

THE FLORA OF LYON COUNTY.

BY B. SHIMEK.

The geographical position of Lyon county, its proximity to the dry western plains, its altitude and topography, and the fact that it is the only county in the state containing exposures of crystalline rocks (Sioux quartzite), make it one of the most interesting counties in the state from a botanical standpoint, for these varied conditions naturally have their influence upon the flora, which for its relationship looks rather toward the high dry western plains than toward the more moist prairies and forest regions to the east. For this reason a somewhat detailed report upon the flora may be of interest.* The surface of the county is for the most part a rather high prairie, which in the vicinity of the rivers becomes more rolling or quite rough, especially in the western part. No extensive swamps, or ponds or lakes are found. The Rock and Little Rock rivers are the only streams within the county that approach the dignity of rivers, and the Big Sioux, the largest stream, forms the western boundary of the county.

The greater part of the county is tillable. The river valleys are alluvial, and in some places somewhat sandy. The prairies are covered with a good black loam, the subsoil being loess clay in the southern part of the county and drift clay to the north. The latter makes quite as good a soil as the

*The observations herein recorded were made during three seasons in the months of June, July and August, and notes upon woody plants, etc., were also made in January. The vernal flora was not studied.

former, except on knolls and ridges where there is occasionally an excess of sand and gravel. The poorest soils are found in the western part of the county, in the hilly country bordering the Big Sioux river. Here in many places, especially on southerly slopes, the surface is gravelly and the soil is unproductive. The Sioux quartzite exposures in the extreme northwest corner of the county present a number of interesting botanical features.*

Upon and adjacent to them are found several species of plants which have not been found elsewhere in the state, such as *Opuntia fragilis*, *Potentilla pennsylvania strigosa*, *Euphorbia obtusata*, *Artemisia frigida*, *Aphyllon ludovicianum*, *Schedonardus texanus*, *Buchloe dactyloides*,† *Woodsia scopulina*, *Marsilea vestita*, and several mosses and lichens. Other species found on the drier portions of the exposures are rare in the state. Such are: *Talinum teretifolium*, *Hosackia purshiana*, *Polygonum tenue*, *Oxytropis lamberti*, *Chrysopsis villosa*, *Pentstemon gracilis*, *Gilia linearis*, *Carex stenophylla*, *Selaginella rupestris*.

In addition to this the more shaded portions of the rock exposures, the adjacent streamlet and the more or less permanent pools of water with their outlying bits of marsh and moist prairie, the adjoining alluvial Big Sioux river valley with its mud flats, sandbars and moist shaded banks, the drier prairie hills bordering the river valley on the east, and the not remote cultivated fields on the broad upper terrace of the river valley, all bring here together a variety of conditions scarcely to be found within any equal area in the state, and all this in a strip lying along the northern boundary of the state, and measuring scarcely two miles in length, and but a few rods in width. This area, as might be expected, contains a greater variety of plants than any other part of the county indeed but few species which belong to the county are not found within these restricted limits.

Aside from this the county offers but little variety in the conditions which determine the distribution of plants. The

*For the author's discussion of the flora of these exposures see the Proc. Iowa Acad. Sci., Vol. IV, pp. 72-77, and Vol. V, pp. 28-31.

†Professor Macbride now reports this from Osceola and Dickinson counties.

valleys of the larger streams present the usual alluvial conditions, the rough western part of the county with its rounded hills, capped with loess or drift clay, is in surface and flora like the dry loess hills along the Big Sioux and Missouri rivers farther south, while the greater part of the county is rather high prairie, with occasional gravelly knolls or ridges, and low marshy "draws." Each of these regions, of course, develops its characteristic flora.

The names of plants which are employed in the following discussion are, with few exceptions, those of Gray's Manual of Botany, sixth edition. These are chosen not because they are in all cases deemed correct, but because the manual is still the most widely used work on systematic botany in the state. This will make the list intelligible to a great number of those who have not followed the recent attempts at changes in nomenclature, while those who have done so will have no difficulty in understanding to which plants reference is being made.

NATIVE TREES AND SHRUBS.

So proportionately small is the forest area of Lyon county that in any account of the botany of the county the woody plants would stand among the last to be considered. But much greater importance must be attached to them when we seek in their distribution and habits the key to the solution of the problems of tree-planting which are of so much importance in the economy of the prairie regions.

Such natural groves as occur are practically restricted to the three larger streams of the county. They are found in part in alluvial valleys, and in part upon the lower slopes of the adjacent hills. Along some of the smaller tributaries are found small clumps of the willows *Salix amygdaloides* and *Salix discolor*, and of wild plum and white ash, but these can scarcely be called groves.

The finest natural grove is found in the southwestern corner of the county along that part of the Big Sioux river which flows westward toward Canton, S. Dak. The river here

approaches close to the high and broken bluffs on the south side, being separated from them only by a narrow strip of alluvial plain. For two miles these bluffs present a rugged face to the north, seamed and scarred by ravines and gullies which run back toward the higher crests to the south. Almost everywhere these northern slopes, as well as the narrow alluvial plain below, are covered with a well developed forest. On the alluvial plain soft maple, box elder, white elm and white ash are most common, basswood is abundant on the lower slopes, while on the higher slopes bur oak is the prevailing form. But in no place does the grove reach the very summit of the bluffs to any considerable extent.

Upon the lower slopes true arboreal conditions exist. Mosses and smaller species of flowering plants characteristic of wooded regions, are abundant, and springs flow from the base of the wooded bluffs. This is in reality the only place in the county where true forest conditions, as we understand them in the rougher eastern and southern sections of the state, exist. Here, too, are found practically all of the species of woody plants which are native to the county, and on the lower slopes and the adjacent flats they are quite as vigorous and thrifty as in more easterly forest regions. It is only on the higher, more exposed slopes that the stunted bur oak displaces all other trees, or rather, is alone able to gain a foothold. In these more exposed portions of the grove the surface conditions are quite different. The stunted trees, growing more stunted with greater exposure, are scattered, forming "open" groves. The intervening ground surfaces are in large part covered with tufts of grasses and other prairie plants, and there is an almost total absence of leaf mould, of moss-covered decaying sticks and logs, and of the masses of smaller vegetation so characteristic of deeper woods. Northward from the Chicago, Milwaukee & St. Paul railroad the bluffs on the Iowa side are still rugged, but as the river flows almost due south, they are here more exposed to the southerly winds, and consequently but few groves have developed, and

these are of the stunted, open type, chiefly in ravines and "pockets" below the crests of the hills, on the leeward side.

The alluvial valleys of the large streams present the usual conditions which prevail along prairie streams which are skirted with clumps and bands of timber. As compared with more typical alluvial valleys southeastward they show a smaller number of species of trees, the trees are more scattered with a lesser variety of small plants growing beneath them, and there are frequent encroachments of species from the adjacent prairies.

The native woody plants of the county may be divided into three groups according to habitat:

1. *Species of the alluvial lowlands.*—As noted, these are found chiefly along the larger streams, but straggling specimens of the species already enumerated may be found here and there along smaller streams.

The following species were collected:

Acer dasycarpum Ehrh. Soft Maple. Common.*

Negundo aceroides Moench. Box Elder. Common.

Populus monilifera Ait. Cottonwood. Common, but probably chiefly introduced.

Salix amygdaloides Anders. Black Willow. Common.

Salix longifolia Muhl. Sand-bar Willow. Common.

Salix cordata Muhl. Heart-leaved Willow. Not rare.

Salix missouriensis Bebb (?)† Missouri Willow. Not common.

Sambucus canadensis L. Common Elder. Quite common.

Amorpha fruticosa L. False Indigo. Quite common.

Crataegus coccinea L. Red Haw. Not rare.

Prunus americana Marsh. Wild Plum. Common.

Fraxinus americana L. White Ash. Common.

Celtis occidentalis L. Hackberry. Common.

Vitis riparia Mx. Wild Grape. Quite common.

*All references to abundance of these woody plants are intended merely to convey a general idea of relative abundance of species in the restricted timbered area. The sum-total of any one species, of course, amounts to comparatively little because of the limited total forest area.

†Identified by Mr. Ball.

Viburnum lentago L. Sheep-berry. Not rare.

Salix discolor Muhl. Pussy Willow. Quite frequent.

The last six species of the preceding list also sometimes occur on banks and lower slopes; indeed this is true to a very limited extent of nearly all of the species in the list, the line of demarkation being by no means sharply defined. The intergrading of conditions naturally results in a mingling of species in any case, and this is intensified by the greater adaptability of some species to conditions which are not normal. For this reason in any system of plant grouping based on habitat it is practically impossible to draw sharp lines between the groups so defined.

2. *Species growing on protected banks and lower slopes.*—Most of these species also extend more or less into the lowlands. This group most nearly presents the species and conditions which characterize hilly woods eastward. This is especially true in the large grove already described, which is really the only typical locality in the county. The following is a list of the species:

Tilia americana L. Basswood. Common, especially in the large grove.

Ulmus americana L. White Elm. Common.

Ulmus fulva Mx. Red Elm. Rather common.

Ostrya virginica Willd. Hop Hornbeam. Frequent.

Fraxinus pubescens Lam. Red Ash. Found sparingly only near the Sioux quartzite exposures. Stunted forms of this and White Ash occasionally ascend to the crevices in the rock- ledges.

Gymnocladus canadensis Lam. Kentucky Coffee-tree. Quite common in the large grove.

Amelanchier canadensis T. and G. Juneberry. Found occasionally in the large grove.

Prunus virginiana L. Choke Cherry. Quite frequent.

Rosa blanda Ait. Smooth Rose. Not common.

Rubus strigosus Mx. Wild Red Raspberry. Not rare.

Xanthoxylum americanum Mill. Prickly Ash. Quite common, occasionally forming dense thickets.

Ribes floridum L'Her. Wild Black Currant. Not rare.

Ribes gracile Mx. Missouri Gooseberry. Very common locally, sometimes forming dense clumps.

Celastrus scandens L. Climbing Bittersweet. Not rare.

Euonymus atropurpureus Jacq. Burning Bush. Not common.

Ampelopsis quinquefolia Mx. Virginia Creeper. Quite common.

Menispermum canadense L. Moonseed. Not rare.

3. *Species of higher slopes and drier places.*—Stunted specimens of these species are likely to be found in straggling clumps almost anywhere on the prairies, especially on knolls and slopes, but they form no very considerable part of the prairie flora, being more common at the borders and in the vicinity of groves, or even extending into them.

Quercus macrocarpa Gray. Bur Oak. This is the most interesting tree in all the northwestern division of the state. It seems to be the pioneer of hard-wood trees, being the first of all trees to gain a foothold upon the knolls and slopes of the prairies. On the leeward side (*i. e.*, N. and N. E.) of the slopes the trees reach some size, though never forming the fine specimens which typify the species further east. As they ascend upward or reach out into less protected tracts they become more stunted and form the variety *olivæformis* Gray. Fruiting specimens not over a foot in height are frequently found in the exposed places. They have small leaves and small acorns, and sometimes several short stems are clustered on the same root. This species presents the best example of the stunting effect of summer winds upon the perennial plants of the northwest.

Rhus glabra L. Smooth Sumach. Quite common.

Rhus toxicodendron L. Poison Ivy. Common.

Salix humilis Marsh. Prairie Willow. Quite common.

Symphoricarpos occidentalis Hk. Wolfberry. This is the most widely distributed of the smaller woody plants, being found in almost all kinds of soils and situations. It usually grows in clumps.

Ceanothus americanus L. New Jersey Tea. Not rare.

Rosa arkansana Porter, the Prairie Rose, found commonly on the prairies may also be listed here.

CULTIVATED FOREST TREES.

The lessons which are taught by the native groves of Lyon county may well be applied in the cultivation of forest trees. The forest areas are small, it is true, and by far the greater part of the country presents a more fitting field for the study of prairie conditions, but the very fact that some trees do grow indicates that so far as general conditions are concerned they are not wholly unfavorable to the growth of trees. The native groves are uniformly found in valleys or on the north and east slopes of hills and knolls. The prevailing summer winds are southerly and southwesterly. They are strong and frequent, and being hot and dry they parch the exposed surfaces of the prairies. Both by their physical force and by their temperature and dryness, they check the growth of trees. In situations which are not exposed to these winds native trees grow readily and normally, but in exposed places, if developed at all, they are stunted and straggling. The Bur Oak, already cited, furnishes the best illustration of the effect of these winds.*

Exposure to the early spring sun on northern slopes, which hastens the early development of buds which are often nipped by late frosts, also serves to check or exterminate trees on southerly slopes.

Naturally the conditions which operate against the growth of native trees will also be unfavorable to the development of cultivated trees. To grow trees successfully in this county it is necessary that so far as possible they receive protection

*For a more detailed discussion of the effect of winds on growth of trees see the author's paper in the Proceedings of the Iowa Acad. of Sci., for 1899.

from the summer winds. There are really but two kinds of habitats in the county which are unfavorable to the growth of trees, namely the low, wet places in which the soil is "soured," and the gravelly knolls and limited rock exposures. The remaining soils are suitable for the growth of trees, and there seems to be no special difference between the drift clay soils and the loess, the latter, of course, representing merely the finer parts of the former sifted out. In both of these soils trees will grow readily if properly protected. This is best accomplished either by planting on northern and eastern slopes where this is possible, or by growing the trees in mass, in groves and not merely in rows, and surrounding the groves with rows of Cottonwood. The Cottonwood is the best nurse-tree for this purpose as it grows readily singly or in rows,—indeed it will not grow well in groves, the inner trees usually becoming dwarfed and soon dying out, while the outermost row uniformly shows greater vigor and longer life. All other trees, however, do better in groves, which should be dense at first, and later as the trees grow larger, they should be gradually thinned out. While small the trees should be cultivated, and later mulched with straw. Too much straw near the trees, however, increases the danger from mice. The weeds should be cut before going to seed, and left on the ground. No stock of any kind should be permitted to enter the grove, as nothing so quickly destroys trees. It is better to raise trees from seeds where possible, or to plant small trees. Nothing is gained by planting large trees as these are usually severely checked in their growth by transplanting. In transplanting, the roots should never be exposed to the air or permitted to dry.

With our present knowledge it is safe to say that as yet no introduced forest trees have exhibited superiority over native trees. The Russian Poplar, which has been tried, is scarcely a success, and moreover is a tree of comparatively little value. The Catalpa freezes down and is not a success. The introduced White Willow (*Salix alba*) is of the usual doubtful value. The miles of willows planted by Jesse Fell in the vicinity of

Larchwood in 1873 are now generally considered a nuisance. The Russian Mulberry will answer for wind-breaks and hedge-rows, but has no superior value. Lombardy Poplars have long ago been declared worthless, and few appear in this county. Evergreens of various kinds have been tried, sometimes with success, but more frequently they have failed. In a general way it is safe to say that most evergreens will do quite well when protected by other trees in groves already established, but as pioneers they are scarcely to be recommended.

Probably the best coniferous tree is the European Larch (*Larix europæa*). It will grow in comparatively dry places, the fact that its leaves are deciduous (and hence it is not an "evergreen") no doubt being an advantage. It makes a fine tree, grows rapidly, and its long straight trunk makes desirable post timber. It is not uncommon about Larchwood, and its success has been amply demonstrated.

The Red Cedar (*Juniperus virginiana*), while rather difficult to start in the open, makes good wind-breaks, and, when established, grows well. It is more readily grown under the protection of other trees, but the bark is often attacked by mice.

The Scotch Pine (*Pinus sylvestris*) grows fairly well, though, like all other evergreens, it is hard to start. It does not, however, make a satisfactory tree in the end, becoming scrawny and unsightly after eighteen or twenty years. The Austrian Pine (*Pinus austriaca*) makes a handsomer tree than the preceding, and improves with age.

The Norway Spruce (*Abies excelsa*) and some of the western spruces have been tried, but only with indifferent success. The best evergreens may be found in the former Larchwood nursery, but here they received special care and were grown in a large grove under very favorable circumstances. But even here the White Pine (*Pinus strobus*) was not a success, and its cultivation in this part of the state seems almost impossible.

Arbor Vitæ (*Thuja occidentalis*) has been tried, but is no more promising than some of the preceding.

In individual cases evergreens have done well, but on the whole they are not adapted to open prairie country, and as they are difficult to start, their planting, excepting occasionally for ornamental purposes, is an unprofitable venture.

Deciduous trees fare better. This is probably due at least in part to the fact that the loss of leaves (partial in very dry seasons in summer, and complete in winter) results in the loss of the transpiring apparatus, and the consequent inability of the tree to throw off water during these unfavorable periods. The trees which are most widely cultivated are the Cottonwood, Soft Maple, Box Elder and White Willow, the last being introduced. These and other species are here considered separately.

Cottonwood (*Populus monilifera*). The chief value of this tree lies in its rapid growth and its ability to hold its own when planted in single rows, this fact making it of value around groves of other trees. Mr. Carter, who surrounded and quartered several sections of land in Allison township with cottonwood trees some twenty-two to twenty-five years ago, demonstrated the possibilities of this tree. Single rows of Cottonwoods, now grown to large size, give to several square miles of surface the appearance from a distance of a large forest, and within the area itself the protection from winds, and other advantages offered by timber tracts, are presented in a marked degree.

For extensive wind-breaks, and for nurse-trees (only on the outside of groves, however), it is the most valuable tree cultivated in this part of the state.

Box Elder (*Negundo aceroides*). This tree grows rapidly, and produces a dense growth in a short time. It is also easily cultivated. However, it does not produce a tree of lasting value, and could be displaced by the White Ash with profit.

Soft Maple (*Acer dasycarpum*). This tree grows rapidly and if grown in clusters forms good wind-breaks, but, as a permanent investment it is not of much value, its brittleness also making it undesirable.

White Willow (*Salix alba*). This is extensively grown in some parts of the county, chiefly for hedge-rows. It quickly forms a dense wind-break, but is otherwise scarcely desirable. With Cottonwood it may be used for the outer protection of groves.

A number of other species native to Lyon county, or common in not remote sections of the state, are suitable for cultivation, and in the end prove much more satisfactory than the four most commonly cultivated kinds. The following are among the best:

White Ash (*Fraxinus americanus*). This is undoubtedly in many respects the most satisfactory tree for cultivation for general purposes on our prairies. It forms a pretty tree, stands drouth better on the whole than any other of the species in this list, is not easily broken by the winds, and in the end produces wood of excellent quality, an item which should not be forgotten, for to the farmer upon the treeless prairies a piece of strong, durable wood, suitable for repairs, etc., is often a great desideratum. Horses, rabbits, etc., do not often gnaw the White Ash, nor is it frequently attacked by insects, and this gives it an additional advantage. It grows best in groves which are protected on the south and west. The chief objection which has been made to this tree is that it is of slow growth. This is true only during the first five to eight years. During these first years the Box Elder easily outstrips it, but is soon excelled by it, not only in quality, but in beauty and size. The fine Ash trees on the old Carter place in Allison township, the splendid groves belonging to the McGuire Brothers in Rock township, and numerous smaller groves scattered over the county, demonstrate the usefulness and desirability of this tree beyond a doubt.

Black Walnut (*Juglans nigra*). This valuable tree can be grown with success in this county. The great mistake, however, which has been made in most efforts thus far, is that the trees were planted in narrow bands or rows, and were exposed. This develops trees with short trunks and wide-spreading crowns which make but little headway, and in exposed places they soon die. If grown in groves, especially among older trees of other species, they grow readily and produce tall straight trunks. The ash and walnut may both be planted in old groves of the softer woods with the view of displacing them. Walnut seed is best planted in the fall, and should not be covered very deeply.

White Elm (*Ulmus americana*). The elm has not yet demonstrated its usefulness in this county. It does quite well, however, in groves where not exposed to the winds, and in such places makes a good rapidly-growing tree. Rabbits and horses, however, relish it, and often do much damage.

Bass-wood (*Tilia americana*). While this tree does not compare in value with some of the preceding, it makes a fine shade and ornamental tree, but must be grown in sheltered places.

Wild Cherry (*Prunus serotina*). This species is but little cultivated, but deserves greater attention. It seems to grow even in somewhat exposed places, but does better in groves. The Red Elm (*Ulmus fulva*), the Hackberry (*Celtis occidentalis*), and the Honey Locust (*Gleditschia triacanthos*) are also sparingly cultivated, but they scarcely equal the preceding species of this list in value, though they may be successfully grown. The Wild Plum (*Prunus americana*) when grown in thickets makes splendid wind-breaks, and should be more widely cultivated for that purpose.

The hard-wood trees such as Oaks, etc., can scarcely be grown to advantage until larger groves are established in which they may find necessary protection. Farmers might well begin to replace their groves of Cottonwood, Box Elder, Maple, etc., with White Ash, Walnut, and other more valuable

trees. The latter could be easily grown in the shelter of the old groves, and in the end would give quite as much protection, besides yielding valuable wood. They are slower growers perhaps, but since the old soft wood groves are established and give the farmer the needed protection, this is a matter of less concern than when the groves were first planted. In case a new grove is to be established it would pay to first set out soft-woods as nurses, and then mingle the more desirable species with them, or plant in alternating rows or groups.

NATIVE HERBS.

The native herbaceous plants are here roughly grouped according to habitat. No sharp lines can be drawn, of course, and it is intended merely to indicate the ordinary or most common habitat.

1. *Species of ordinary fertile prairie.*—Some of these species encroach on the dry slopes, while others extend into the wet low-lands.

Anemone patens var. *nuttalliana* Gray. Pasque-flower. Specimens were collected as late as June.

Ranunculus rhomboideus Goldie. Prairie Crowfoot. Not rare.

Delphinium azureum Mx. Larkspur. Common.

Sisymbrium canescens Nutt. Tansy Mustard. Common.

Astragalus caryocarpus Ker. Ground Plum. Common.

Petalostemon candidus Mx. White Prairie Clover. Common.

Petalostemon violaceus Mx. Rose-purple Prairie Clover. Common.

Psoralea argophylla Pursh. Silver-leaf Psoralea. Very common.

Psoralea esculenta Pursh. Pomme Blanche. Not rare.

Glycyrrhiza lepidota Nutt. Wild Liquorice. Not rare.

Potentilla arguta Pursh. Five-finger. Very common, often in rather dry places.

- Cnicus altissimus* L. Tall Thistle. Common.
- Coreopsis palmata* Nutt. Tickseed. Common.
- Echinacea angustifolia* D.C. Purple Cone-flower. Common.
- Erigeron strigosus* Muhl. Daisy Fleabane. Very common.
- Helianthus annuus* L. Sunflower. Locally common.
- Helianthus maximiliani* Schrad. Maximilian's Sunflower. Very common.
- Lepachys columnaris* T. and G. Prairie Cone-flower. Locally common.
- Lepachys pinnata* T. and G. Gray-headed Cone-flower. Common.
- Liatris scariosa* Willd. Blazing Star. Very common.
- Prenanthes racemosa* Mx. Rattlesnake-root. Not rare.
- Silphium laciniatum* L. Compass-plant. Very common.
- Solidago speciosa* var. *angustata* T. and G. Prairie Showy Golden-rod. Very common.
- Asclepias verticillata* L. Whorled Milkweed. Common.
- Asclepias tuberosa* L. Pleurisy-root. Common.
- Asclepias speciosa* Torr. Showy Milkweed. Not rare.
- Acerates viridiflora* var. *lanceolata* Gray. Green Milkweed. Not rare.
- Phlox pilosa* L. Downy Phlox. Locally very common.
- Onosmodium carolinianum* var. *molle* Gray. False Gromwell. Common.
- Pentstemon laevigatus* Sol. Smooth Beard-tongue. Locally common.
- Juncus tenuis* Willd. Slender Rush. Very common, also often in wet places.
- Elymus macouni* Vasey. Macoun's Wild Rye. Not rare.
- Agropyrum repens* Beauv. Couch-Grass. Common locally.
- Agropyrum glaucum* R. & S. Blue-joint. Very common.
- Bouteloua racemosa* Lag. Racemed Bouteloua. Locally common.
- Stipa spartea* Trin. Porcupine Grass. Very common locally.

2. *Species of dry prairies, gravelly knolls, etc.*

Cerastium nutans var. *brachypodium* Eng. Short-stalked Chickweed. Locally common.

Silene antirrhina L. Sleepy Catch Fly. Common.

Linum sulcatum Rid. Wild Flax. Locally common.

Oxalis violacea L. Violet Wood-Sorrell. Not common.

Polygala verticillata L. Milkwort. Not common.

Vicia americana var. *linearis* Wat. Vetch. Occasional.

Hosackia purshiana Benth. Locally common. Native?

Amorpha canescens Nutt. Lead Plant. Very common.

Really a shrub.

Oxytropis lamberti Pursh. Loco-weed. Quite common locally in the western part of the county.

Cassia chamæcrista L. Partridge Pea. Common, introduced?

Potentilla norvegica L. Five-finger. Common.

Potentilla pennsylvanica var. *strigosa* Lehm. Hoary Five-finger. Rare, found only in the vicinity of the Sioux quartzite.

Enothera serrulata Nutt. Evening Primrose. Common.

Enothera biennis L. Common Evening Primrose. Common.

Opuntia rafinesquei Engelm. Prickly Pear Cactus. Reported from Lyon county by Professor Pammel.*

Pimpinella integerrima B. & H. Yellow Pimpernel. Common.

Kuhnia eupatoroides, L. False Boneset. Common.

Liatris punctata Hk. Blazing Star. Common.

Grindelia squarrosa Dun. Gum Plant. Not common.

Chrysopsis villosa Nutt. Golden Aster. Common.

Solidago rigida L. Stiff Golden-rod. Very common. The most characteristic plant on the dry hills.

Solidago missouriensis Nutt. Missouri Golden-rod. Common.

Aster oblongifolius Nutt. Aromatic Aster. Common.

Aster amethystinus Nutt. Amethyst Aster. Rare.

*Proc. Iowa Acad. Sci., Vol. III, p. 119.

- Aster sericeus* Vent. Silky Aster. Common.
- Aster ptarmicoides* T. & G. Upland White Aster. Locally common.
- Helianthus rigidus* Desf. Stiff Sunflower. Very common.
- Achillea millefolium* L. Yarrow. Frequent.
- Artemisia caudata* Mx. Wild Wormwood. Common.
- Artemisia frigida* Wild. Wormwood Sage. Rare.
- Artemisia ludoviciana* Nutt. Western Mugwort. Common.
- Artemisia canadensis* Mx. Canada Wormwood. Not common.
- Lygodesmia juncea* Don. Rush-like Lygodesmia. Common.
- Specularia perfoliata* A. DC. Venus' Looking-glass. Common.
- Gilia linearis* Gray. Narrow-leaved Collomia. Common in the vicinity of the Quartzite exposures.
- Lithospermum hirtum* Lehm. Puccoon. Common.
- Castilleja sessiliflora* Pursh. Downy Painted-cup. Not rare.
- Gerardia aspera* Dougl. Rough Purple Gerardia. Rare.
- Pentstemon gracilis* Nutt. Beard-tongue. Quite common.
- Pentstemon grandiflorus* Nutt. Large-flowered Beard-tongue. Very common on the gravelly banks and bluffs along the Big Sioux river.
- Verbena angustifolia* Mx. Narrow-leaved Vervain. Not rare.
- Hedeoma hispida* Pursh. Mock Pennyroyal. Common.
- Hedeoma pulegeoides* Pers. American Pennyroyal. Common.
- Isanthus cœruleus* Mx. False Pennyroyal. Rare.
- Scutellaria parvula* Mx. Small Skull-cap. Not common.
- Plantago patagonica* var. *gnaphaloides* Gray. Pursh's Plantain. Locally common.
- Oxybaphus nyctagineus* Sweet. Heart-leaved Umbrella-wort. Quite common.
- Oxybaphus hirsutus* Sweet. Hairy Umbrella-wort. Not common.
- Polygonum tenue* Mx. Slender Knotweed. Common only in the vicinity of the Quartzite.

Comandra umbellata Nutt. Bastard Toad-flax. Rather common.

Euphorbia glyptosperma Engel. Ridge-seeded Spurge. Not common.

Euphorbia marginata Pursh. White-margined Spurge. Occasional.

Euphorbia obtusata Pursh. Blunt-leaved Spurge. Not common.

Tradescantia virginica L. Spiderwort. Common.

Allium stellatum Nutt. Wild Onion. Not rare.

Carex stenophylla Wahl. Involute-leaved Sedge. Common in the vicinity of the Quartzite.

Carex adusta (?) Boott. Sedge. Not common.

Carex cephalophora Muhl. Sedge. Not rare.

Carex pennsylvanica Lam. Sedge. Not common.

Carex straminea var. *brevior* Des. Sedge. Common.

Carex straminea Willd. Sedge. Not rare.

Chrysopogon nutans Benth. Indian Grass. Still common on native prairie.

Agrostis scabra Willd. Rough Hair-grass. Rather common.

Poa pratensis L. Blue Grass. Probably introduced in such places.

Bouteloua hirsuta Lag. Muskit Grass. Local.

Bouteloua oligostachya Torr. Muskit Grass. Common.

Buchloe dactyloides Engelm. Buffalo Grass. Found now only in the vicinity of the Quartzite exposures.

Andropogon furcatus Muhl. Beard Grass. Common.

Andropogon scoparius Mx. Beard Grass. Common.

Festuca tenella Willd. Fescue Grass. Local.

Hordeum pusillum Nutt. Little Barley. Quite common locally.

Koeleria cristata Pers. Quite common on unbroken prairie.

Panicum scribnerianum Nash. Scribner's Panicum. Not rare.

Schedonnardus texanus Steud. Not rare in the vicinity of the Quartzite exposures.

Sporobolus cuspidatus Torr. Rush Grass. Common.

Equisetum lævigatum Braun. Scouring Rush. Frequent.

3. *Species growing on rocks, in crevices, etc.*—These are found on the Sioux Quartzite.

Aquilegia canadensis L. Wild Columbine. Occasional.

Talinum teretifolium Pursh. Fame-flower. Common.

Opuntia fragilis Haw. Prickly Pear Cactus. Not rare.

Woodsia scopulina D. C. Eaton. Rocky Mountain Woodsia. Common on the Sioux Quartzite ledges near the Big Sioux.

Selaginella rupestris Spring. Not common.

Numerous mosses and lichens are also found on and near the Quartzite. The latter group is especially well represented, the rocks being in large part covered with numberless specimens of numerous species.

4. *Mesophytic species of wood and meadow.*—This group includes species which require an average amount of moisture, and in most cases prefer more or less shade. They are the species of our ordinary wooded tracts. (a) Species of deeper woods, moist banks, borders of thickets, etc.

Clematis virginiana L. Common Virgin's Bower. Common.

Anemone cylindrica Gray. Long-fruited Anemone. Not rare.

Silene stellata Ait. Starry Campion. Quite frequent.

Amphicarpæa pitcheri T. & G. Hog Peanut. Frequent.

Desmodium canadense D. C. Tick Trefoil. Common.

Geum virginianum L. Avens. Common.

Heuchera hispida Pursh. Alum-root. Rather belonging to the following group.

Solidago serotina var. *gigantea* Gray. Golden-rod. Common.

Erigeron philadelphicus L. Common Fleabane. Common.

Campanula americana L. Tall Bellflower. Common.

Apocynum cannabinum L. Indian Hemp. Not rare.

Hydrophyllum virginicum L. Water-leaf. Not common.

Pedicularis canadensis L. Lousewort. Not rare.

Laportea canadensis Gaud. Wood Nettle. Rather frequent.

Pilea pumila Gray. Richweed. Rather common.

Polygonatum giganteum Diet. Great Solomon's Seal. Occasional.

Smilax herbacea L. Carrion Flower. Not rare.

Elymus canadensis L. Wild Rye. Common.

Leersia virginica Willd. White Grass. Common.

Panicum dichotomum L. Forked Panicum. Common. A weed.

Asplenium filix-fœmina Bernh. Spleenwort. Local. (b) Species of rocky, sometimes more or less shaded, banks.

Thalictrum purpurascens L. Purplish Meadow Rue. Frequent, but probably more common with the following group.

Oxalis corniculata var. *stricta* Sav. Yellow Wood-sorrel. Very common, and occurring in a variety of habitats.

Senecio aureus L. Squaw-weed. Common.

Ellisia nyctelea L. Quite common.

Ipomœa pandurata Mey. Wild Potato-vine. Occasional.

Farietaria pennsylvanica Muhl. Pellitory. Locally common. (c) Alluvial species, growing near streams and ponds. Most of these species also commonly occur on the borders of wet prairie meadows.

Ranunculus abortivus L. Small-flowered Crowfoot. Common.

Viola palmata var. *cucullata* Gray. Common Blue Violet. Quite common.

Echinocystis lobata T. & G. Wild Balsam Apple. Common in low woods.

Cryptotœnia canadensis D. C. Honewort. Not rare.

Galium aparine L. Goose Grass. Common.

Galium triflorum Mx. Sweet-scented Bedstraw. Common.

Artemisia biennis Willd. Wormwood. Common.

Eupatorium purpureum L. Purple Boneset. Not rare.

Helianthus tuberosus L. Jerusalem Artichoke. Not rare.

Helenium autumnale L. Sneezeweed. Common.

Rudbeckia laciniata L. Cone-flower. Common.

Silphium perfoliatum L. Cup Plant. Common.
Vernonia fasciculata Mx. Iron weed. Common.
Steironema ciliatum Raf. Loosestrife. Common.
Gerardia tenuifolia Vahl. Slender Gerardia. Common.
Scutellaria lateriflora L. Mad-dog Skull-cap. Common.
Polygonum ramosissimum Mx. Bushy Knot-weed. Not rare.

Humulus lupulus L. Common Hop. Common.

(d) Species growing in open places in wooded tracts, but also running into the prairie.

Fragaria virginiana Mill. Strawberry. Common.

Solidago serotina Ait. Golden-rod. Common.

Aster laevis L. Smooth Aster. Very common.

Aster novae-angliae L. New England Aster. Quite common.

Helianthus grosse-serratus Martens. Saw-tooth Sunflower.

Common.

Heliopsis scabra Dunal. Ox-eye. Common.

Scrophularia nodosa var. *marylandica* Gray. Rather common.

Monarda fistulosa L. Wild Bergamot. Frequent.

Sisyrinchium angustifolium Mill. Blue-eyed Grass. Not rare.

Hypoxis erecta L. Star-grass. Common.

Smilacina stellata Desf. False Solomon's Seal. Not rare.

(5) Species growing in sandy places along streams.

Strophostyles angulosa Ell. Wild Bean. Common.

Eragrostis major Host. Strong-scented Eragrostis. Common. Introduced.

Panicum virgatum L. Prairie Grass. Common.

Some of the species in the following group also frequently appear in sand, especially if it is mingled or covered with alluvium.

(6) Species growing in swamps, or at least in wet places.

These may be roughly divided into those which manifest a preference for wet places, and those which are distinctly swamp-species.

(a) Species growing in localities which are more or less moist.

Anemone pennsylvanicus L. f. Bristly Crowfoot. Not rare.

Nasturtium palustre DC. Marsh Cress. Common.

Nasturtium palustre var. *hispidum* DC. Rare.

Nasturtium sinuatum Nutt. Water Cress. Frequent.

Stellaria longifolia Muhl. Long-leaved Stitchwort. Not common.

Lathyrus palustris L. Swamp Vetchling. Not common.

Penthorum sedoides L. Ditch Stone-crop. Quite common.

Rotala ramosior Koehne. Rare. Near Quartzite exposure.

Lythrum alatum Pursh. Loose-strife. Quite common.

Ammania coccinea Rottb. Rare. Found only near Sioux Quartzite exposures.

Cicuta maculata L. Water Hemlock. Frequent.

Asclepias incarnata L. Swamp Milkweed. Common.

Mimulus ringens L. Monkey-flower. Not rare.

Ilysanthes riparia Raf. False Pimpernel. Occasional.

Pedicularis lanceolatus Mx. Swamp Louse-wort. Not common.

Lycopus sinuatus L. Water Horehound. Common.

Physostegia virginiana Benth. False Dragon-Head. Not common.

Mentha canadensis L. Wild Mint. Common.

Teucrium occidentale Gray. Germander. Locally very common.

Acnida tuberculata Moq. Water-Hemp.

Rumex salicifolius Weinm. White Dock. Frequent.

Rumex altissimus Wood. Pale Dock. Common.

Polygonum acre H. B. K. Water Smartweed. Common.

Polygonum pennsylvanicum L. Smartweed. Common.

Allium canadense Kalm. Wild Garlic. Rather common.

Carex hystricina Muhl. Sedge. Quite common.*

Carex sartwellii Desv. Sedge. Not common.

Carex vulpinoidea Mx. Sedge. Common.

*The sedges mentioned in this report were reviewed by Mr. R. I. Cratty, of Arr. Strong, Iowa.

- Carex trichocarpa* Muhl. Sedge. Common.
Carex cephalophora Muhl. Sedge. Common.
Carex straminea Willd., var. Sedge. Not common.
Cyperus erythrorhizos (?) Muhl. Not common.
Cyperus aristatus Rottb. Quite abundant.
Cyperus diandrus Torr. Common.
Cyperus speciosus L. Rather frequent.
Alopecurus geniculatus L. Foxtail Grass. Common.
Calamagrostis canadensis Beauv. Blue-joint. Still very common on undisturbed prairie.
Muhlenbergia glomerata Trin. Drop-seed grass. Not rare.
Muhlenbergia mexicana Trin. Drop-seed grass. Common.
Spartina cynosuroides Willd. Tall Marsh-grass. Common locally.
Calamagrostis longifolia Hook. Reed Bent-grass. Quite common.
 (b) Swamp species.
Sium cicutaefolium Gmel. Water Parsnip. Not rare.
Herpestis rotundifolia Pursh. Hedge-Hyssop. Found in and around the edges of pools in the vicinity of the Quartzite exposures. Rare.
Veronica anagallis L. Water Speedwell. Not common.
 With the preceding.
Juncus nodosus var. *megacephalus* Torr. Rush. Locally common.
Sparganium eurycarpum Engelm. Bur-reed. Not rare.
Alisma plantago L. Water-plantain. Common.
Sagittaria variabilis. Engelm. Arrow leaf. Common in spots.
Eleocharis acicularis R. Br. Spike-Rush. Common.
Eleocharis ovata R. Br. Spike-Rush. Rather frequent.
Eleocharis palustris R. Br. Spike-Rush. Quite common.
Eleocharis tenuis Schultes. Not common.
Scirpus atrovirens Muhl. Bulrush. Common.
Scirpus lacustris L. Common.
Scirpus americanus Pers. Not common.

Beckmannia erucæformis var. *uniflora* Scrib. Found only in streamlet near Sioux Quartzite exposure.

Scolochloa festucacea. Link. Not rare.

(7) *Aquatic species.*

These are of two kinds—those which are rooted in mud, etc, but remain submersed, and those which are floating. Both of course are restricted in their distribution.

(a) Species which are rooted, but submersed.

Ranunculus circinatus Sibth. Stiff Water Crowfoot. Not common.

Nuphar advena sit f. Yellow Pond Lily. Rare.

Nymphaea reniformis DC. White Water Lily. Rare.

Myriophyllum heterophyllum Mx. Water Milfoil. Not common.

Polygonum muhlenbergii Wats. Knot-weed. Locally common.

Ceratophyllum demersum L. Hornwort. Locally common.

Elodea canadensis Mx. Water-weed. Locally common.

Heteranthera graminea Vahl. Mud-Plantain. Not common.

Potamogeton amplifolius Tucker. Pond-weed. Rock river. Not common.

Potamogeton fluitans Roth. Pond-weed. Rock and Big Sioux rivers. Common.

Potamogeton pauciflorus var. *niagarensis* Gray. Rock river. Not common.

Potamogeton pectinatus L. Rock river. Not rare.

Potamogeton zosteræfolius Schum. Rock river. Quite common.

Marsilea vestita H. & G. Found sparingly in pools on the Sioux Quartzite.

(b.) *Floating species.*

Lemna minor L. Duck-weed. Locally common.

Spirodela polyrrhiza Schleid. Common in a pond in the northwest corner of the county.

(8.) *Parasites.*

To the foregoing list should be added the following parasites:

Cuscuta arvensis Beyr. Dodder. On low prairie plants. Locally common.

Cuscuta gronovii Willd. Dodder. On weeds, etc. Not rare.

Cuscuta glomerata Choisy. Dodder. On coarse weeds. Locally common.

Cuscuta tenuiflora Engelm. Dodder. On shrubs and coarse weeds. Common.

Aphyllon ludovicianus Gray. Broom-rape. Two specimens only were found on the quartzite tract. Introduced, no doubt.

FORAGE PLANTS.

The prairies were formerly covered with good forage-grasses. These are rapidly becoming exterminated, but virgin prairie still produces a number of species in abundance.

Of the species already listed the following may be classed as still valuable: *Andropogon furcatus*, *Calamagrostis canadensis*, *Agropyrum glaucum* and *repens*, *Panicum virgatum*, *Elymus canadensis* (of some value) and *Koeleria cristata*. The following would be useful if they occurred in sufficient quantities: *Chrysopogon nutans*, *Poa pratensis*, *Beckmannia erucaeformis* var. *uniflora*, *Buchloe dactyloides*, and the three species of Gamma Grass (*Bouteloua*) which are of some use on poor lands.

A few species add to the bulk, but not much to the value of prairie hay. Such are: *Spartina cynosuroides*, *Muhlenbergia glomerata* and *mexicana*, *Alopecurus geniculatus* and *Leersia virginica*.

The yellow Fox-tail (*Setaria glauca*) a common weed, is of some value as fodder in stubble. The remaining grasses and the sedges are of very little value.

WEEDS.

Both introduced and native plants appear as weeds. Of the introduced forms the following were observed:

Mustard; Charlock (*Brassica sinapistrum* Boiss.). Very common in fields. It is said that sowing Millet in fields infected with it will exterminate this pest.

Pepper-grass. Two species, *Lepidium virginicum* L. and *intermedium* Gray, both probably introduced, are not uncommon, but they are not specially harmful.

False Flax (*Camelina sativa* Crantz.). Sparingly introduced, probably with flax.

Purslane (*Portulaca oleracea* L.). Not very common.

Alsike Clover (*Trifolium hybridum* L.). Sparingly introduced.

Horse weed (*Erigeron canadensis* L.). A nuisance in waste places.

May-weed; Dog-fennel (*Anthemis cotula* DC.). Not in sufficient abundance to be harmful.

Hog-weed (*Ambrosia artemisiifolia* L.). Becoming more common and a nuisance in waste places.

Great Ragweed (*Ambrosia trifida* L.). Common, and becoming troublesome.

Marsh Elder (*Iva xanthiifolia* Nutt.). Becoming more common and growing very troublesome, especially on lower lands.

Cockle-bur (*Xanthium canadense* Mill.). Common and troublesome, especially on lower grounds.

Burdock (*Arctium lappa* L.). Not yet common.

Dandelion (*Taraxacum officinale* Web.). Not very abundant.

Sow-Thistle (*Sonchus asper* Vill.). As yet scarcely noticeable.

Prickly Lettuce (*Lactuca scariola* L.). Not yet common.

Black Nightshade (*Solanum nigrum* L.). Occasionally in lower cultivated grounds.

Ground-cherry (*Physalis pubescens* L.). In fields, etc.

Bindweed (*Convolvulus sepium* L.). Occasionally in corn-fields.

Plantain (*Plantago major* L.). Becoming troublesome in lawns, etc.

Mullein (*Verbascum thapsus* L.). Not specially troublesome.
Neckweed (*Veronica peregrina* L.). Common in cornfields, etc., but insignificant.

Curled Dock (*Rumex crispus* L.). Not very common.

Black Bindweed (*Polygonum convolvulus* L.). Quite common, and sometimes troublesome in fields.

Pig-weed (*Amarantus retroflexus* L.). Quite common in waste places.

Tumbleweed (*Amarantus blitoides* Wats.). Quite common, and somewhat troublesome.

Russian Thistle (*Salsola tragus* L.). Quite common. In barren places or gravelly slopes the plants are often quite small and simple-stemmed. The species has not become specially troublesome.

Lamb's Quarters (*Chenopodium album* L.). Common in waste places.

Foxtail (*Setaria glauca* Beauv.) Common.

Old-Witch Grass (*Panicum capillare* L.). Rather frequent.

A few other forms, presumably native, also occur as weeds and do not appear in the preceding lists. They are:

Maple-leaved Goosefoot (*Chenopodium hybridum* L.). Not common.

Three-seeded Mercury (*Acalypha virginica* L.). Quite common in fields, etc.

Nettle (*Urtica gracilis* Ait.). Locally common, especially in rather low places.

Prostrate Vervain (*Verbena bracteosa* Mx.). A common weed in waste places. Probably introduced?

Hoary Vervain (*Verbena stricta* Vent.). Very common, and becoming a nuisance in pastures and waste places.

Blue Vervain (*Verbena hastata* L.). Rather common, especially in lower grounds, and becoming a weed.

Squirrel-tail Grass (*Hordeum jubatum* L.). A pernicious weed, now already troublesome locally.

Of the species already given in the preceding lists several may be classed as weeds. The following appear chiefly in

cultivated grounds or waste places: Wild Liquorice (*Glycyrrhiza lepidota*), Partridge Pea (*Cassia chamaecrista*), Daisy Fleabane (*Erigeron strigosus*), the wild sunflowers (*Helianthus annuus*, *H. maximiliani*, and *H. grosseserratus*), Yellow Wood-sorrel (*Oxalis corniculata* var. *stricta*), and Pleurisy-root (*Asclepias tuberosa* L.).

A much larger number of native plants encroach upon pastures.

The following interfere chiefly with pastures on rather dry grounds: Loco-weed (*Oxytropis lambertii*), Lead-plant (*Amorpha canescens*), Varrow (*Achillea millefolium*), Tall Thistle (*Cnicus altissimus*), Stiff Sunflower (*Helianthus rigidus*), Stiff Golden-rod (*Solidago rigida*), Rush-like Lygodesmia (*Lygodesmia juncea*), White-margined Spurge (*Euphorbia marginata*) Evening Primrose (*Oenothera biennis*), False Gromwell (*Onosmodium carolinianum* var. *molle*), and Porcupine Grass (*Stipa spartea*). The Stiff Golden-rod is so common on the hills in the western part of the county that it is decidedly troublesome. The Loco-weed, the White-marginal Spurge, and the Porcupine Grass are dangerous to cattle, but fortunately are not so common as to cause apprehension.

In pastures upon grounds which are more or less moist the following may be troublesome: Sneezeweed (*Helenium autumnale*), Cone-flower (*Rudbeckia laciniata*), Iron-weed (*Vernonia fasciculata*), Swamp Milkweed (*Asclepias incarnata*), Germander (*Teucrium occidentale*), Smartweed (*Polygonum pennsylvanicum*), and the Slender Rush (*Juncus tenuis*.)

Most of the weeds herein enumerated can be exterminated by persistent cutting before seed is produced. Fire and the plow also render material assistance. Individual effort, however, counts for but little, and if weeds are to be subdued in any section, a joint effort to keep them down in the fields, in waste places, and by the roadsides, must be made by all landholders.