GEOLOGICAL SURVEY OF KENTUCKY.

N. S. SHALER, DIRECTOR.

REPORT ON THE BOTANY

OF

BARREN AND EDMONSON COUNTIES,

BY JOHN HUSSEY, BOTANICAL ASSISTANT,

WITH AN INTRODUCTION BY N. S. SHALER.

PART II. VOL. I. SECOND SERIES.

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INTRODUCTION.

The following report of Professor Hussey, Botanical Assistant of the Survey, is published in advance of the completion of the work of which it forms a part, in order that there may be some immediate record of the economic and scientific value of the forest trees and other plants of Western Kentucky. I am satisfied that the very great importance of the store of woods useful in the arts found in Western Kentucky has been greatly overlooked, and deserves immediate attention. The finest hard-wood forests known to me in any country lie between the Louisville and Nashville Railroad and the Mississippi river. I am confident that there is no other region on this continent where as large a mass of timber useful in the arts, and contiguous to transportation, can be found.

The arts into which these varieties of wood enter are multifarious, and of the greatest economic importance. I am satisfied that there is no point in America where so extensive opportunities exist for the creation of a direct trade in hard-wood with Europe. For many years wine-cask staves have been shipped from this district to New Orleans, and, though by the imperfect organization of the business half a dozen profits are paid before they come to the coopers' hands in France, they pay the best profits that are made on the oak timber in this district. By very little effort the casks could be made on the French models on the ground, and shipped as bundles of staves to Europe. A precisely similar industry exists in the shipment of sugar-boxes from the State of Maine to Cuba, the parts being bound up in "shooks" and bundles. By this arrangement the value of this industry to our people would be greatly increased. The demand from this source is very great, and steadily increasing. Another most promising industry has yet to be begun on this ground, though existing elsewhere in

less favorable portions of this country, viz: the making of carriage-parts hubs, felloes, and other elements in such structures, for export. For this purpose the new growth of timber on the barrens, as well as much of the slow growth oak, hickory, &c., of other parts of this district, is peculiarly fitted, having all the properties of second growth. All along the tributaries of Green river we have admirable trees for such industries; places where water-powers can be utilized at actual contact with permanent navigation for steamers directly connecting with New Orleans by the cheapest possible carriage.

The ample stores of oak and other ship timbers along this stream suggests the possibility of developing another industry here. Good ship timber can be had in this district at one third the lowest prices ruling on the Atlantic seaboard. Food is scarcely half as dear. So I am confident that a given tonnage would not cost one third what it would in transatlantic ports, as far as these elements of cost are concerned. Coal for running saw-mills, where steam-power is preferred, can be had for about two dollars and a half a ton. When built, ships would not want for cargo. They could be laden with timber or grain, and could be taken without risk to New Orleans each winter, though drawing as much as twenty feet of water. This is beyond all needs of vessels of this class. Used in this fashion, there is an immediate and most important source of wealth in our vanishing forests, which exceeds computation. Again and again, on the borders of Green river, I have seen, in a few dozen acres of tobacco clearings, enough noble ship timber going to utter waste by fire or decay to have built half a dozen large merchantmen. If such a demand could be created, there are tens of thousands of acres in every Green River county that would be worth a hundred dollars per acre for their timber alone.

In a certain way, the hard-wood timber of Western Kentucky is a more immediate and satisfactory source of wealth than its coal or iron. It takes less capital to develop an industry in it, and the competition will be far less considerable. At the same time, in the class of population it attracts to the State,

and the variety of industry it brings in its train, the industries in wood are superior to all other forms of manufacturing.

The scientific questions connected with our Western forests are even as interesting as those of an economical nature. While they must be reserved for special discussion in the memoirs of the Survey, where, as matters of purely scientific value, they will find their proper place, a brief statement of some of the most important points may be admitted here. In connection with the ancient barrens or prairies, which gave their name, in itself a misnomer, to Barren county, one of the most fertile regions in the State, we have two important questions: First, as to the origin of the treeless conditions which prevailed there when our race first came into the region; and secondly, how the retimbering was effected. The discussion of the first of these questions will lead us far into the difficult problems connected with the origin of prairies. I would only suggest, that inasmuch as the forests came back on the stoppage of the fires, to which reference is made in the following report of Professor Hussey, it is not unreasonable to look to for sweeping fires as the cause of the first destruction of the timber. We have seen within a few years how forest fires, once gaining headway in an unusually dried forest, may sweep over hundreds of miles of territory. A practice of firing prairies long continued might in time extend their limits from the regions where they are natural, from the absence of sufficient rainfall, over more and more of the forest area, until the prairie area had been driven from the Upper Missouri into the central regions of the Ohio Valley. This seems to me the most satisfactory method of accounting for the change.

The rapid restoration of the timber in Kentucky and parts of Indiana and Ohio, while the prairies of Illinois show but little tendency to restore their timber, is less easily to be explained. I am inclined, after considerable study of the matter, to conclude that the "barrens" or prairies of Kentucky had not been long stripped of their timbering, the period of open conditions having endured for such little time that the seeds of the trees had not all decayed in the soil. In no other way could the

exceedingly rapid return of the forests be explained. It has not yet been possible to adopt the statistical plan of studying our western forests shown in the report on the forests of Greenup county, &c. When this is done, it will be seen that the new or second-growth forests on the "barrens" is not nearly as diversified as the other and older forests; there being far more variety in the trees of the old than there is in the new forests.

Assistant John R. Proctor, of the Kentucky Survey, has made some important observations as to the Western forests of the old "barrens," going to show that the conglomerate or beds just below the coal form a natural limit to this once treeless area on the west. The detail of these observations will properly find a place in the proposed memoirs on the distribution of the forest trees of Kentucky.

N. S. SHALER.

INTRODUCTORY LETTER.

Professor N. S. SHALER—

SIR: The accompanying report is, as you will see, on the basis of actual collection. The number of plants in the list could have been greatly augmented had I placed in it plants observed, but not collected.

The first part is a list of the collections actually made, arranged according to the catalogue of Mr. A. H. Curtiss, which follows the order of Gray's Manual.

The second part is made up of Notes on Distribution, Territory Collected Over, and Botanical and Economical Notes. This part could have been greatly enlarged; but I thought that it would be better to await the results of a further prosecution of the Survey, to enlarge upon the peculiarities, the richness, and the economical value of the Flora of Kentucky.

Respectfully,

JOHN HUSSEY.

LAFAYETTE, IND., March 15, 1875.

REPORT ON THE BOTANY

OF

BARREN AND EDMONSON COUNTIES.

By JOHN HUSSEY.

TERRITORY COLLECTED OVER.

My collections were made in the western part of Barren county, or that part west of the Louisville and Nashville Railroad, in the Cave region, and in the county of Edmonson. My observations in Barren county would lead me to the conclusion that the traditions which are current as coming from the settlers are true; that is to say, that when the whites first came to these parts, it was, indeed, a barren region, destitute at least of trees. On the more level parts of this county the trees are yet small in size and few in species. The size of the trees alone would settle the question as to the length of time in which the present forest has stood, especially when taken in connection with the absence of the remnants of an older forest in the matter of fallen trunks and stumps. On the line of sandstone-capped hills seen rising between the line of the railroad and Green river are to be found larger trees than any in the more level portions of the county, showing that when the rest of the county was bare of trees, there were some crowning these hills. The limited number of species found in Barren county would itself be conclusive of the question of the recent introduction of forest growth into this region. The most of the oaks are of the following species: *Quercus*, *coccinea*, *rubra*, *nigra*—the latter species very numerous. *Alba* is found, but not abundant; also *imbricaria* and *obtusiloba*, about the numerous sinkholes. I saw no poplars, no tulip trees, linn, beech, black walnut, or butternut.

The largest trees are oaks, about fifteen inches in diameter three feet from the ground. I saw scarcely a willow or a maple of any kind. The soil is a stiff limestone, considerably impregnated with iron, making it of a red color, and not highly productive of ordinary cereals. The surface is very uneven, being full of sinkholes, formed by the falling in of the cavernous passages which form a network under this whole district. The celebrated Mammoth Cave is only one of the hundreds of caverns of this remarkable region. Not in the trees only, but also in the herbaceous flora, was the limited number of species noticeable. It is well understood that the aborigines of this country were accustomed to burn over the surface of the prairies; but for what purpose it does not seem to be perfectly understood. There may have been several considerations which led them to this quite universal custom. It has been said that they thus destroyed the old culms of grass, and cleared the way for the springing of the tender shoots in the spring. They may also have had in view the destruction of hurtful insects, as the grasshoppers, by destroying their eggs, or of noxious serpents, which must have been destroyed in immense numbers by the annual fires on the prairies. Another reason may have had consideration; the tall dead grass would be liable to be fired by accident at any time, and thus human life and many villages be endangered in the night, or in times of high winds, with no means of escape; but if at a certain time, when all are on the lookout, the firing should take place, there would be no danger to life or property.

This habit of firing the prairies must have exerted a wide influence on the character and distribution of plants in the parts of our country where prairies existed. Certain plants could not survive the fires. The annuals must have been greatly diminished by the custom. Those which were perennials under ground, would suffer less than any other class of plants. The fire swept off everything above the surface—seeds not covered by the soil, young plants of trees; but the well-protected living roots of herbaceous perennials, with the nourishment of another crop of shoots stored away safely be-

neath the sod, suffered no damage. But as these fires were annually kindled, how did it happen that here and there all over the broad prairies clusters of trees withstood their destructive influence, and lived and flourished? The reason of the deficiency of trees on the prairies has been held by some to be the absence of the nutriment in the soil which they required, or the fineness of the soil, which was supposed to be unfavorable to the growth of timber trees. This latter view, taken in connection with the fact that the knolls on which the clumps of trees are generally found are composed of more porous material, as sand or gravel, seemed to receive confirmation. But the fact that all kinds of trees do grow well when planted and protected in prairie soil, upsets both these theories without further refutation. The soil is not too finely divided; it does not lack the necessary constituents. Not taking into consideration how a country may have been deprived of a forest—whether by the ravages of insects, a succession of unfavorable seasons, or by a conflagration alone, or connected with one or all of the foregoing causes, or by any other cause—when once deprived of a forest, annual fires would likely prevent its restoration while they were continued. If the fires were purposely kindled, and at a certain time, so that the villages could be protected against their ravages, the inhabitants would do it by clearing away the dead grass from the vicinity of their dwellings. In fact the grass would perish to the roots around their villages from being trampled upon and burnt out by the fires in and about their habitations. It is not beyond supposition that the aborigines themselves, for various reasons, might scatter the seeds of trees intentionally or accidentally, from the mast with which they must have provided themselves for winter consumption. They would occupy the knolls, if such there were, for their villages. The aboriginal well knew where the beds of gravel were, as is proved by the use he invariably made of them as repositories of his dead. Throughout Western and Southern Ohio scarcely a terrace gravel-bed has been dug out and removed for road-making, but has been found to have been used as a place of interment for his dead.

I had no opportunity to learn by observation how extensive the prairie was, a part of which extended into that portion of Barren county in which I collected. It evidently extended some distance south or southeast of Bowling Green; but how far it did extend in this direction or eastward, I had no opportunity to observe. To the westward, in Edmonson county, there is evidence of the treeless condition existing. The very numerous ravines, valleys, and hillsides, become covered with tree growth first. The large tulip trees, hemlocks, sugar maples, beeches, and chestnuts found in these less exposed localities, prove that generations of tree growth have passed since their seeds were scattered here; but the uplands show, that long since the deep valleys and hillsides were covered with forest growth, these were almost or entirely bare. Notwithstanding this, however, Edmonson county was forest-covered a generation before Barren county.

Taking the two counties together in which my collecting was done, they differ very much in surface character. In Barren county the prevailing rock is limestone, except on the caps of the high hills, where sandstone is found. But in Edmonson county the heavy conglomerate and sandstone of the carboniferous period prevails at all points. The deep gulches cut by the numerous tributaries of Nolin and Bear creeks give a very different character to the geography of this county from that of Barren. These gulches must considerably modify the climate; at least in them and beneath their immense walls of conglomerate and sandstone the extremes of heat and cold are greatly modified, and protection is furnished to several species of plants not found out of these places in this region.

BOTANICAL NOTES.

The list accompanying this will show the limited number of species found in the counties collected over. To give a correct understanding of the list, I should state that my collecting was confined to the months of May, June, July, and a few of the first days of August. The weather was unusually dry, which I suppose exerted an unfavorable influence upon the number of

species. When it is borne in mind that this region is widely separated from the Allegheny Mountains, that it is not a high region, the presence of *Abies Canadensis* will be unexpected; but this makes a large growth in the gulches of Edmonson county. The *Ilex opaca* attains the size of fifteen to eighteen inches in diameter, and forty to fifty feet in height. The little shrubs, *Mitchella repens* and *Gaultheria procumbens* were found in abundance there. *Kalmia latifolia* is abundant. The *Ptelea trifoliata* grows on the Nolin. I mention this to say that I noticed that the petals did not open in all instances, but cohered at their apices, and were pushed off by the stamens and pistils as in some species of the vitis genus.

The *Spiraea aruncus* was a very common plant, and I noticed a feature of it which I have never seen referred to by any one; it was the occurrence of a small deciduous bractlet on each pedicel, but not touching the flower. The *Leavenworthia Michauxii* was collected by me near the town of Glasgow Junction, just northwest of town, growing in a nearly filled-up sinkhole. This is quite a rare plant, and but few specimens were found. *Trifolium reflexum* occurs in several localities between the railroad and Mammoth Cave, which is in the eastern part of Edmonson county. I mention it because I have never found so many specimens in any one locality before, and also to make a note of the fine rose-pink color it everywhere had. The variety of *Celtis occidentalis*, called *pumila*, commences to appear in Barren county, and extends everywhere through the country as far as Hopkinsville, in Christian county. I did not see the ripe fruit; but shrubs ten feet high were not uncommon, with an abundance of fruit. The leaves are thin, smoother than those of the large form, and much tapering. I did not see a large tree of *Celtis occidentalis* anywhere in this section such as are everywhere seen in creek bottoms north of the Ohio. Among ferns, I found, in Barren county, growing on the extreme eastern end of the sandstone ridge, under which is Short Cave, *Cheilanthes vestita*. The hairs on this fern were distinctly jointed, and between each joint much flattened; but the contiguous sections flattened in different planes. This character

is not given in descriptions, although in other species of the same genus the hairs are called "obscurely or distinctly articulated;" and in one the word "flattened" is added—*vide* Gray's Botany.

The fern *Polypodium incanum* was collected on that ledge of sandstone running between the mouth of Mammoth Cave and Green river, and perhaps two hundred yards from the main entrance to the Cave. It was also found growing on a large sand rock on the west fork of the creek, which flows by the old iron furnace west of Nolin, and about one half mile above the furnace. I did not find it in any other locality in the county. I consequently did not find it growing in the moss on trees or the roots of trees. Those places where I did gather it were very dry; had as little opportunity for moisture as any places I could name. One was on the edge of a sand rock among dried-up moss. With the other was found growing the *Camptosorus rhizophyllus*. Mr. W. T. Knott, of Lebanon, Kentucky, showed me a single frond *Polypodium incanum*, which he had gathered among moss on earth beside a stream. Mr. John Williamson, of Louisville, has found this fern within twelve miles of that city. I found the *Asplenium Bradleyi* on a cliff at the head of Dismal creek. It grew on the face of a steep sand rock exposed to all the vicissitudes of the weather. This limited locality was the only place of its occurrence, according to my observation. It seems here as a relic of a former period, having perished from all these miles of cliff formation, and lingering here awhile before giving up the struggle of existence so far to the north. A hundred or so fronds were all I had heart to gather, not willing to hasten its extermination by any act of mine.

The *Trichomanes radicans*, by a singular coincidence, was found growing near, on, or rather under, the same cliff. This rare fern I found in about a dozen localities in this county, always growing on the under side of an overhanging sand rock, where the moisture trickled down and kept the leaves bedewed with spray. I collected this fern also last year in the extreme eastern part of this State, in Carter county. The fronds evi-

dently remain active for several years. They bear their spore cases on the end of veins on the edges of the fronds. In no case have I ever seen a frond, which seemed recently unfolded, develop its spore vessels. A season of repose, of longer or shorter duration, occurs after its development, before it puts forth its little cups, from the bottom of which the bristle grows, and at the base of which the *sporangia* develop and cluster. But what seemed still more curious to me is the fact that the crops of *sporangia* are not all formed and ripened at once; but they are successively developed at the base of the lengthening bristle. I have seen these bristles more than half an inch long, and still beset at the base with ripening *sporangia*, the scars left by those long since fallen being still visible all along the bristle. I think the life of a fertile frond may be for as long as four or five years. It may not be out of place to add, that the fronds were generally well filled with spore vessels. It is probably due to the fact that the numerous flocks of sheep which find protection under the overhanging cliffs during winter, and feed upon this fern, that its extinction seems so near at hand. There were hundreds of situations where it might flourish as well as where it was found, but where it is not found to grow; and those places where it was found were inaccessible to the sheep, either by being above their reach or too far under the rock. I had often to crawl or draw myself in to where it covered the under surface of the overhanging rock, where there was barely room for my head and shoulders.

ECONOMICAL NOTES.

Turning to the more practical side of my work, I can say that the quantity of valuable timber-trees seems practically inexhaustible.

Soft-wood.—The tulip tree, in the west commonly called poplar (*Liriodendron tulipifera*), is abundant along the tributaries of Green river. The trees are of large size, and make good lumber. Those which grew nearest the river and its principal tributaries have been mostly floated down the river; but in the country back there is still much of this valuable timber.

The *sweet gum* (*Liquidambar styraciflua*) is still very abundant on the river and its tributaries. This tree has not been sought after so much as the tulip tree, and, consequently, has not been removed to so great an extent. It is a soft wood, and valuable for most purposes where poplar has been used. For all kinds of structures, where there is no immediate exposure to the weather, this is a valuable wood. The trees are of immense size, being frequently found in the counties lying next down the river from Edmonson county, four and a half feet in diameter and seventy to eighty feet high, with scarcely a limb. They equal the largest poplars. There is not much *linn* or bass-wood (*Tilia Americana*) found on the tributaries of Green river. The trees found are small and of little value for sawing.

Hard-wood.—The species of oak, known among wood-workers as white oak, attains an enormous development along Green river. The white oak, burr oak, and swamp white oak, form immense trunks, reaching to a height of eighty feet, where they still seem to be three feet in diameter. One could hardly determine which to admire most—their number, their size, or grand uniform straight trunks. Although for thirty years the trade in French butts via New Orleans has existed, one cannot see that even an impression has been made on the supply. Timber which has stood the test for such a long period of time in the manufacture of wine-casks needs no recommendation from any one.

The *Spanish oak* is very plentiful in some localities. The timber of this species of oak is valued for wagon-work of all kinds, and is scarcely, if at all, inferior for such manufactures to white oak. The bark is also used in tanning.

Chestnut oak is abundant on the ridges on both sides of Green river, but especially to the west of it. The largest *beech trees* I have ever seen are very abundant on Green river. Their trunks are finely formed, running up forty to fifty feet without any large branches, and as much as three feet in diameter three feet from the ground.

The *chestnut* is abundant also.

The *hickories* are among the largest trees—very tall, but not so great in diameter as the oaks and sweet gum, but exceedingly numerous. Neither *black* nor *white walnuts* are here found in abundance, and the trees which are found are of inferior size. The *wild cherry* is not abundant. The *sugar maple*, *black birch*, and *hemlock* are common in the gulches. The white soft maple is found everywhere. On the uplands hoop-poles seem quite inexhaustible in quantity, and of very good quality.

Black hickory (*Carya Tomentosa*), when from five to ten inches in diameter near the base, is used for making bent-work in the manufacture of buggies and carriages, and for other uses. In the counties of Grayson and Edmonson there is an immense supply of this class of wood. Much of it is too far from the railroad to bear hauling by wagon, and then car transportation to points where it is manufactured into carriage stuff. If some company would put up machinery in the midst of the material, it would certainly prove remunerative if properly carried on. The timber would cost but a trifle, labor in abundance could be had at a fair price, and fuel would be very low, as in many places coal is to be had for the digging from hillside veins. The manufactured articles could be got away at a small expense compared with that of hauling the rough timber. During the winter and spring months, when the river and its tributaries are in good stage of water, the expense of getting material transported would be comparatively little. The large quantity of the right kind of material found here, the extreme abundance of fuel and cheap labor, would give a well-managed company the control of the market in such manufactures.

White elm, so-called in this State (*Ulmus alata*), is very abundant all through the counties of Grayson and Edmonson, as well as in the other parts of the State, especially along the tributaries of Green river below these counties. This is one of the valuable materials for manufactures found here. The wood fibres of the elm interlace, and render the wood tough and difficult to split, while it is both light and elastic. These are the qualities desired in hubs for carriages, small spring-

wagons, and buggies. No iron bands are required, and they may be very light; at the same time they are strong, and neither split or crack if properly seasoned. A large quantity of this wood is found of the right size for the uses named.

Mulberry, sassafras, chestnut.—The value of the trees just named for fence-posts is not well understood. Mulberry is equal to black locust in all respects, except that it does not become quite so hard. The sassafras is scarcely, if at all, inferior to either, and both are found here in considerable quantities. The sassafras is a tree of rapid growth, and springs up everywhere in old fields and abandoned ground. The wood is light, but tough enough to hold nails, and is very enduring in all exposures. The chestnut is valuable wood for posts, but it should be cut at the season when there is the least sap in the wood to prevent the ravages of insects, and that decay produced by decomposition of the sap. The month of August or September, when the growth of the season is completed, and there is usually a deficiency of moisture in the ground, would be the best time to cut it. By dipping the end of the seasoned wood which is to go into the ground in hot coal-tar, a post will be secured which will outlast a generation. The time is coming when either fencing must be abandoned, or some other material than oak on the one hand, which is too perishable, or locust or cedar on the other, which will be too expensive, must be found. With seasoned posts of either of these trees, and seasoned chestnut boards, a fence will be made which will last a generation.

Turning-wood.—The elm (*Ulmus alata*), which is a fine-grained white-wood, the dogwood (*Cornus Florida*), buckeye (*Aesculus* of several species), the holly (*Ilex opaca*), the hop-hornbeam (*Ostrya Virginica*), and the ironwood (*Carpinus Americana*)—these and other trees, suitable for the manufacture of turned work of various kinds, exist in great abundance. The dogwood is specially abundant, and of large size for that little tree, sometimes eight or nine inches in diameter, and is of well-known properties; the wood is very hard and compact when seasoned, and useful for any kind of turned work requir-

ing fineness of grain and hardness. For work requiring soft white-wood, the elm, holly, buckeye, with many others, such as white soft maple and linn, give a wide range for choice, and all are to be had in considerable quantities.

FRUIT-RAISING.

This branch of industry has been neglected hitherto in the part of the State under consideration. But many localities offer good inducements to persons fitted for, and inclined to, this agreeable and often profitable pursuit. That series of hills known as Muldraugh's Hill, connecting east with the spurs of the Cumberland Mountains, and with more or less altitude extending westward to the Ohio river, are becoming known to be well adapted to the growth of various kinds of fruits, among which are the peach and strawberry. The series of hills in the western part of Barren county, running nearly parallel with Green river, it is also known, are equally adapted to the peach, which seldom fails to produce good crops. The same is true of localities in Edmonson county, near the course of the Nolin, where peach trees are said never to have failed in any season, for forty years, to bear. The distance from good markets is the great hindrance to the extension of this industry. With the use of the new and improved methods of desiccating fruits, perhaps it would be equally profitable to take them to market in a dried condition, especially when we consider the low price of land in settlements remote from railroads and large towns, and the comparative cheapness of labor.

CONCLUSION.

When a full survey of the resources of the State of Kentucky shall have been made, it will be found that the wealth of her forests and the natural productions of her soil will be a matter not insignificant, even when compared with the inexhaustible resources of coal and iron beneath the surface. From the extreme east to the west of this great State every part is clothed with the most valuable kinds of wood, from the bald cypress of the extreme southwest to the white pine in the

Cumberland table-land, and to the inexhaustible oak forests of the Green river counties, and those of the eastern and south-eastern part of the State. This timber is not to be regarded as treasured-up wealth—to be preserved and held sacred, and its removal to be deplored—but rather as wealth wasting, as capital lying idle and unproductive. Trees have their period of life—their time of death. Go through the broad forests and see how the giants of vegetation are falling into decay; creaking and dismantled by the storms, or mouldering away prone upon the earth. When any tree is full grown, it should be removed and give place to others striving to exist under its shade. A wise use of the woodman's axe is not to be deplored—it may be a saving as well as a wasting agent.

Ranunculaceæ—

Clematis Viorna, L.
Clematis Virginiana, L.
Anemone Caroliniana, Walt.
Hepatica triloba, Chaix.
Hepatica acutiloba, DeC.
Thalictrum anemonoides, Michx.
Thalictrum dioicum, L.
Thalictrum purpurascens, L.
Thalictrum clavatum, DeC.
Ranunculus recurvatus, Poir.
Ranunculus repens, L.
Isopyrum biternatum, T. and Cr.
Aquilegia Canadensis, L.
Hydrastis Canadensis, L.
Actæa spicata, L., v. rubra, Mx.

Magnoliaceæ—

Magnolia acuminata, L.
Magnolia umbrella, Lam.
Liriodendron tulipifera, L.

Anonaceæ—

Asimina triloba, Dunal.

Menispermaceæ—

Menispermum Canadense, L.

Berberidaceæ—

Jeffersonia diphylla, Pers.
Podophyllum peltatum, L.

Nymphæaceæ—

Nelumbium luteum, Willd.

Papaveraceæ—

Sanguinaria Canadensis, L.

Fumariaceæ—

Corydalis glauca, Pursh.
Corydalis aurea, Willd.

Cruciferæ—

Leavenworthia Michauxii, Torr.
Dentaria laciniata, Muhl.
Cardamine rhomboidea, DeC.
Cardamine hirsuta, L.

Violaceæ—

Viola sagittata, Ait.
Viola pedata, L.
Viola pubescens, Ait.

Cistaceæ—

Lechea minor, Lam.

Hypericaceæ—

Ascyrum Crux-Andreæ, L.
Hypericum prolificum, L.
" " v. densiflorum.
Hypericum corymbosum, Muhl.
Hypericum mutilum, L.

Caryophyllaceæ—

Silene stellata, Ait.
Silene Pennsylvanica, Mx.
Silene Virginica, L.
Silene antirrhina, L.
Arenaria serpyllifolia, L.
Arenaria patula, Mx.
Stellaria pubera, Mx.
Cerastium nutans, Raf.
Sagina nodosa, Fenzl.

Anychia dichotoma, Mx.
Mollugo verticillata, L.

Portulacaceæ—
Portulaca oleracea, L.
Claytonia Virginica, L.

Tiliaceæ—
Tilia Americana, L.

Linaceæ—
Linum Virginianum, L.

Geraniaceæ—
Geranium Carolinianum, L.
Geranium Robertianum, L.

Rutaceæ—
Zanthoxylum Americanum, Mill.
Ptelea trifoliata, L.

Simarubaceæ—
Ailanthus glandulosus, Desf.

Anacardiaceæ—
Rhus glabra, L.
Rhus copallina, L.
Rhus venenata, DeC.
Rhus Toxicodendron, L.
" " v. radicans (L.), Torr.
Rhus aromatica, Ait.

Vitaceæ—
Vitis æstivalis, Mx.
Vitis cordifolia, Mx.
Vitis vulpina, L.
Vitis indivisa, Willd.
Ampelopsis quinquefolia, Mx.

Rhamnaceæ—
Ceanothus Americanus, L.

Celastraceæ—
Celastrus scandens, L.
Euonymus atropurpureus, Jacq.
Euonymus Americanus, L.

Sapindaceæ—

Æsculus glabra, Willd.
Æsculus flava, Ait.
Acer saccharinum, Wang.
" v. nigrum (Mx.), Gray.
Acer dasycarpum, Ehrh.
Acer rubrum, L.
Negundo aceroides, Mœnch.

Polygalaceæ—

Polygala ambigua, Nutt.

Leguminosæ—

Trifolium reflexum, L.
Medicago lupulina, L.
Psoralea melilotoides, Mx.
Robinia Pseudacacia, L.
Wistaria frutescens, DeC.
Tephrosia Virginiana, Pers.
Desmodium nudiflorum, DeC.
Desmodium pauciflorum, DeC.
Desmodium rotundifolium, DeC.
Lespedeza repens, T. & G.
Stylosanthes elatior, Swartz.
Vicia Caroliniana, Walt.
Phaseolus helvolus, L.
Clitoria Mariana, L.
Cercis Canadensis, L.
Cassia Marilandica, L.
Cassia chamæcrista, L.
Cassia nictitans, L.
Gymnocladus Canadensis, Lam.
Gleditschia triacanthos, L.

Rosaceæ—

Prunus Americana, Marsh.
Prunus cerasus, L.
Prunus serotina, Ehrh.
Spiræa corymbosa, Raff.
Spiræa Aruncus, L.

Gillenia stipulacea, Nutt.
Agrimonia Eupatoria, L.
Geum album, Gmelin.
Geum vernum, T. & G.
Potentilla Norvegica, L.
Fragomaria Virginiana, Ehrh.
Rubus villosus, Ait.
" v. humifusus.
Rubus Canadensis, L.
Rosa setigera, Mx.
Cratægus Oxyacantha, L.
Cratægus coccinea, L.
Cratægus crus-galli, L.
Pyrus coronaria, L.
Amelanchier Canadensis, T. & G.

Saxifragaceæ—

Hydrangea arborescens, L.
Saxifraga Virginiensis, Mx.
Heuchera villosa, Mx.
Heuchera Americana, L.
Mitella diphylla, L.

Crassulaceæ—

Sedum pulchellum, Mx.
Sedum ternatum, Mx.

Hamamelaceæ—

Hamamelis Virginica, L.
Liquidambar Styraciflua, L.

Onagraceæ—

Circæa lutetiana, L.
Gaura filipes, Spach.
Oenothera biennis, L.
Oenothera fruticosa, L.
Luwigia alternifolia, L.
Luwigia palustris, Ell.

Melastromaceæ—

Rhexia Virginica, L.

Lythraceæ—

Cuphea viscosissima, Jacq.

Passifloraceæ—

Passiflora lutea, L.

Umbelliferæ—

Sanicula Canadensis, L.
Daucus carota, L.
Thaspium aureum, Nutt.
Zizia integerrima, DeC.
Erigenia bulbosa, Nutt.

Araliaceæ—

Aralia racemosa, L.
Aralia quinquefolia, G.

Cornaceæ—

Cornus florida, L.
Cornus sericea, L.
Nyssa multiflora, Wang.

Caprifoliaceæ—

Sambucus Canadensis, L.
Viburnum prunifolium, L.
Viburnum nudum, L.
Viburnum acerifolium, L.

Rubiaceæ—

Galium Aparine, L.
Galium concinnum, T. and G.
Galium trifidum, L.
Galium triflorum, Mx.
Galium pilosum, Ait.
Cephalanthus occidentalis, L.
Mitchella repens, L.
Houstonia purpurea, L.
" v. longifolia, (Willd.)
" v. ciliolata, (Torr.)
Houstonia augustifolia, Mx.
Houstonia cærulea, L.

Compositæ—

Elephantopus Carolinianus, Willd.

Eupatorium perfoliatum, L.
Conoclinum cœlestinum, DeC.
Sericocarpus solidagineus, Nees.
Erigeron bellidifolium, Muhl.
Erigeron Philadelphicum, L.
Erigeron annuum, Pers.
Inula helenium, L.
Polymnia Canadensis, L.
Polymnia Uvedalia, L.
Silphium trifoliatum, L.
Parthenium integrifolium, L.
Rudbeckia hirta, L.
Coreopsis auriculata, L.
Coreopsis senifolia, Mx.
Maruta cotula, DeC.
Achillea millefolium, L.
Gnaphalium decurrens, Ives.
Gnaphalium polycephalum, Mx.
Gnaphalium uliginosum, L.
Senecio aureus, L.
Centaurea Americana, Nutt.
Cirsium Virginianum, Mx.
Cynthia Virginica, Don.
Hieracium Gronovii, L.
Taraxacum Dens-leonis, Desf.
Lactuca Canadensis, L.

Lobeliaaceæ—

Lobelia cardinalis, L.
Lobelia syphilitica, L.
Lobelia puberula, Mx.
Lobelia inflata, L.

Campanulaceæ—

Campanula Americana, L.
Specularia perfoliata, A. DeC.

Ericaceæ—

Vaccinium stamineum, L.
Vaccinium arboreum, Marshall.

Epigea repens, L.
Gaultheria procumbens, L.
Oxydendrum arboreum, DeC.
Kalmia latifolia, L.
Rhododendron maximum, L.

Aquifoliaceæ—
Ilex opaca, Ait.
Ilex mollis, Gray.

Ebenaceæ—
Diospyros virginiana, L.

Plantaginaceæ—
Plantago lanceolata, L.
Plantago virginica, L.
Plantago heterophylla, Nutt.

Primulaceæ—
Dodecatheon Meadia, L.
Lysimachia quadrifolia, L.
Lysimachia ciliata, L.
Lysimachia lanceolata, Walt.
Anagallis arvensis, L.
Samolus valerandi, L., v. americanus, G.

Bignoniaceæ—
Tecoma radicans, Juss.
Catalpa bignonioides, Walt.

Orobanchaceæ—
Epiphegus virginiana, Bart.
Conopholis americana, Wallr.

Scrophulariaceæ—
Verbascum Blattaria, L.
Scrophularia nodosa, L.
Collinsia verna, Nutt.
Chelone glabra, L.
Pentstemon pubescens, Soland.
Pentstemon digitalis, Nutt.
Mimulus alatus, Ait.
Conobea multifida, Benth.
Veronica serpyllifolia, L.

Veronica peregrina, L.
Seymeria macrophylla, Nutt.
Gerardia flava, L.
Castilleia coccinea, Spreng.
Pedicularis canadensis, L.

Acanthaceæ—

Ruellia strepens, L.

Verbenaceæ—

Verbena angustifolia, Mx.
Verbena bracteosa, Mx.
Lippia lanceolata, Mx.
Phryma leptostachya, L.

Labiatæ—

Trichostema dichotomum, L.
Pycnanthemum Tullia, Benth.
Pycnanthemum lanceolatum, Pursh.
Pycnanthemum linifolium, Pursh.
Salvia lyrata, L.
Salvia urticifolia, L.
Monarda fistulosa, L.
Blephilia ciliata, Rof.
Nepeta Glechoma, Benth.
Brunella vulgaris, L,
Scutellaria canescens, Nutt.
Scutellaria pilosa, Mx.
Scutellaria parvula, Mx.
Scutellaria galericulata, L.

Boraginaceæ—

Echium vulgare, L.
Lithospermum hirtum, Lehm.
Mertensia virginica, DeC.
Myosotis verna, Nutt.
Cynoglossum virginicum, L.
Cynoglossum Morisoni, DeC.
Hiliotropium europœum, L.

Hydrophyllaceæ—

Hydrophyllum macrophyllum, Nutt.
Hydrophyllum appendiculatum, Mx.

Polemoniaceæ—

Polemonium reptans, L.
Phlox glaberrima, L.
Phlox pilosa, L.
Phlox procumbens, Lehm.
Phlox divaricata, L.

Convolvulaceæ—

Quamoclit coccinea, Mœnch.
Ipomea pandurata, Meyer.
Convolvulus arvensis, L.

Solanaceæ—

Solanum carolinense, L.

Gentianaceæ—

Sabbatia angularis, Pursh.
Frazera carolinensis, Walt.

Apocynaceæ—

Apocynum cannabinum, L.

Asclepiadaceæ—

Asclepias phytolaccoides, Pursh.
Asclepias variegata, L.
Asclepias quadrifolia, Jacq.
Asclepias tuberosa, L.

Oleaceæ—

Fraxinus americana, L.
Fraxinus pubescens, Lam.
Fraxinus viridis, Mx.
Fraxinus quadrangulata, Mx.

Aristolochiaceæ—

Asarum canadense, L.

Phytolaccaceæ—

Phytolacca decandra, L.

Chenopodiaceæ—

Chenopodium urbicum, L.

Polygonaceæ—

Polygonum hydropiper, L.
Polygonum aviculare, L.
Rumex crispus, L.
Rumex acetosella, L.

Lauraceæ—

Sassafras officinale, Neeo.
Lindera Benzoin, Meisner.

Loranthaceæ—

Phorodendron flavescens, Nutt.

Saururaceæ—

Saururus cernuus, L.

Euphorbiaceæ—

Euphorbia maculata, L.
Euphorbia hypericifolia, L.
Euphorbia corollata, L.
Phyllanthus carolinenis, Walt.

Urticaceæ—

Ulmus fulva, Micheli.
Ulmus americana, L. Walld.
Ulmus alata, Michx.
Celtis occidentalis, L.
" " v. pumila, Pursh.
Morus rubra, L.

Platanaceæ—

Platanus occidentalis, L.

Juglandaceæ—

Juglans cinerea, L.
Juglans nigra, L.
Carya alba, Nutt.
Carya tormentosa, Nutt.
Carya porcina, Nutt.

Cupuliferæ—

Quercus alba, L.
Quercus macrocarpa, Mx.
Quercus Prinus, L.
" " v. monticola, Mx.

Quercus imbricaria, Mx.
Quercus nigra, L.
Quercus falcata, Mx.
Quercus coccinea, Wang.
Quercus rubra, L.
Castanea vesca, L.
Fagus ferruginea, Ait.
Corylus americana, Walt.
Ostrya virginica, Willd.
Carpinus americana, Mx.

Betulaceæ—
Betula nigra, L.
Alnus serrulata.

Salicaceæ—
Populus tremuloides, Mx.
Populus grandidenta, Mx.
Populus monilifera, Ait.
Populus balsamifera, L.

Coniferæ—
Pinus pungens, Mx.
Pinus inops, Ait.
Abies canadensis.
Juniperus virginiana, L.
Taxus baccata, v. canadensis (Willd.), Gray.

Araceæ—
Arisæma triphyllum, Torr.

Hydrocharidaceæ—
Vallisneria spiralis, L.

Orchidaceæ—
Liparis liliifolia, Richard.
Cypripedium pubescens, Willd.
Cypripedium spectabile, Swartz.

Amaryllidaceæ—
Hypoxis erecta, L,

Iridaceæ—
Iris cristata, Ait.
Sisyrinchium bermudiana, L.

Dioscoraceæ—

Dioscorea villosa, L.

Smilaceæ—

Smilax glauca, Walt.
Smilax tamnoides, L.

Liliaceæ—

Chamælirium luteum, Gray.
Uvularia perfoliata, L.
Allium canadense, Kalm

Juncaceæ—

Luzula campestris, DeC.

Commelynaceæ—

Tradescantia virginica, L.
Tradescantia pilosa, Lehm.

Filices—

Polypodium vulgare, L.
Polypodium incanum, Swartz.
Adiantum pedatum, L.
Pteris aquilina, L.
Cheilanthes vestita, Swartz.
Pellaea atropurpurea, Link.
Asplenium pinnatifidum, Nutt.
Asplenium Trichomanes, L.
Asplenium ebeneum, Aiton.
Asplenium montanum, Willd.
Asplenium angustifolium, Mx.
Asplenium thelypteroides, Mx.
Asplenium felix-foemina, Bernh.
Camptosorus rhyzophyllus, Link.
Phegopteris hexagonoptera, Fee.
Aspidium thelypteris, Swartz.
Aspidium noveboracense, Swartz.
Aspidium spinulosum, Swartz v. intermedium, Muhl.
Aspidium Goldianum, Hook.
Aspidium marginale, Swartz.
Aspidium acrostichoides, Swartz.
Cystopteris bulbifera, Bernh.

Cystopteris fragilis, Bernh.
Onoclea sensibilis, L.
Woodsia obtusa, Torr.
Dicksonia punctilobula, Kunze.
Osmunda regalis, L.
Osmunda Claytoniana, L.
Osmunda cinamomea, L.
Botrychium virginicum, Swartz.
Ophioglossum vulgatum, L.

Lycopodiaceæ—

Lycopodium selago, L.
Selaginella apus, Spring.

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