minnesota, that the New Rocky Mountain Botany would cover the adjacent regions to the west. The book was therefore a disappointment, but it leaves the field open for some enthusiastic young man to write a plains flora, or perhaps a Flora of the Mississippi Valley. It may be said that the plains flowers are not very attractive, but it will be found that they are well adapted to their environment, and therefore worthy of careful study.

It is perhaps generally known that western Minnesota is for the most part a high rolling prairie, from 1,000 to 1,800 feet above the level of the sea. The largest area of level land in this region is the

Red River valley, the ancient bed of the glacial Lake Agassiz. The observations noted in this paper are more pertinent to the high rolling prairie regions lying south of the Red River valley proper. These prairies are practically all of a drift formation. The regions to the north of them, or perhaps western Minnesota itself, seems at one time to have been underlain by extensive formations of limestone which became food for the glacier, and was ground up and incorporated with the other materials in such a way as to produce a soil of surpassing fertility. In respect to the amount of decomposing limestone found in the soil, western Minnesota differs markedly from eastern Minnesota, or from Wisconsin, and the difference is all in its favor. An outcrop of granitic rocks crosses the state from its northeast corner to its southwest corner, but the material from which the extraordinarily fertile soil of western Minnesota was formed was very largely sedimentary rocks abounding in carbonate of lime. Very few exposures of this rock are now to be found remaining in place. There is found on the northeasterly side of Big Stone lake about half a mile from its head an outcrop of shale bearing many concretions, apparently gypsum crystals, but the exact nature of these so far as the writer knows has not been determined. Prof. Todd of the United States Geological Survey is of the opinion that this outcrop is Carlisle shale of the Benton group. Should this opinion prove to be correct one might hazard a guess that the immense number of large and powerful springs found along the southwesterly side of Big Stone lake are due to the running out in this locality of the water bearing Dakota sandstone.

Rich as this soil is minerally, it is probable that part of its fertility is due to the action of nitrifying bacteria which found congenial hosts on the roots of leguminous plants formerly so abundant on the prairie. This is merely suggested without any purpose of going into the extensive literature of this branch of the subject. Certain it is that those parts of the prairies lying highest and driest and apparently possessing the least fertile soil have produced the best crops for many years, some having stood continuous wheat cropping for forty years. Lands lying on a somewhat lower level and apparently possessing much more soil humus, have not been nearly so productive; and it is a fact that the original prairie sod in such locations did not contain nearly so many leguminous plants. It has been noticed, too, that those portions of the original prairie that have been fenced and long pastured and afterwards broken up and planted to ordinary farm crops have not been nearly so productive as the prairies that were broken without being pastured. It is reasonable to believe that there must be some connection between this lack of fertility and the fact that the leguminous plants were so quickly destroyed by cattle.

Like the buffalo the leguminous flora of western Minnesota has now practically passed away, and the traveler on the prairies sees only farm crops, or waste pieces of land bearing weeds of various kinds, many of them being immigrants from Europe. It seems proper to put on record some account of these plants before the memory of them entirely dies out. They practically exist now only in herbaria,

or as isolated individuals in waste places or along railway rights of way; and even in such places they are being rapidly driven out by more persistent vegetation. Kentucky blue grass is driving out the original prairie grasses as well as the leguminous plants.

As nearly as the writer can remember the most common of the prairie legumes was *Psoralea argophylla* Pursh, and it was the silvery silky-white pubescence of this plant that contributed so much toward giving the prairies their prevailing gray tint. It is a plant of wide distribution all over the northwestern plains.

On high rolling prairies, and on bluffs and ridges, one was sure to find *Psoralea esculenta* Pursh, a hairy grayish looking plant with the aspect of a lupine. Deep in the tough prairie sod was buried its oval or oblong farinaceous root. Encased in its tough leathery exterior these roots supplied a white starchy and mealy interior of agreeable flavor. This plant, the tipsini or teep-se-nee of the Indians, the Pomme de Terre of the French voyageur, was the source of a large part of the food supply of the natives. It is said the Indians dried it and made it into flour which was used for thickening soups and for other purposes. The young men who followed the early breaking plows on the western Minnesota prairies can testify that the roots were very good eaten raw. The Pomme de Terre river received its name from the abundance of this plant on the sandy prairies along its banks near where it was crossed by the old Joe Brown trail.

When Prof. Holzinger was a home missionary in Cottonwood county he collected *Psoralea tenuiflora* Pursh, in that county, but it was a rare plant. It was afterward collected between Morton and Granite Falls by Prof. MacMillan.

The common ground-plum of the Minnesota prairies was known as *Astragalus caryocarpus* Ker. in the old manuals, and bears the same name in Robinson & Fernald's New Manual. Dr. Rydberg separated it from *Astragalus* and proposed it the new genus *Geoprimum*. Prof. Nelson in the New Manual of Rocky Mountain Botany leaves the plant in *Astragalus* as did Dr. Britton, but favors the division of the old species so that our plant becomes *Astragalus crassicaarpus* Nutt. It was very common in the early days, and tradition tells us that its fleshy pods were frequently cooked by travelers as a substitute for green peas. One writer has testified that its flavor is midway between that of green peas and asparagus. For many years back the plant has been so infested with "pea bugs" that no one would care to eat the dish.

The widely distributed *Astragalus Carolinianus* L, or *A. Canadensis* L. extends throughout western Minnesota but it was nowhere very common. It was found on prairies, in valleys and along river banks. The specific name "canadensis" is used in the new Gray's Manual and by Dr. Rydberg in his Flora of Colorado, while the New Manual of Rocky Mountain Botany follows Dr. Britton and Dr. Small in preferring the name "carolinianus." It seems that both names appear in Linnaeus' "Species Plantarum," "carolinianus" being No. 9 and the other No. 10.

At widely separated intervals over the prairies of the western

part of the state there are found knolls often of considerable height formed of drift materials, which may be considered as either remnants of moraines or water formed kames. It is an interesting fact of plant distribution that it was on the tops of these kames, and nowhere else on the prairies, that were to be found in the early days fine specimens of *Astragalus nitidus* Doug., usually called *Astragalus adsurgens* Pall. in the early reports. This plant grew from a deep tap-root, and its exceedingly numerous stems, branching only at the base, formed a dense matted clump. Its compact spikes of purplish flowers have something of the aspect of heads of the common red clover. The New Gray's Manual regards the plant as identical with *Astragalus adsurgens* Pall, but that species is regarded as growing only in Asia by Dr. Rydberg, and by the New Manual of Rocky Mountain Botany.

On flat alkaline prairies and sometimes in river valleys *Astragalus hypoglottis* L. was very common in the early days. It is a slender little plant and does not form dense clumps as do many other of the Astragali. The New Rocky Mountain Botany regards it as identical with *Astragalus goniatus* Nutt., but Dr. Rydberg is of a different opinion and regards the Siberian plant as distinct from the American.

On the slope of a railway cut at Ortonville there were collected in 1898 a few specimens of *Astragalus missouriensis* Nutt. This plant is new to the flora of the state, and the writer was at first inclined to think that it had been introduced by the railway; but a visit to the same locality a few years later led to finding many specimens in the vicinity growing in the original prairie sod, so that it may be regarded as truly indigenous. The plant is not mentioned in the New Gray's Manual so that it is an addition to the "Manual region" as well as to the flora of the state. This plant has been separated from *Astragalus* by Dr. Rydberg, and is placed by him in his new genus *Xylophacos*.

Growing toward the summits of rather steep banks and bluffs where the sod is somewhat broken up by the washing of rains one is apt to find *Astragalus lotiflorus* Nutt. This plant is placed by Dr. Rydberg in the old genus *Phaca*. But if one will compare a well developed fruiting specimen of *Astragalus lotiflorus* with a similar specimen of *Astragalus missouriensis* it will be very hard to believe that the two plants belong to two distinct genera. It seems best to leave them both in *Astragalus*. Perhaps some of our western Minnesota plants belong to Sheldon's *Astragalus eliocarpus* but a comparison of the plants with specimens from Colorado leave the matter in great doubt.

Astragalus flexuosus Doug. was collected at Montevideo in 1885 but the station soon became obliterated. It is quite common near the railway yards at Ortonville. Dr. Rydberg would place this plant in Nuttall's old genus *Homalobus*.

Sheldon reports the collection of *Astragalus tenellus* Pursh in Otter Tail county, and it seems likely that one of the writer's collections at Ortonville was this species. Dr. Britton places this species in *Homalobus*, as does Dr. Rydberg in his *Flora of Colorado*.

Along the summits of bluffs and on prairie knolls *Aragallus Lambertii* (Pursh) Greene is a fairly common plant, and always an object of interest. It is one of the Loco weeds and is common in bluffy pastures, but no instance of cattle poisoning from eating it has come to the writer's knowledge. The New Gray's Manual uses the name *Oxytropis* for the genus, while Dr. Britton used the name *Spiesia* in the Illustrated Flora and the name *Aragallus* in the Manual.

Wild Licorice, *Glycyrrhiza lepidota* Pursh, was fairly common on rich moist prairies, growing sometimes where the soil was partly alkaline. The root of the wild species seems not to be so sweet as the licorice of commerce.

The boys who broke the prairies of western Minnesota forty years ago have vivid recollections of the Devil's Shoe Strings, the plant with so tough a root that it would double around the sharpest plowshare and clog the breaking plow. This plant is *Amorpha canescens* Pursh, and it was very common. Its whitened foliage did much to give the prairies their characteristic gray tint. *Amorpha nana* Nutt., called *Amorpha microphylla* Pursh in the New Gray's Manual, was less common. Its foliage was green and glabrous and its spikes of bright purple flowers were very showy. *Amorpha fruticosa* L. was common on the banks of streams, but it could hardly be called a prairie plant.

Parosela dalea (L) Brit. or *Dalea alopecuroides* Willd. as it is called in the New Gray, was found occasionally, but it was a rare plant.

Among the prairie clovers *Petalostemon candidus* Michx was common, and it is probable that *Petalostemon oligophyllus* (Torr.) Rydb. was common too, but the two species have so much in common as to be difficult to distinguish. *Petalostemon purpureus* (Vent.) Rydb. was common, too, while *Petalostemon villosus* Nutt., so common in the eastern part of the state, was either absent or very rare.

The Perennial Pea, *Lathyrus venosus* Muhl., was quite common in especially rich ground, near gopher mounds. *Lathyrus palustris* L. was common, too, especially in its variety, *Lathyrus palustris linearifolius* Ser.

One Lespedeza, *L. capitata* Michx., may be recorded as a prairie plant, but it was nowhere very common. It was usually found on dry banks and bluffs.

Lotus americanus (Nutt.) Bisch., or as it is called in the New Gray's Manual *Hosackia americana* (Nutt.) Piper, appears never to have been very common in this region but has been collected by the writer at Big Stone lake and Montevideo, and by Sheldon at Lake Hendricks.

These western prairies can scarcely claim more than one *Desmodium*, *D. canadensis* (L) DC., and this was nowhere very common, and did not grow far from bluffs and river valleys.

Strophostyles pauciflora (Benth.) Hook. has been collected by the writer as far west as Big Stone lake, but it can hardly be called a prairie species.

Vicia americana Muhl. was common throughout the prairie region,

in rich moist places, and *Vicia linearis* (Nutt.) Greene, a western species, has been collected as far east as Ortonville.

In conclusion it may be said that the prairie Legumes while belonging to but few species were rich in individuals, and probably contributed much to the fertility of the prairies.

PREHISTORIC ABORIGINES OF MINNESOTA AND THEIR MIGRATIONS.

N. H. Winchell.

[Paper written for the Minnesota Historical Society, and read Feb. 9, 1907.]

(ABSTRACT.)

Prof. Winchell based his discussion on the latest results of the study of the Glacial period, and the conclusions of the Bureau of American Ethnology. He said that by the former the farthest back that we hope to trace the human occupancy of Minnesota is not more than five or six thousand years, that being the approximate date at which the state became habitable after the retirement of the ice of the last Glacial epoch.

He called attention to the map of late major Powell showing the distribution of the original linguistic stocks of the American aborigines, which number between fifty and sixty; and to some of the remarkable features of that distribution. He showed that after the Glacial period the tribes resident along the Pacific and the Atlantic coasts, and on the gulf coast began a slow migration into the country that had before been uninhabitable lying toward the north. The vanguard of the tribes moving from the southwest was held by the Athapascan and the Algonquian, and from the southeast by the Iroquois and the Sioux. Remnants of these tribes still reside in their pristine seats, and their dialects, which have been carefully studied, are found to be more archaic than the body of the same now known further north, showing that these remnants were the parents of the more northern dialects.

The valley of the Ohio and much of the adjacent country were occupied by the migrating Sioux and they became the celebrated mound builders of the region. The Algonquian, moving from the southwest, took possession of the timbered region of the northwest, extending to Hudson's bay, the whole of Minnesota probably being occupied by them. This constituted the first great migratory movement.

Then began a great war—the result of which was the disruption and expulsion of the Ohio mound builders. This is confirmed by traditions, and by some sub-historic facts. The Algonquians of the northwest moved southeastwardly and crossed the Mississippi in a hostile incursion near the southern boundary of Minnesota, and finally drove the mound builders who have now been learned to have been