C. Flora of Eagle Lake and Vicinity.

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The work embodied in the following report was accomplished by the writer, assisted by Mr. Charles M. Ek, during the summers of 1899 and 1900, under the auspices of the Indiana University Biological Station. The purpose of the work is to present a study of Eagle Lake as a unit of environment as regards plant life, and the special line of investigation was that of the various plant aggregates of the lake, including their relations to each other and to that body of water. Many thanks are due to Dr. C. H. Eigenmann, Director of the Station, and to Dr. Mottier, Head of Department of Botany of the the Station, for assistance in suggesting and mapping out lines of work.

As regards the plan of the work, it will be helpful to the reader to bear in mind that the survey of the area studied was made in a series of concentric rings, beginning at the northeast corner of the region described, that is, at the laboratories, and starting southward. All descriptions have this beginning and sequence, and the sides of the lake are described in the following order: (1) east side, (2) south side, (3) west side, (4) north side.

Eagle Lake is one of the many small lakes of northern Indiana which occupy depressions in the surface of the glacial drift. It is somewhat irregular in outline, and consists of a large main body, a somewhat narrow neck or channel, and a large bay at the west end. According to Mr. Large, who made a survey of the lake several years ago (Proceedings Ind. Acad. Sci., 1896), the area of the lake is about 0.897 square mile.

Before entering into a detailed description of the lake and its flora, however, it may be well to consider briefly the surrounding country. This description of the region surrounding the lake is not intended to be exhaustive; it is simply presented as a sort of frame for the picture of the lake itself. The whole region from the lake shore to and including characteristic portions of the high ground beyond the limits of the lake plain, moreover, not only represents a sort of unit area in itself, but at the same time includes an interesting variety of conditions and furnishes interesting bits of well marked biological areas that are to be found on a large scale elsewhere, but which here in their limited size offer very favorable opportunities for study.

Eagle Lake and its plain are nearly surrounded by a rather abrupt terrace of yellow sand, which rises at varying distances from the lake

shore and beyond which extends the undulating upland, forming the characteristic topography of the region in general. In only three rather narrow points does the terrace approach very near to the water's edge. These places are (1) along the northern part of the lake, near the northern end of the Assembly grounds, (2) at the place known locally as Yarnelle's landing, or Yarnelle's point, and (3) near the outlet. At all other places it recedes from the lake, leaving a large, level, lake plain. The rampart of hills, or terrace, is cut through in three places: (1) Cherry Creek valley, (2) the valley of Clear Creek, and (3) at the outlet. In the direction of Warsaw there is a long stretch of low ground, the exact natural limits of which it is impossible to define on account of many artificial changes, but which contains Market-street pond, an interesting body of water, and extends farther on toward the lakes on the other side of Warsaw, such as Pike Lake, Center Lake and others.

Along the southeast and south shore is a high, narrow ice ridge between the lake and the lake plain. The ice ridge is present elsewhere also, but is nowhere else so plainly marked. Fig. 1 shows a bit of old tolerably well marked ice ridge in this region.

In the discussion the regions about and including the lake will be noted in the following order: (1) The terrace and upland, along with the gullies through them. (2) The lowland between the terrace and the lake, consisting of lake plain and lowland forest. (3) The lake shore and belt of shore plants. (4) The ponds and bayous belonging to the lake plain. (5) The belt of marsh plants (plants with emersed leaves), and of short-stemmed aquatics. (6) The belt of long-stemmed aquatics. In the general discussion, simply typical species will be mentioned. The lake plants proper will be discussed more thoroughly later.

The terrace is composed of a yellow sand with an admixture of some clay. The slope from the lake plain is occasionally gradual; always, however, there is finally a rather steep and bluffy ascent. At Yarnelle's point there is no gradual slope at all, but the bank rises sheer from the water's edge.

THE UPLAND.—In the state of nature the upland is covered with a forest of such trees as the various oaks and hickories, some walnuts, a few tulip trees, wild cherry, ash and elm. In some cases there is no undergrowth of shrubs, and very little grass or herbs, as the forest floor is covered with a thick carpet of dried leaves. At other places, especially near the sides of gullies, there is an undergrowth of such shrubs as prickly

Fig. 1.

ash, raspberry and blackberry, some hoptree (*Ptelea*) and witch hazel, while the forest floor is covered with a carpet of common bladder fern, *Cystopteris fragilis*, some maiden-hair fern (not very common), Indian turnips, wood rush, various galiums, pinks, may-apples, hawkweeds, wood sunflowers, tick trefoils, and so on. *Anychia* is abundant in some places. In other places are a few scattered patches of *Sabbatia angularis*, frostweed, pinweed and *Hepatica hepatica*, the round-lobed liver leaf. This is the predominant species of the genus here; in fact, the only species the writer has seen at all, while in other parts of the State, except in Marshall County, the only species the writer has seen was *H. acuta*. In a hasty trip to Chapman's Lake, not far from Eagle Lake, plenty of *Hepatica acuta* was seen and no *H. hepatica*. (At Chapman's Lake, too, *Impatatiens pallida* was the only species seen. At Eagle Lake I have seen only *I. fulva*.)

Syndesmon thalictroides, which is usually regarded an early spring bloomer, flowers occasionally in late summer in various forests near the lake. During the summer of 1899 a specimen was found in the woods south of Cherry Creek, about one-half mile from the lake, in flower in August. In 1900 a plant was found in full bloom June 29, over near the Pennsylvania railroad, and another on July 30, up Clear Creek ravine.

Toward the foot of some of the hills, and in rather open spaces, is found an abundance of such plants as the black huckleberry (*Gaylussacia resinosa*), mullein foxglove, downy false foxglove, wild flax, frostweed, and in some places *Frasera*. Here, too, is an abundance of dense tufts of various mosses, while a small cup lichen, *Cladonia*, covers the earth with a continuous gray mantle. Toward the outer edge of the forest and at the foot of the hills is a sparse growth of wild oat grass and *Fimbristylis*.

The heavy forest southeast of the lake contains about the same species of trees as those mentioned above as characteristic of the hill forest. Here is a large number of introduced plants, as motherwort, burdock, and sweet briar rose. The forest near Yarnelle's point contains a basin where pin oak is almost the only species, while in the forest near the outlet there is coral root in considerable abundance. There is an abundance of fungi in all the forests, of Myxomycetes, Boleti and various Agarics.

In certain places the forests have been removed from the hills, where it has been left to grow up again without apparently having ever been cultivated much; we have a growth peculiar to such places everywhere. In one such region sassafras, not frequently to be met with in the native

forest, has taken the place and grows so thickly as to shade out all undergrowth except a few spindly, discouraged-looking plants of red sorrel, *Rumex acetosella*. The lower leaves of this copse of sassafras took on beautiful autumnal coloration quite early in 1900. It was quite noticeable toward the end of July. Other parts of this once cleared place are covered with a thick sod of Kentucky blue grass.

There is also in the region just described (east of the lake) a sparse growth of scrubby oaks with clumps of raspberry and blackberry and wild grapes here and there.

The Russian mulberry has established itself here and forms an abundant sprinkling through the copse. The trees have in all probability sprung from seed scattered by birds. A peculiarity of this place is the tendency of plants of one species to form continuous patches to the exclusion of almost everything else. The sassafras has been cited as an example of this. One finds here and there a large bright green spot where dewberry vines have crowded out everything else. In other spots large patches of common five-finger (*Potentilla canadense*), in others *Steironema ciliatum*, and in others of prostrate tick trefoil cover the ground exclusively.

Where the ground has been wholly cleared, and cultivated, and then abandoned, we have, besides the ever present ragweed and *Chenopodium*, such rosette plants as mullein, pasture thistle, and canada thistle. Pepper grass is abundant, shepherd's purse scarce. There is also an abundance of such mat plants as purslane, carpetweed, and spreading spurges. Species of *Eragrostis* spread out in the form of mats. Crabgrass is abundant, and where the ground is cultivated, one of the most persistent and annoying weeds. *Euphorbia corrolata* is particularly abundant and conspicuous.

The gullies and immediately adjacent forests have a flora of their own somewhat different from the rest. The gully of Cherry Creek is a broad, level, swampy tract of country, covered with willows, sedges, skunk cabbages and various other marsh plants. It has a mucky soil, and resembles an extension of the lake plain.

Along the sides of this gully is considerable underbrush in the forest. There are plenty of such small trees as juneberry, flowering dogwood, ironwood, water-beech and haws, and such shrubs as hop-trees (*Ptelea*), witch hazel, bladdernut, and so on. Far up the gully is a specimen of the laurel-leaved oak, *Quercus imbricaria*, and one of alternate-leaved dogwood, neither of which are particularly common in the region. At the foot

of the hills are a few ferns, lady-fern, maiden-hair and brittle bladder fern (*C. fragilis*). In general, however, the delicate wood ferns are not abundant in this region. *Mitella diphylla* fringes the slope of the hills here and there. Both in this gully and at places in the lake plain, as the southern end of the Assembly grounds, are soggy hills covered with a growth of sedges, shrubby five-finger, grass of parnassus, and so on. Numerous springs issue from these hills. In the bottom of the gully, and near the creek itself, is an abundance of swampy ground, with *Sagittarias* and other marsh plants. Here is an abundance of the liverwort, *Conocephalus*.

One dry hillside along this gully is completely covered with hounds-tongue. The hillsides from which springs issue bear in places large patches of horse-mint (*Monarda fistulosa*) and are made purple in August by masses of iron-weed in bloom.

The upper part of the gully of Clear Creek is different both in appearance and flora from that of Cherry Creek. Here the creek cuts its way through hills of sand and gravel. The bottom of the tolerably wide gully is mostly sandy soil, and the creek bottom is solid and often contains sand-bars and gravel-banks. The different slopes have a somewhat different flora. There are a few large basswood trees, and some beech and a few box-elder on the east side. On the slope on this side are found rock cress, *Blephilia*, nettles, beech-drops, and so on. On the west side of the gully were found spice bushes, *Celastrus scandens*, or climbing bitter-sweet, hedge hyssop, tall scouring rushes, blood-root, celandine poppies, remains of trillium, wood anemones, dutchman's breeches, and the like.

The sides of the outlet, where there is a broad marshy region without any pronounced gully, showed no plants different from those common to the region, except there was an especial abundance of the reindeer lichen, *Cladonia rangiferina*. There is here a broad, densely overgrown, swampy tract, full of willows.

At different places between the sand hills and the lake are the *low ground forests*, the bottoms of which seem to be slightly higher than the surface of the lake plain itself. One of these forests is to be found in the vicinity of the laboratories and another down along Clear Creek. This forest differs considerably from the high-ground forest in both soil and vegetation. The soil is a rich, black, sandy loam. The trees are burr oak, ash, aspen, willow, elm, plum, and so on. At the junction between the low-ground and high-ground forests we have at one place, near Chicago

Hill, a clump of red-bud trees. At another, on the border line between the upland and lowland forest, the ground is thickly covered with ground ivy, *Nepeta glechoma*.

Here in the low-ground forest we have, especially in the first forest mentioned (that near the laboratories), a dense undergrowth of hazel-nut, prickly ash, hop tree and many other shrubs, so that the wood was somewhat difficult to pass through. The forest floor is also thickly covered with a quite dense growth of vines and tall weeds of numerous species, among which may be mentioned virgin's bower (*Clematis virginiana*), grape, hop, spotted touch-me-not, false nettle, American bell flower, great blue lobelia and cardinal flower, rice cut-grass, and many other such plants.

The low-ground forest in the vicinity of the laboratories was much modified during the summer of 1900, as a good deal of the underbrush was removed. In all cases it goes entirely down to the fringe of willows which grows at the edge of the lake.

The second low-ground forest, at the southern or west of southern side of the lake, not far from the region of Clear Creek mouth, consists of nearly the same sort of trees as the other, but the ground is rather more marshy, black and level, and the vegetation of the forest floor is of a somewhat different sort. There are more soft maples and large willows here, and lizard's tail is a characteristic plant. A small part of the shore is sandy here, and there is, between the lake shore and the low ground, back from the lake, a high, narrow ice ridge, four or five feet wide and breast high, and quite steep on each side. There are tolerable good ice ridges in other places, as south of Chicago Hill pier a little way, shown in Figure 2 (Fig. 2 shows lake plain on the left with willows on the ice ridge on the right), and over by Yarnelle's point, but these are not nearly so well marked.

The greater part of the country between the lake and the hills is a flat, level, meadow-like tract, forming the *Lake plain*. The soil of this plain is generally of a black or brown muck, with plenty of marl in places. Ditches dug through it reveal an abundance of gasteropod shells, many of them yet entire but very fragile, and many of them broken. These attest the former existence of the lake over the lake plain.

Traditions of old settlers refer to a time when the lake shore came up, in places at least, to the foot of the hills. One such tradition refers to the lake reaching the base of the hill known as Hamilton Mound, and the

date assigned is about 1836. It is not reported whether this was simply the result of a temporary flood or a constant condition. The area of the surface is subject to quite marked variation at present, possibly more so than before the removal of much of the surrounding forest. The Government Survey shore line of 1834 lies at places considerably outside present maps of the lake. Mr. Large expresses his opinion that it perhaps marked the limit of the swampy ground.

In appearance and vegetation the various parts of the lake plain differ considerably from each other. In some places the soil is a reddish or brownish muck, in other places it is a blackish soil. In some parts it is a

Fig. 2.

sedgy, ferny meadow, in others it is covered with a dense growth of bushes, as clumps of willow, *Cephalanthus* and *Cornus*. There seem to be indications, however, that it was once nearly alike in vegetation, and that the sedgy, ferny meadow has been cleared off by artificial means. One indication of this is that we have wholly different regions on different sides of fences, one side of the fence being bushy, and the other covered with sedges, grasses and ferns only. In one place where there was such a level meadow, a few dead willow sprouts were noticed. Examination revealed that they were charred about the roots and had probably been killed by

fire, which had passed through and left the ground rough and tussocky. Between this meadow just described and the lake, near the lake shore, were plenty of low bushes, which had probably been saved by the proximity of the lake and possible resulting saturation of the ground, or more probably by the amount of sand in the low ice ridge upon which they grew. A few characteristic portions of the lake plain will be described in order:

(1) At the Assembly grounds, where the lake plain was once quite broad, it has been modified by filling in, and by the construction of base ball grounds and race track. This portion is now a level field overgrown with grass.

(2) The portion of the lake plain bordering on the southern end of the Assembly grounds was once brushy like the portion next to be described now is, but the brush has been cleared off. At present it is a level tract, covered thickly with sedges and ferns. Toward midsummer it is made purple in patches by the blossoms of loosestrife, *Lythrum alatum*. Later in the year there is a zone of blue about the height of one's head from the many blossoms of tall blue vervain, while later still the ground is yellow in places with blossoms of the cone-flower or black-eyed susan, which grows in great abundance here, and blossoms quite late in the season.

Farther on down, near the Biological Station, the lake plain is more in its natural condition. Here, at the foot of the hills, is a belt of sensitive fern extending for a good way along the edge of the plain. The whole plain is pretty densely covered with low clumps of *Cornus*, willows, Carolina rose, and button-bush. An examination of this region shows three distinct formations of vegetation. Upon a casual glance one sees very little but bushes. A close examination, lower down toward the ground, will show a thickish growth of tall sedges and a few coarse grasses, while an examination still nearer the surface of the ground will reveal a growth of slender prairie fern. These formations are shown to particularly good advantage where artificial agencies have been at work. Where the bushes only are removed, one sees for the most part simply a level stretch of tall, narrow-leaved sedge, with a few stalks of tall grass here and there. Where the grass has been mown one sees an unbroken patch of fern.

In the vicinity of the laboratories a low-ground forest, already described, comes down entirely to the water's edge. South of this is another stretch of lake plain. This plain is mostly devoid of bushes, except a narrow fringe along on the low ice ridge. It is covered with sedges, tall grasses and an under-formation of marsh fern. The distribution of plants

in this region is somewhat patchy in places. There are several areas covered with the royal fern, *Osmunda regalis*, at the outer edge, near the hills. This fern grows so thickly here that at certain times the ripened sporangia give the whole landscape a brownish cast. Toward the lake is a pond of considerable size fringed with cat-tails and a whitish sedge, along with *Eleocharis* and *Sagittaria*. Near the lake shore, as has been said, is a fringe of willows. In this portion of the plain, during the month of August, the wand-like stems of blazing star, *Lacinaria spicata*, with long spikes of violet purple flowers, rise here and there and give a peculiar effect.

The portion of the lake plain south of the lake is continuous with that just mentioned and extends to Clear Creek. Along its outer margins it is much like the portion just described—a sedgy, flat stretch of country. To this during the late summer an abundance of swamp milk-weed and joe pye weed tint the whole landscape a light purple. Near the lake is a large pond or marsh where grows in one place great patches of *Sagittaria*. Here are the most extensive patches of bulrush, cat-tail, *Sparganium* and *Calamus* in the vicinity. Beside growing by themselves in places, these plants also grow together in other spots, forming a mixed flora. The soil is more than saturated with water, and is very miry. There are not many willows here, but just a little distance west, near Clear Creek, the large marsh extends back a long distance, and consists of an almost impenetrable willow thicket. Back of this willow thicket is a low-ground forest, already mentioned. At the extreme west end of this marsh it becomes more open and prairie-like, and has the appearance of having been burned over. Among the tall sedges of this place is an abundance of such plants as prairie fern, prairie dock and a tick trefoil (*Meiboma canadense*), very showy when in bloom. Some of the ground is mossy. One large tamarack with several smaller ones, probably its seedlings, are growing here isolated from others of the kind. The ground is not like that generally found in tamarack swamps.

At the termination of this marsh, a hill, part of it under cultivation and part of it upland forest, comes down near to the lake. From this place the hill and high-ground forest extend along the lake shore to some distance beyond Yarnelle's point, and for a space the lake plain and low ground wholly disappear.

Beyond Yarnelle's landing, and near the neck of the lake, the lake plain begins again and broadens considerably. Part of the plain has been

cleared and pastured and mown so that little is left but the sedges. Part of it is covered densely with willows. It is not different in appearance from other portions of the lake plain, and is different in vegetation only in that in the wet portion adjacent to the lake two *Utricularias* are found among the sedges, one, *U. vulgaris* sparsely, and probably left by the lake as it retreated after a flood, and the other, *U. intermedia*, forming a dense and continuous mat over the ground. Here, too, is a large cat-tail and bur-reed marsh, and the bottom of the ground among these plants is thickly covered with moss, a long, bright green species. Wild senna is abundant in this place. The open plain continues until near the outlet, where it has never been cleared, and consists of a dense willow thicket. The plain on the western side of the lake is cleared, and at one place extends through a narrow neck between the hills for a considerable distance from the lake.

The lake plain along the northern shore is so much like that of the other part that no detailed description need be given, except to say that that portion along the neck of the lake, that is, the western end, is still a willow thicket, while the remainder is cleared. In the direction of Warsaw, along the middle part of the north shore of the lake, the hills make a large loop, so that the lake plain spreads out into a large round bay, with a narrow neck or channel. Here is one large and many small tamarack trees and many alders. The ground, however, is tolerably dry and there is no marsh in this region. One bunch of *Sphagnum* was found growing high and dry at the foot of the hills in the sandy ground, forming a tussock around the base of a tree. The plain narrows as one goes eastward until the hills nearly reach the lake near the railroad station at Winona.

From Eagle Lake, toward Warsaw, extends an interesting stretch of level ground. The surface is higher than that of the plain, but it is swampy and mucky. Part of this was once an old tamarack marsh; and, although no tamarack trees remain, it still abounds in *Sphagnum*, choke berries, chain fern, hispid dewberries and huckleberries. It has probably once been the home of many of those interesting plants generally found in tamarack marshes—pitcher plants, orchids of various species, cranberries, and perhaps droseras.

At this place the railroad intersecting the region brings in its interesting accompaniment of introduced plants. Among these are *Lupinus perennis*, squirrel-tail grass, *Salsola kali*, and so on.

Along the lake shore there is in many places a narrow fringe of willows and dogwoods. These probably once formed a continuous stretch, but have been removed by artificial means. Just edging the lake, too, was found, during the summer of 1899, an abundance of creeping *Selaginella*, but it was not nearly so abundant in 1900.

PONDS.—Just as the lake occupies a large hollow in the surface of the drift, so are lesser hollows in the surface of the lake plain, and in the region surrounding the lake, occupied by *ponds*. In some of the shallower ponds, and these remote from the lake, the supply of water is temporary and they are dry basins during the drier parts of the year. The ponds are exceedingly varied in appearance and flora, and are interesting objects to study. They are really lakes in miniature, and may represent future stages of the lake itself. Lack of space, however, will prevent the discussion of this interesting feature of the region, except to say that their quiet waters contain in abundance many interesting aquatic forms which are not to be found in the lake, or which occur there only in limited quantity. Among these plants are the various duckweeds, *Lemna minor*, *L. trisulca*, *Spirodella polyrhiza*, *Wolffia columbiana* and *W. braziliensis*, which are to be found in the ponds and lagoons on the eastern side of the lake. Other ponds contain an abundance of liverwort, two species, *Ricciocarpus natans* and *Riccia fluitans*, being abundantly represented. Some of the ponds containing foul water have *Utricularia vulgaris* in abundance. Here the bladders are black and full of dark, solid dirt, and the plants blossom profusely. This plant is found only scantily in the lake itself, and in this situation the bladders are empty and more or less transparent. The whole plant is bright green and I have not seen it in blossom at all. One of the ponds (Market street) contained *Brasenia* in abundance, and it blossoms profusely. A small patch was found in the southwestern part of Eagle Lake, but I have never seen it in bloom there. One of the ponds east of the lake contained large balls of nostoc in great abundance.

THE LAKE PROPER.—Preparatory to the task of mapping the various plant aggregates of the lake, it was found necessary to measure along the shore line, and so become acquainted with the relative distance of various objects. This work was done quite carefully and lengthy notes taken concerning the nature of the shore. Stations were established and full descriptions written of neighboring objects, so as to make their recognition possible. This was the most laborious and tedious part of the work, and not particularly fruitful of direct results, for of the great mass of

notes taken the greater number would be tedious and uninstructive to the reader. The value of this work was evident, however, during every succeeding stage of the work; for during all the subsequent observations of the lake, every detail of the shore was familiar as nothing else could have made it, and objects could be oriented at a glance from any position in the lake.

Of the many things that might be said in detail concerning the physiography of the lake only a few of the most important and striking, as character of soil along shore, etc., can be noted.

SOIL OF SHORE.—Various parts of the shore, as along the Assembly grounds, at the Biological Station, and south of Chicago Hill pier, are sandy beach. This sand is not like that of the sand hills; it is a solid, whitish sand, with small banks or streaks of quite reddish sand here and there. Other parts of the shore are of a tough, blackish or brownish muck; the greater portion of the shore is of this nature. The shore about Yarnelle's point is rather coarse gravel.

Some parts of the shore are suffering wave erosion. Particular examples of this are the region just south of the mouth of Cherry Creek, and again at the cape just beyond the neck of the lake, and on the southern side. At these places the lake has encroached a good deal on the land in spite of the protection afforded by the roots of bushes, etc. Trees and bushes are undermined and fall over, and there are stumps in the lake bottom for some way out. At other places, as at the south end of the lake and along parts of the north end, the treeless, mucky shore is being worn away. Here the waves act as a "horizontal saw" (to use Le Conte's illustration), leaving a solid, mucky platform in the bottom and a steep, almost vertical step off at the water's edge from the level plain to the bottom. The waves often cut between tussócks of grass and leave minute fiords. At other places the sod or turf is undermined, and moves up and down with the waves. The muck is in places very tough and resisting. Large chunks of the fibrous soil are torn loose from the shore or bottom and rolled by the waves into a peculiar rounded form, much like a rounded rock in shape, and yet not torn apart. The work of erosion along these mucky stretches of shore is hastened and assisted very materially by holes, presumably water-dog burrows, which honeycomb the soil and render it susceptible of being broken up into pieces.

Elsewhere, especially between the patches of *Scirpus lacustris* to be described later, sedimentation is going on quite rapidly, and banks of soft,

black mud are in the progress of formation. The waves throw up the mud in the form of loops and bands, and so form small irregularities in the coast line. An examination of the mud thrown up or built up in these situations shows it to be composed of small pieces of *Scirpus* in various stages of decay. Thus the *Scirpus* furnishes a large amount of material for the building up of new shores. Besides the comminuted and decayed *Scirpus* there are occasional banks of broken *Scirpus* stems, not yet decayed nor much broken up, piled like windrows up beyond the summer water line. These banks are probably piled up during the high water of spring or shoved up by the ice. Upon the soft, black mud banks mentioned above, there springs a dense growth of annual weeds which forms the advance guard of land vegetation in these regions.

It may be that the lake plain has for its foundation decayed *Scirpus* stems, to which is added turf from the sedges that today so thickly clothe its surface.

As has been said, long stretches of shore are made up of a firm, whitish sand. Such stretches are to be found along the Assembly grounds, north of Chicago Hill pier, and in the vicinity of the mouth of Clear Creek. This sand is often found floating in films on the surface of the water near shore. At the mouths of the creeks, banks or deltas of white sand are built up and these project above the surface of the water when the lake is low, and form islands. At other places it can not be said definitely that either erosion or sedimentation is taking place. Gently lapping waves will pile up a narrow ridge of sand just at the edge of the water, but high, strong waves will wash them down again. During active wave motion the advance of the waves will move particles of sand shoreward, while the back flow will move them back about the same distance.

Frequently on the sandy banks, perhaps everywhere in such places where not interfered with, the three-cornered rush *Scirpus americanus*, grows out and forms the advance guard of vegetation.

THE FLORA OF THE LAKE SHORE is not essentially different in species from that of the shallow ponds adjacent to the lake, especially the large pond on the southern shore. The only difference is that the plants in that pond (bulrush, cat-tail, spatterdock, pickerel-weed and arrowhead) form large patches, as they have here a broad region of shallow water and congenial soil. Along the lake shore the plants, all except the bulrush, form comparatively narrow belts. Most of the bulrushes (*Scirpus lacustris*) in the ponds outside of the lake are light in color and soft in texture (there

are only a few found of the dark green firm form), while the reverse is true of the bulrushes in the lake.

THE FLORA OF THE LAKE PROPER now comes up for consideration. In the beginning it may be well to state that many of the plants growing in the neighborhood of the shore exhibit decided variations in general appearance. They have two extreme forms, one found growing in shallow water and the other in deep water. Among such plants may be mentioned the following:

(1) *Scirpus lacustris* (light green, apparently glaucescent — easily crushed— form already noted) grows in rich muck in shallow water. This appears to continue in blossom longer than the other, and but one patch is found in the lake proper, though it is abundant in the ponds. The dark-green, firm form, growing in the marl and in deeper water, generally has the umbel more contracted. At a few places these forms seem to intergrade, although there is no gradual shading-off at the place in the lake where they grow side by side.

(2) *Nymphaea advena*, or spatterdock, exhibits a variation in habit really very slight but quite conspicuous, and readily noticed by the most superficial observer. In rich soil and shallow water it is stout and erect, the large petioles holding the leaves high out of the water. In deep water all, or nearly all, the leaves float, and the petioles are lax.

(3) White water lily—the same general change, only more marked. The shallow water form has stout petioles, holding the leaves far above the surface of the water and at an angle, and the leaves show a radical ribbing or faint fluting, not coincident with the veins, but in direction like that of a palm-leaf fan—deep water form, with slender, weak, often coiled petioles and leaves floating on the surface of the water. On sandy bottom the plant is much smaller in leaf and flower, giving the form (Var. *minor* Simms).

(4) Water plantain, leaves exceedingly variable in shape, those under water resembling eelgrass; those floating are much like leaves of some of the *Potamogetons*, while the aerial leaves resemble the ordinary plantain.

The following brief synopsis will suffice to give a general idea of the centripetal sequence of the various plants of the lake. (1) On shore, out of water: *Scirpus americanus*, *Sagittarias*, *Eleocharis acicularis* and cattails. Here, too, may be reckoned *Polygonium amphibium*, with its roots on shore and its prostrate stem floating. It strikingly resembles a *Potamogeton*. (2) On shore and extending away into the water; *Scirpus*

lacustris, *Potamogeton fluitans*, *Nymphaea advena*. (3) Confined to shallow water: *Pontederia cordata*, *Naias flexilis*, *Nitella* (a small moniliform species), *Eleocharis interstincta*, *Eleocharis palustris*, *E. mutata*, *Cladium mariscoides*, *Vallisneria spiralis* and *Potamogeton natans*. (4) Deep-water plants: *Ceratophyllum*, *Myriophyllum*, *Potamogeton lucens*, *P. amplifolins* and *P. pectinatus*. Beyond this last group belongs mostly the floating confervoid algae of the lake.

A consideration of the habits of the plants just mentioned will show at once how their forms correspond to their position. Each group mentioned have certain common characteristics, and may be placed in the same ecological group. (1) The shore plants already mentioned generally have stiff, stout petioles and stiff, generally rather thick, leaves. (In the *Scirpi* and *Eleochari* the culms function as leaves.) They all have large air tubes leading to the roots. This applies to all the lake-dwelling species.

Growing near the shore in places are the aquatics with short stems and the plant wholly submersed. *Naias* is a good type. They form a band in the center of a group which forms a wider belt, the emersed leaved lake plants.

These *lake plants with emersed leaves* extend from the shore out to where the water is about 6½ feet deep. Among these are reckoned the *Scirpi* and *Eleochari* (with the explanation above). These plants form the broadest belt in the lake, and one reason for the breadth of their distribution is to be found in the variability of the species which compose it, as has been dwelt upon somewhat fully above. This belt may, on this account, be divided into two strips; one including the shallow water forms and the other the deep water forms. *Castalia* and *Nymphaea*, which belong here, grow out to a depth of about five feet eight inches. *Scirpus lacustris* grows out farther, that is, to a depth of 6½ feet, and it here projects up out of the water about 5 feet, making the total length of some of the longest culms 11½ feet. Where Scirpus grows out into deep water it seems to exhaust itself in the effort to reach light and air, and so they are generally few-fruited or wholly sterile, with deadish brown tips. They progress out into the lake by means of rhizomes, and at the outer edges of the belt one can frequently note their arrangement in straight lines, corresponding to the position of the root stock.

The Aquatics with Submersed Leaves.—It is difficult to fix the exact limits of these plants with certainty, especially so that they could be represented on a map, for they do not form visible patches at the surface. It is convenient, as said above, to divide them into two groups—the short-

stemmed aquatics—for length of stem seems to be the chief factor in determining the habitat. It should be borne in mind, however, that the long-stemmed are quite variable in length, depending on depth in which they grow. In general the influences which determine the habitat of wholly submersed aquatics, aside from the kind of soil at the bottom, is the amount of light (and probably dissolved gases) available. The amount of light and dissolved gases is determined by the nearness to the surface. The former is also determined by the clearness of the water; and in case the clearness of the water is disturbed by organisms characterized by holophytic nutrition, the amount of gaseous plant food, as well as the light, would be decreased with the increase of amount of suspended organic material. This feature of the case will be touched upon later.

The short-stemmed aquatics (*Naias*, *Chara* and the like) grow only in shallow water. They were found out to a depth of six feet of water, rarely more.

Among the *long stemmed aquatics* Potamogeton *lucens* is generally found in isolated patches, while *Myriophyllum*, *Ceratophyllum*, and *Potamogeton pectinatus* grew together, making long belts. These form the extreme central belt of (phanerogamic) lake plants. They are to be found from 100 or 150 to 600 feet from shore, according to depth of water. By means of dredging it was ascertained that these plants rarely or never grow out much deeper than can be seen from a boat with favorable light. Twelve feet was the greatest depth at which any were found. As they grew to be about six feet long, the distance from their tops to the surface of the lake varies from about six feet, at the deepest, to nothing at the shallowest places where they grew. During the latter part of August, 1899, when the lake surface was quite low, due to a protracted drouth, some of the plants of *Myriophyllum* projected up to the surface and the tops floated, but they did not seem to be thriving well.

Toward the south-central part of the lake is a large bar, and its position is marked on the water surface by the presence of Potamogetons and other deep-water plants.

It is seen, therefore, that the greater part of the lake bottom is devoid of coarse vegetation, the plants making only a rather narrow belt around near the shore. The plants seem limited, moreover, to depths much shallower than might be expected. Records of these species growing to considerably greater depths are common. This limit in depth may perhaps be partly explained by the large amount of diffused matter to be found

in Eagle Lake. This material is so abundant that it gives the lake water a decided amber color, and the rays of the sun penetrating into the water make streaks much like those formed by sunlight entering into a very dusty room, or dusty atmosphere, as in the phenomenon commonly spoken of as the "sun drawing water." It is very certain that this material cuts off a great deal of light, and perhaps absorbs considerable of plant food. At any rate, there seems to be an interference of some sort between the larger plants and the plankton—a fact generally observed. (See a reference to this relation, part 5, page 257, of Science, Vol. XI, No. 268.)

THE LAKE ALGAE.—No particular attention was paid to the Algae except where they formed conspicuous masses. Most of the work in this group was left to the investigators in plankton. *Oedogonium*, *Cladophera* and *Spirogyra* could be found almost any time in the ditches and along the edges of the lake.

Throughout both summers of the work, 1899 and 1900, *Mongeotia* was very abundant in the lake, especially in the head bay. Much of it formed immense cloudy patches among the water weeds, and much of it was in the shape of large, floating, yellowish green patches. There was a good deal of *Rivularia* in the lake. All I saw here was attached. It grew in a semi-globular form, fastened to water weeds and rushes. Upon rich, muddy bottom, where there is an abundance of dead bits of Scirpus, there is a good deal of *Chaetophora*, which assumes the form of a narrow, elongated, dichotomously branching thallus, which resembles some of the narrow *Riccias* in outward aspect. The water is full of fine granular masses of *Clathrocystis*, and short, stout, rigid filaments of *Oscillaria*, which resemble hair clippings. *Hydrodictyon* is very peculiar in its occurrence in the lake. It suddenly appears in great masses at the mouth of Cherry Creek, and then, after remaining a few days, it is washed in great masses upon the shore and suddenly disappears, generally after reproduction, so that after the large plants have disappeared the water is full of very tiny ones. The date of appearance of this plant in 1900 was July 13. By July 27 all the older *Hydrodictyon* had disappeared as a mass and the water was full of young plants.

Many large *Nostoc*-like jelly masses of an unicellular alga, probably *Aphanothece*, were found along the northern shore of the West bay. Among other algae noted in considerable masses was *Microthamnion*. There was also a few plants of a small momiliform species of *Nitella* found

in the south part of the lake, quite near shore, in 1899. None was seen in 1900.

The water is quite full of minute algae, which is generally kept well mixed up with the water by the constant churning of the waves. In quiet places, however, as near the shore in sheltered places, or among the rushes, these algae, mainly *Clathrocystes*, form a surface scum. On one day during the latter part of the summer of 1899, when the lake was tolerably low, and after a very calm night, these algae formed an unbroken film or scum over the surface of the lake, except where broken up by the jumping of fishes, etc. The track of the boat and every oar-stroke could be noted across the lake as far as could be seen clearly at all, and, as said above, every place where a fish had splashed up was left as a break on the surface. Some phenomenon similar to this is briefly noted in an article by C. D. Marsh, and various names given for it, as "breaking of the meres." or "working of the lakes." (See Science, Vol. XI, No. 268, first column, page 379.)

DETAILS OF DISTRIBUTION.—In the preceding discussion the only determining condition of plant distribution taken into consideration was the amount of water present in the soil or about the plant; and the various plant groups have been spoken of as if they occurred in regular concentric belts or circles.

The amount of water has indeed been the most conspicuous influence, and the most easily measured, here as everywhere, and it has been this fact that has determined the conception of the ecological groups, xerophytes, mesophytes, and hydrophytes. It is needless to say, however, that there are multitudes of other influences, such as soil, temperature, and many obscure and perhaps undiscovered influences which operate to make the distribution of the various species tolerably irregular.

Some of the most noteworthy irregularities will now be discussed more in detail. Only lake plants will be noted.

SCIRPUS AMERICANUS (three-cornered bulrush) is found in scattered patches at almost any bit of sandy shore. Along the east and south shores it grows rather thinly and covers only small areas. Its general absence or scarcity along the eastern side of the lake is due in some cases (as in front of the Assembly grounds) to artificial removal. Beginning at the southeastern bend of the lake, however, it extends in large and frequent patches almost to the bend which forms the neck of the lake. At places where it is thickest, as at the gravelly shore at Yarnelle's landing, it is

the predominant form, here growing very dense and close. There are also dense strips of considerable length on the shore along the northern end of the lake. Its distribution seems to be determined by the presence of solid sand-beds or bars where it delights to grow. It generally grows wholly on shore or in only quite shallow water, and does not seem to like the beating of waves so well as does *S. lacustris*. Fig. 3 shows a characteristic set of relations (south of Chicago Hill pier). Willows on ice ridge at the left. *Scirpus americanus* on sandy bank. *S. lacustris* in water with stems on shore. A patch of *Pontederia cordata* in water in foreground.

Fig. 3.

PONTEDERIA CORDATA occurs in small or isolated patches all around the lake, but by far the largest and most continuous stretch is at the south end, not a great way from the mouth of Clear Creek. This plant is generally associated with *Nymphaea advena* and is closely similar to it in structure and habit. It generally forms a belt between the main mass of *Nymphaea* and the shore. The *Pontederia* farthest from shore grows in among the *Nymphaea* nearest the water's edge. *Sagittaria*, in so far as it grows along the shore, occupies nearly the same position, except that it grows at the water's edge. *Pontederia* and *Nymphaea* grow in considerable abundance in the pond south of the lake, and *Sagittaria* has its best de-

velopment here, forming an immense patch intermixed with other plants. Among other plants which frequently come down to the water's edge, but which are most abundant on the lake plain or in its ponds, are cat-tails, Calamus, and some *Phragmites*.

The chief representatives of the short-stemmed aquatics are *Naias flexilis* and *Chara*. *Naias* grows in scanty patches nearly everywhere in the shallow water near the shore. There are occasionally very dense patches. Such were found in 1900, midway between the Biological Station and Willow point, near the mouth of Clear Creek, and out in front of the laboratories. There was also considerable on the west side of the lake near the shore.

CHARA begins at the southwest corner of the lake and covers a considerable area there. Then it stops until near the neck of the channel which lies between the lake and West Bay. It covers nearly all the bottom of this channel, and extends in a good way, about 300 or 400 feet nearly all around the bay, except for a distance along the western side, where it is mucky. Another patch of Chara occurs, mixed in with Naias, in front of the Assembly grounds. The specimens of Chara found in this latter place were much larger and longer than those found elsewhere, and were fuller of fruit.

SCIRPUS LACUSTRIS is the most abundant and conspicuous of the lake plants. One belt begins about 200 feet north of Chicago Hill pier. From this place it extends, with the exception of a few very narrow interruptions, almost to Yarnelle's point, where it thins out and wholly disappears for a little way, its place being occupied, as before noted, by *S. americanus*. Not far north of the landing, however, it begins again and extends up to the channel, and runs far out into a sharp cape at this point. There is another small patch in the middle of the channel, which is cut in two by the steamboat track. This plant fringes the outlet bay quite thickly, and then occurs again at the mouth of the canal which leads from the lake to Warsaw. Another strip begins at the channel and extends up to the red ice-house. There is a broad region bare of any *Scirpus* all along the Assembly grounds; its absence here is in all probability due to artificial removal, for the conditions of growth are in every way favorable. The last patch begins along Willow Cape and extends far out into the lake, and grows along the shore until a little north of the laboratories. This leaves a large gap until nearly to Chicago Hill pier. This plant seems to delight in a soft, marly soil, and does best in rather shallow water. Its

absence at Yarnelle's landing may probably be accounted for by the sudden slope at that shore and by the gravelly beach. Whenever long bars run out into the lake, *S. lacustris* marks the place by projecting out into long capes. Fig. 4 represents a characteristic patch of *S. lacustris* (south of Chicago Hill pier), along with other relations. On the left, shore with willows, and mud bar with *Scirpus stems*. Between the shore and Scirpus are patches of *Pontederia cordata*.

Fig. 4.

Potamogeton pectinatus forms a wide belt extending from rather shallow water (four feet) to seven or eight feet. It occurs in scattered patches all round the lake. *P. amplifolius* grows in somewhat deeper water than the preceding. It forms several large patches, one in front of the laboratories and one near the mouth of Clear Creek. Other smaller patches are distributed quite generally. *Myriophyllum* and *Ceratophyllum* generally grow in the same depth of water and often form mixed patches. The latter is found almost all round the lake in considerable quantities. These two plants form their thickest patches in the mud near the outlet.

Potamogeton lucens, though abundant, is rather scattered. *P. zosterifolius* and *Heteranthera dubia* grow intermixed in about five feet of water.

and resemble each other somewhat, except *Heteranthera* has a round stem. Bits of *Heteranthera*, broken off by the waves and washed ashore, take root and grow and blossom, forming mats of short, bright green plants with yellow blossoms.

The spatterdock (*Nymphaea*) and water lily (*Castalia*) are to a considerable extent found growing together. *Nymphaea* forms a tolerable large patch in the pond in southern lake plain. It is not found in the lake along any part of the northwestern shore at all. It covers a very large area at the southern end of the lake near the mouth of Clear Creek (see Fig. 5), and runs its greatest distance out from shore on a bar formed at the

Fig 5.

mouth of the creek. It begins again at the extreme end of the West Bay, near the outlet, and forms a broad marginal belt around this part of the shore. There is a third patch at the mouth of the steamboat canal. It extends for some distance beyond the canal mouth to the north side. Nymphaea seems to prefer a muddy bottom. It seems to be fond of a gentle current, and extends from the lake for some distance up Clear Creek, and down the outlet. Its greatest development in the southern part of the lake is due to the protection it has there from lashing winds, as this

is the sheltered side of the lake. Fig. 6 shows a patch of spatterdock, with intermixed bulrushes, near the outlet.

Castalia odorata, or white water lily, has a somewhat more general distribution, as scattered plants occur nearly all round the shore. There is a number of stout plants growing in the bayou in front of the laboratories, then there is none whatever until about 700 feet south of Chicago Hill pier. From this place occurs occasional patches of the small form until the large stretch of *Nymphaea* at the mouth of Clear Creek, is reached. Here there is a wide, dense growth of the ordinary floating-leaved form. There is a second large patch, similar to this one, in the bend at the south-

Fig. 6.

west corner of the lake. It is here nearly free from spatterdock. The broad bay leading to the outlet has two belts, the outer belt of the stout form growing almost out of the water in the rich muck at the edge of the shore, and the ordinary form out in the water. (These are shown in Fig. 7.) There are scattered small patches all along the west coast of the West Bay. In 1899 a good-sized patch grew about the region of the mouth of the steamer canal. It was not noted in 1900. Here the species ends except for occasional plants.

Many other plants are found in the lake, but not in quantities sufficient to call for more than passing notice. Only a few plants of *Philotria* were seen here, although it grows abundantly in bayous. *Vallisneria* grows most plentifully just south of the mouth of Cherry Creek, about Chicago Hill pier, about 700 feet south of this, near Clear Creek mouth, at the western end of West Bay, near the pier by the ice-houses, and off the Assembly grounds. Bladderwort, *Utricularia vulgaris*, fringes the edges of the channel, but it is not particularly abundant here. It was really found in much greater quantities in the lake plain just beside the channel. The

Fig. 7.

plants in the lake are bright green, with empty bladders and no blossoms, while those in the foul water of Willow Point bayou and elsewhere were very different in appearance, the bladders black with contents, and the stems bearing abundant flowers.

Water-shield (*Brasenia purpurea*) covers rather thinly only one small area at the south side of the lake. The plants are small and unthrifty, and I have never seen them in blossom at this place. In a pond not far away (Market-street pond) they blossomed abundantly during the summer of 1899.

Cladium mariscoides grows in several small patches at the edge of the lake, mixed in with the *Scirpus*. *Eleocharis palustris* grows in the lake rather scantily in two places, one just a little north of Chicago Hill pier, at the beginning of the *Scirpus* patch, and the other a little south of Yarnelle's landing. *Elcocharis interstincta* and E. *mutata* form each two small patches along the southwestern shore of the lake and at Yarnelle's landing. There were only a few duckweeds (*Spirodela*) found in the lake proper. This was along the southern edge, where it was shady and calm.

GENERAL RELATIONS.—The plants on the shore, especially those which grow out upon newly-made soil, probably have a good deal of influence in binding the shore together, and assist in the encroachments of the land upon the lake. This influence, however, is difficult to measure or express in definite terms, for it seems irregular and uncertain, as erosion goes on quite rapidly even where there are forests on shore, wherever the wind has full sweep. Small trees are uprooted and fall, and in some places stumps are found in the bottom of the lake near shore.

THE PLANTS IN THE WATER, especially the *Scirpus*, form a large amount of material for the building up of new shore. They also break the influence of the waves against the shore. At times, when the surface of the lake was quite rough, the water above a large patch of water weeds, particularly *Potamogeton amplifolius*, was often noted to be perfectly calm. The large submersed leaves of the latter plant are very effective in catching the moving molecules of water, retarding their motion, and so preventing waves.

The larger plants in the lake bear certain relations to the plankton. Among the *Scirpi*, the *Clathrocystis* scum is abundant almost any time during the latter part of the summer. Here we have a marked influence on the vertical distribution of the plankton. On the afternoon of August 21, 1900, a thickish coating of clathrocystis was noted among the bulrushes near the shore, and during the night the lapping waves piled it up in a narrow streak along the water line.

The stems of the water plants furnish lodgment for many aquatic plants and animals. Fresh water sponges grow abundantly upon the *Scirpus* stems.

A peculiarity of a species of *Rivularia* may be noted in this connection. It frequently grows quite abundantly attached in small hemispheric masses to stems and leaves of water plants. I have never seen it floating in Eagle Lake at all, and Dr. Howe, who has worked particularly with the

plankton, has found it floating but once. At Turkey Lake it is said to float in great quantities, the whole lake appearing crowded full of dark green spheres the size of a large pinhead, and on a short visit to Tippecanoe Lake I noticed the same phenomenon. I have not had opportunity to compare the richness of vegetation of Turkey and Tippecanoe Lakes with that of Eagle Lake. It is possible that the condition *Rivularia* assumes depends upon the abundance or scarcity of plants which will serve as places of attachment. In assuming this attached position it escapes the plankton nets, and so its abundance is liable to be underestimated; for as there is difficulty in manipulating the net among the water weeds, direct comparison of its abundance would be impossible to obtain.

As an agent in the dissemination of seeds the lake acts only to a limited extent, as a floating seed would need sufficient surface projecting above the water in order to be wafted far. Many such seeds as acorns, hazel nuts and butternuts were floating in the water, but all of them were decayed. In the case of winged seeds, however, it was different. A number of small seedlings of the soft maple were found growing along the shore about high-water line, and the seeds had evidently been deposited there by the waves. The year of 1899 was somewhat noteworthy for the very heavy crop of elm seed, especially white elm. In the early summer of that year, in the vicinity of Fort Wayne, the writer noted woodland ponds, the surfaces of which were entirely covered with the seeds of this species. In the same summer, but later, there was found at the high-water line of the lake just north of the laboratories a row of small seedling elms growing as thickly as they could stand. There was another long, thick row in a corresponding position along the southeast shore of the lake. In the summer of 1900 quite a number of the elms were found. They had increased well in size and looked quite thrifty. If undisturbed they may form the beginning of a forest, much like the present low-ground forest along the lake shore. There was no elm seedlings of 1900 noted; the crop of seed in the forests was not by any means so large during that summer.

Below is appended a list of plants noted in the vicinity of Eagle Lake. The list of plants occurring in the neighboring forests, or at any distance from the lake, is not intended to be complete, as observations were made here only incidentally as time could be taken from the lake work. It is believed that all the phanerogams of the lake have been noted. The order and synonymy is that of Britton and Brown's Illustrated Flora. Wherever these names differ from those of the sixth edition of Gray's Manual

the latter are given also. In arranging this list I have availed myself of the labors of Dr. Stanley Coulter in his list of the flowering plants and ferns of Indiana in the State Geological Report of 1899. Much botanical survey work has been done in the county (Kosciusko) in which Eagle Lake is situated by various botanists, among them chiefly Dr. Stanley Coulter and Mr. W. W. Chipman.

LIST OF PLANTS NOTED AT EAGLE LAKE AND VICINITY.

1. Botrychium virginianum (L.) S. W. Virginia Grape Fern.
   In upland forests; not common.
2. Osmunda regalis L. Royal Fern.
   Very common in the southeastern portion of the lake plain, near Chicago Hill. Frequent in tamarack swamps.
3. O. cinnamomea L. Cinnamon Fern.
   Not rare in swamps. Quite abundant in a tamarack swamp a few miles southeast of Warsaw.
4. O. claytonia. Clayton's Fern.
   Not rare along Clear Creek mouth.
5. Onoclea sensibilis L. Sensitive Fern.
   Very common at edges of lake plain in places, especially on the eastern side. Common in low, flat swales.
6. Cystopteris fragilis (L.) Bernh. Brittle Fern.
   Not common. Found in moist, but not wet woods.
7. Dryopteris acrostichoides (Michx.) Kuntze. Christmas Fern. (*Aspidium achrosticoides* S. W.)
   Not abundant; found on a bank along Clear Creek.
8. D. thelypteris (L.) Gray. Marsh shield Fern. (*Aspidium thelypteris* S. W.)
   The most common fern, growing in the flat plains in great abundance, making a distinct strata in places.
9. D. cristata (L.) A. Gray. Crested Shield Fern. (*Aspidium cristatum* S. W.)
   Not very common; found scattered in low, flat woods.
10. Phegopteris hexagonoptera (Michx.). Fee. Broad Beech Fern.
    Not very common; found in dry woods.

11. Woodwardia virginica (L.) J. E. Smith. Virginia Chain Fern.
Abundant in old tamarack swamps, especially along the steamboat canal to near Warsaw, and a tamarack about one mile east of the lake.
12. Asplenium angustifolium Michx. Narrow-leaved Spleenwort.
Some found in the county, but not very near Eagle Lake.
13. A. filix foemina (L.) Bernh. Lady Fern.
Scattered in low, moist woods.
14. Adiantum pedatum L. Maiden-hair Fern.
Not common near the lake; a few plants found at the foot of a hill about a quarter of a mile east of the lake.
15. Pteris aquilina L. Brake.
Found pretty abundantly on sandy hills, especially along the railroad.
16. Equisetum arvense L. Field Horse-tail.
Common along the railroad and on side base of a hill about one-quarter mile east of the lake.
17. E. fluviatile L. Swamp Horse-tail.
In the margins of the ponds adjacent to the lake, in shallow water.
18. E. hyemale L. Common Scouring Rush.
Abundant on hillsides and along the railroad; a good deal of variation in size and general appearance.
19. Lycopodium lucidulum Michx. Shining Club Moss.
In a tamarack east of Eagle Lake.
20. Selaginella apus. (L.) Spring Creeping Selagenella.
In flat, moist plains, among the grass. Abundant in various portions of the lake plain.
21. Larix laricina (Du Roi) Koch. Tamarack. (L. Americana Michx.).
There are several tamarack swamps in the vicinity of Eagle Lake. Most of them are dying.
22. Juniperus virginana L. Red Cedar.
Plants found in the county, but not very near the lake.
23. Typha latifolia L. Broad-leaved Cat-tail.
Abundant in marshes and occasionally at the lake shore. Great patches on the southern lake plain.
24. Sparganium eurycarpum Engelm.
Common in swamps.

25. S. simplex Huds.
    Not rare in a few swamps, quite local, however.
26. Potamogeton natans L. Common Floating Pondweed.
    Abundant in shallow water, Eagle Lake.
27. P. amplifolius Tuckerm. Long-leaved Pondweed.
    In patches, common. Eagle Lake.
28. P. lonchites. (P. fluitans Roth.)
    Common in the lake, especially near outlets and inlets.
29. P. lucens L. Shining Pondweed.
    Abundant in the lake.
30. P. perfoliatus.
    Quite plentiful in Eagle Lake.
31. P. zosteraefolius Schum. Eel Grass Pondweed.
    Abundant.
32. P. pusillus L. Small Pondweed.
    Only a few specimens seen.
33. P. pectinatus L. Fennel-leaved Pondweed.
    One of the most common and widely distributed.
34. Naias flexilis (Willd.) Rost and Schmidt.
    Quite abundant in shallow water, sometimes forming extensive carpets.
35. Triglochin palustris L. Marsh Arrow Grass.
    In a swamp south of the lake about a half mile.
36. Alisma plantago aquatica L. Water Plantain.
    Abundant in moist places.
37. Sagittaria engelmanniana J. G. Smith. (S. variabilis gracilis Engelm.)
    A few plants along the shore of Eagle Lake in lagoons.
38. S. latifolia Willd. Broad-leaved Arrowhead. (S. variabilis Engelm.)
    Quite abundant, especially on the southern lake plain.
39. S. rigida Pursh. (S. heterophylla pursh.)
    A few plants noted in shallow water.
40. S. graminea Michx. Grass-leaved Arrowhead.
    At the Laboratory bayou.
41. Philotria canadensis (Michx.) Britton. Ditch Moss. (Elodea canadensis Michx.)
    In bayous and cut-offs; very little found in the lake itself.
42. Vallisneria spiralis L. Tape-grass. Eelgrass.
    In patches, scattered, not abundant in Eagle Lake.

43. Andropogon scoparius Michx. Brown Beard Grass.
Some along the railroad.

44. A. furcatus. Forked Beard Grass.
Some in the southeast lake plain, and occasional elsewhere.

45. Chrysopogon avenaceus (Michx.) Benth. Indian Grass. (C. Nutans Benth.)
Common, especially along the Pennsylvania Railroad.

46. Syntherisma sanguinalis (L.) Nash. Crab Grass. (Panicum sanguinale L.)
Abundant in cultivated places and a troublesome weed.

47. Panicum crus-galli L. Barnyard Grass.
Abundant in moist places.

48. P. walteri. Salt Marsh Cockspur Grass.
Some along the southeast shore of the lake.

49. P. porterianum Nash. (*P. latifolium* Walt.)
In dry woodlands.

50. P. pubescens Lam. Hairy Panicum.
Common in open woodlands.

51. P. capillare L. Old Witch Grass.
Found abundant in Winona Park.

52. Ixophorus glaucus (L.) Nash. Yellow Fox-tail. (*Setaria glauca* Beauv.)
Abundant in waste places.

53. I. viridis (L.) Nash. Green Fox-tail Grass. (*Setaria viridis* Beauv.)
Quite common.

54. I. italicus (L.) Nash. Hungarian Grass. (*Setaria italica* Kunth.)
Escaped cultivation in various places.

55. Cenchrus tribuloides L. Burr Grass. Sandbur.
Found in dry sandy soil.

56. Zizania aquatica L. Wild Rice.
Some found in a tamarack not far from the lake.

57. Homalocenchrus virginicus (Willd.) Britton. White Grass. (*Leersia virginica* Willd.)
Grows sparsely in damp woods near the lake.

58. H. oryzoides (L.) Poll. Rice and Cut-grass. (*Leersia oryzoids* Swartz.)
Forming tangled, scratchy masses in places along the lake shore.

59. Phalaris arundinacea L. Reed Canary Grass.
Some found on the lake plain.

60. Muhlenbergia diffusa.
Some growing in dry, sparsely wooded places.

61. Phleum pratense L. Timothy.
Abundant.

62. Cinna arundinacea L. Wood Reed Grass.
Found in moist places, especially where shaded.

63. Agrostis alba L. Red Top.
Found along Cherry Creek.

64. Agrostis perennans (Walt.) Tuckerm. Thin Grass.
Some found along Cherry Creek.

65. Calamagrostis canadensis (Michx.) Beauv. Blue-joint Grass.
Scattered among other grasses on the lake plain.

66. Danthonia spicata (L.) Beauv. Wild Oat Grass.
Grows thinly at edges of dry hills.

67. Spartina cynosuroides (L.) Willd. Fresh-water Cord Grass.
Tolerably common in swamps and along the railroad.

68. Bouteloua curtipendula (Michx.) Torr. (*B. racemosa* Lag.)
One patch on a hill toward the southern end of the Assembly grounds.

69. Eleusine indica (L.) Gaertn. Yard Grass.
Found along streets at Warsaw.

70. Phragmites phragmites (L.) Karst. Reed. (*P. communis* Trin.)
Some grows along the lake shore. Abundant in a tamarack swamp northeast of Eagle Lake.

71. Eragrostis purshii Schrad.
Not rare, along roadsides and old fields.

72. E. major Host.
Abundant in old fields and along roadsides.

73. Dactylis glomerata L. Orchard Grass.
A little found growing along roadsides.

74. Poa annua L. Low Spear Grass.
Found in a dooryard east of Eagle Lake.

75. Poa compressa L. Wire Grass.
Not rare in old fields.

76. Poa pratensis L. June Grass. Kentucky Blue Grass.
Scattered everywhere.

77. Panicularia nervata (Willd.) Kuntze. (*Glyceria nervata* Trin.)
Common at the edges of various ponds.

78. Panicularia fluitans (L.) Kuntze. Floating Manna Grass.
Not uncommon in ponds.

79. Festuca eliator L. Fall Fescue Grass.
Scattered, principally along the railroad.

80. Bromus ciliatus L. Wood Chess.
Tolerably common, scattered in thin forests.

81. B. secalinus L. Cheat. Chess.
In old wheat fields.

82. Agropyron violaceum (Hornem) Vasey. Purplish Wheat Grass.
Along the Pennsylvania Railroad, near Warsaw.

83. Hordeum jubatum L. Wild Barley. Squirrel-tail Grass.
Found in scant tufts along the Pennsylvania Railroad.

84. Elymus virginicus L. Wild Rye.
Scattered.

85. Hystrix hystrix (L.) Millsp. Hedge-hog Grass.
Some found at the edges of a field east of Eagle Lake.

86. Cyperus diandrus Torr. Low Cyperus.
In the lake plain, especially along the south part of Chicago Hill.

87. C. strigosus L. Straw-colored Cyperus.
Common in moist places.

88. C. filiculmis Vahl. Slender Cyperus.
Abundant on open sandy hillsides.

89. Dulichium arundinaceum (L.) Britton. (*D. spathaceum* Pers.)
Common in marshy places. Most abundant in Market-street pond.

90. Eleocharis interstincta (Vahl.) R. and S.
A few patches in the lake. One in the south end, the others near Yarnelle's landing.

91. E. mutata (L.) R. and S. Quadrangular Spike Rush. (*E. quadrangulata* R. Br.)
A few small patches in nearly the same regions as the above.

92. E. ovata (Roth.) R. and S.
The most abundant species of the genus. Found everywhere in moist places.

93. E. palustris (L.) R. and S. Creeping Spike Rush.
Scattered along the edge of the lake, among the *scirpi*. A good patch just a little way north of Chicago Hill pier.

94. E. acicularis (L.) R. and S. Needle-spike Rush.
Tolerably abundant, often found in flower but rarely in fruit, at the edge of the lake and in marshes.

95. E. tenuis (Willd.) Schultes. Slender Spike-rush.
Some found in the lake plain.

96. Stenophyllus capillaris (L.) Britton. (*Fimbristylis capillaris* Gray.)
Found in sandy soil. Some in a field, some at the edge of the lake plain, on the bank at Chicago Hill.

97. Scirpus smithii Gray.
Some found in the county, but not near Eagle Lake.

98. S. americanus Pers. Chair-maker's Rush. (*S. pungens* Vahl.)
Quite abundant along the edges of the lake.

99. S. lacustris L. Great Bulrush.
The most abundant of the species, forming a broad belt around the margin of the greater part of the lake.

100. S. atrovirens Muhl. Dark-green Bulrush.
Common in swamps.

101. S. lineatus Michx. Reddish Bulrush.
Common in wet grounds.

102. S. cyperinus (L.) Kunth. Wool Grass.
Grows in clumps, in ponds.

103. Eriophorum virginicum.
Scattered in marshes—generally old tamaracks.

104. Rynchospora alba (L.) Vahl. White-beaked Rush.
In a marsh south of the lake, also in the tamarack northeast of Eagle Lake.

105. R. Capillacea laeviseta E. J. Hill.
In a marsh south of the lake.

106. Cladium mariscoides (Muhl.) Torr. Twig Rush.
In the lake plain and along the edge of the lake on the west side of the lake.

107. Scleria verticillata Muhl. Low Nut Grass.
Found in a tamarack, and in a flat pasture south of Eagle Lake.

108. Carex lupulina Muhl. Hop Sedge.
Found in swampy places, abundant.

109. C. pseudo-cyperus L.
Found occasionally in swamps.

110. Carex comosa Boot. Bristly Sedge.
Along the edges of the lake, near the outlet, and in ponds.

111. C. lanuginosa Michx. Woolly Sedge.
Some growing in the vicinity of the laboratories.

112. C. filiformis L. Slender Sedge.
A small patch near a pond on the southeast part of the lake plain.

113. C. granulatus Muhl. Meadow Sedge.
Scattered, moist places.

114. C. albursina Sheldon. White Bear Sedge.
Found occasionally in damp woods.

115. C. pennsylvanica Lam.
Found on dry hills, scattered.

116. C. pubescens Muhl. Pubescent Sedge.
A few plants found in dry ground at the southwest side of the lake.

117. C. leptalea Wahl. (*C. polytrichoides* Willd.)
Found in a tamarack northeast of the lake, and in a marsh southeast.

118. C. vulpinoidea Michx.
Common, scattered.

119. C. rosea Schk. Stellate Sedge.
Found sparingly in shaded places.

120. C. cephalophora Muhl.
Found scattered in dry soil, back from the lake.

121. C. tribuloides Wahl.
Growing in clumps, among various grasses in parts of the lake plain.

122. Arisaema triphyllum (L.) Torr. Jack-in-the-Pulpit. Indian Turnip.
Found in forests.

123. A. dracontium (L.) Schott. Green Dragon.
Found in quite moist woods.

124. Peltandra virginica (L.) Kunth. Green Arrow Arum.
Found in a tamarack northeast of the lake.

125. Spathyema foetida (L.) Raf. Skunk Cabbage. (*Symplocarpus foetidus* Nutt.)

Common in moist places, especially up along Cherry Creek.

126. Aeorus calamus (L). Sweet Flag. Calamus.

Found in low ground along the lake and various other moist places.

127. Spirodela polyrhiza (L.) Schleid. Greater Duckweed.

Very common in lagoons, some in sheltered parts of the lake, near shore.

128. Lemna trisulca L. Ivy-leaved Duckweed.

In lagoons and ditches; common.

129. Lemna minor L. Lesser Duckweed.

In lagoons, and in ponds near the lake.

130. Wolffia columbiana Karst.

Very abundant in lagoons.

131. W. braziliensis Wedd.

In lagoons, but not very common.

132. Tradescantia virginiana L. Spiderwort.

Grows everywhere in dry ground; not much seen in moist ground here.

133. Pontederia cordata L. Pickerel Weed.

Common about the edges of the lake.

134. Heteranthera dubia (Jacq.) MacM. Water Star-grass. (H. graminea Vahl.)

Both forms found, the larger in the water and the short on muddy banks.

135. Juncus effusus L. Soft Rush.

Grows along the steamboat canal leading to Warsaw.

136. J. tenuis Willd. Yard Rush.

Abundant.

137. J. canadensis J. Gray.

Found in low ground along the railroads northeast of the lake.

138. Juncoides campestre (L.) Kuntze. Common Wood Rush. (*Luzula campestris* D. C.)

Found scattered in woodlands.

139. Tofieldia glutinosa (Michx.) Pers.

Found in a tamarack northeast of the lake.

140. Allium canadense L. Meadow Garlic.
Found in moist woods.

141. Lilium umbellatum Pursh. Western Red Lily.
Found on sand hills northeast of the lake.

142. L. canadense L. Yellow Lily.
Found growing in moist places.

143. L. superbum L. Turk's Cap Lily.
Grows in the southwestern part of the lake plain.

144. Asparagus officinalis L. Asparagus.
Scattered, quite frequent.

145. Vagnera racemosa (L.) Morong. Wild Spikenard. (*Smilacina racemosa* Desf.)
Found growing in forests.

146. V. stellata (L.) Morong. Star-flowered Solomon's Seal. (*Smilacina stellata* Desf.)
One patch across Cherry Creek from the laboratory.

147. Unifolium canadense (Desf.) Greene. False Lily of the Valley.
In dried tamarack swamps.

148. Polygonatum commutatum (R. and S.) Dietr. Smooth Solomon's Seal. (P. giganteum Dietr.)
Common, especially along the railroad.

149. Trillium recurvatum Beck. Prairie Wake Robin.
Found abundantly in damp woods.

150. Smilax herbacea L. Carrion Flower.
Found in considerable abundance.

151. S. hispida Muhl. Hispid Green Briar.
Found in dry places.

152. Dioscorea villosa L. Wild Yam.
Found in moist, rich woods.

153. Iris versicolor L. Larger Blue Flag.
Abundant in various places along the shore of the lake.

154. Sisyrinchium angustifolium Mill. Blue-eyed Grass.
Abundant in open places, especially along the railroad.

155. Cypripedium acaule Ait. Moccasin Flower.
Found abundantly in a tamarack south of the lake.

156. C. reginae Walt. Showy Lady's Slipper. (*C. spectabile Salisb.*)
Found in a marsh west of the lake.

157. C. hirsutum Mill. Large Yellow Lady's Slipper. (*C. pubescens* Willd.)
Found in dry soil by Yarnelle's landing.

158. Habenaria lacera (Michx) R. Br. Ragged Orchis.
Found in the southwestern portion of the lake plain.

159. H. leucopaea (Nutt) Gray. White-fringed Prairie Orchis.
In the tamarack marsh northeast of the lake.

160. H. psycodes (L.) Gray. Purple-fringed Orchis.
Southeast edge of lake plain.

161. Pogonia ophioglossoides (L.) Ker. Rose Pogonia.
In the tamarack northeast of the lake.

162. Gyrostachys gracilis (Bigel) Kuntze. Slender Ladies' Tresses.
Found in a dry wood east of the lake.

163. Corallorhiza odontorhiza (Willd.) Nutt. Small-flowered Coral Root.
Not rare in a wood south of the outlet.

164. Limodorum tuberosum L. Grass Pink. (*Calopogon pulchellus* R. Br.)
Abundant in tamarack northeast of the lake.

165. Saururus cernuus L. Lizard's Tail.
In wet grounds along Cherry Creek and Clear Creek.

166. Juglans nigra L. Black Walnut.
Scattered in rich woodlands.

167. J. cinera L. Butternut.
Occasional, in woodlands.

168. Hicoria ovata (Mill) Britton. Shagbark Hickory. (*Carya alba* Nutt.)
In woodlands.

169. H. laciniosa (Michx. f.) Sarg. Big Shellbark. (*Carya sulcata* Nutt.)
In woods near Cherry Creek.

170. H. alba (L.) Britton. Mocker Nut. White-heart Hickory. (*Carya tomentosa* Nutt.)
A few trees noted.

171. Populus alba L. White Poplar.
A few trees have escaped cultivation near Warsaw.

172. P. grandidentata L. Great-toothed Aspen.
Occasional.

173. P. tremuloides Michx. American Aspen.
Grows along the lake shore near Chicago Pier.

174. P. deltoides Marsh. Cottonwood. (P. *monilifera* Ait.)
Not rare in low grounds.

175. Salix nigra.

Common along the shores of the lake.

176. Salix discolor.

Forming clumps in low flat grounds. The willows were neither in flower nor fruit during the period of investigation, and were consequently indeterminate; there are doubtless more present than mentioned.

177. Carpinus caroliniana Walt. Water Beech.

In woodlands along the sides of gullies.

178. Ostrya virginiana (Mill) Willd. Ironwood.

In locations similar to the preceding.

179. Corylus americana Walt. Hazelnut.

Abundant in dry ground.

180. Betula pumila L. Low Birch.

Abundant in tamarack marshes.

181. Fagus americana. Sweet Beech. (*F. ferruginea* Ait.)

Not very abundant, only a few trees seen.

182. Castanea dentata (Marsh) Borkh. Chestnut. (*C. sativa americana Wats. and Coult.*)

A quite large tree in the park, evidently pretty old, but probably not native.

183. Quercus rubra L. Red Oak.

In woodlands.

184. Q. palustris Du Roi. Pin Oak.

Found pretty abundantly at the edges of some low slopes.

185. Q. coccinea Wang. Scarlet Oak.

Quite common.

186. Q. imbricaria Michx. Laurel Oak.

Only one tree seen, far up Cherry Creek gully.

187. Q. alba L. White Oak.

Abundant in woodlands.

188. Q. macrocarpa Michx. Bur Oak.

Not particularly abundant; only a few trees noted.

189. Q. platanoides (Lam.) Sudw. Swamp White Oak. (*Q. bicolor* Willd.)

Pretty common in moist places.

190. Q. acuminata (Michx.) Sarg. Yellow Oak. (*Q. muhlenbergii* Engelm.)

A few trees noted; none very near the lake.

191. Ulmus americana L. American or White Elm.
Abundant.

192. U. fulva Michx. Slippery Elm. Red Elm.
Not many trees seen.

193. Celtis occidentalis L. Hackberry. Sugar Berry.
A few trees noted.

194. Morus rubra L. Red Mulberry.
Found in woods; not rare.

195. M. alba tartarica. Russian Mulberry.
An abundant escape in waste land east of the lake.

196. Toxylon pomiferum Raf. Osage Orange. (*Maclura aurantiaca* Nutt.)
Used abundantly for hedges.

197. Humulus lupulus L. Hop.
Found growing in low rich grounds.

198. Cannabis sativa L. Hemp.
A common escape on commons near Warsaw.

199. Urtica gracilis Ait. Slender Nettle.
In clumps in waste places.

200. Urticastrum divaricatum (L.) Kuntze. Wood Nettle. *Laportea canadensis* Gaud.
Abundant in low woods.

201. Adicea pumila (L.) Raf. Clear Weed. Rich Weed. (*Pilea pumila* Gray.)
Abundant in moist places.

202. Boehmeria cylindrica (L.) Willd. False Nettle.
Abundant in moist woods.

203. Parietaria pennsylvanica Muhl.
Not particularly abundant.

204. Commandra umbellata (L.) Nutt. Bastard Toad Flax.
Found growing abundantly in dry places, along the road east of the lake.

205. Asarum canadense L. Wild Ginger.
Rather common in shady woods.

206. Aristolochia serpentaria L. Virginia Snake Root.
Scattered in loose soil of forests.

207. Rumex acetosella L. Field Sorrel. Red Sorrel.
A common nuisance in sandy fields.

208. R. verticillatus L. Swamp Dock.

Found at the edge of bayous and in shallow water.

209. R. brittanica L. Great Water Dock.

Not rare in the lake plain and in low, flat places.

210. R. crispus L. Curled Dock.

Common in waste places.

211. R. obtusifolius L. Bitter Dock.

In situations similar to the preceding.

212. Fagopyrum fagopyrum (L.) Karst. Buckwheat. (F. *esculentum* Moench.)

Along roadsides where it has escaped.

213. Polygonum amphibium L. Water Smartweed.

Common at the edges of the lake.

214. P. emersum (Michx.) Britton. Swamp Smartweed. (P. *muhlenbergii* Watson.)

Abundant in bayous and low places about the lake.

215. P. incarnatum Ell. Slender Pink Smartweed.

Common in wet soil.

216. P. pennsylvanicum L.

Abundant.

217. P. hydropiperoides.

Common, especially in a shallow pond in the southeastern portion of the lake plain.

218. P. orientale L. Prince's Feather.

Escaped cultivation in a field east of the lake.

219. P. virginianum L. Virginia Knotweed.

Rather sparingly found at the edges of low woods.

220. P. aviculare L. Doorweed.

Common in yards.

221. P. erectum L. Erect Knot Grass.

Not so abundant as the preceding, and in moister places.

222. P. convolvulus L. Black Bindweed.

In dry cultivated fields.

223. P. scandens L. Climbing False Buckwheat. (*P. dumetorum scandens* Gray.)

Some in moist ground along Cherry Creek.

224. P. saggitatum L. Arrow-leaved Tear Thumb.

In moist soils about the lake. Very abundant.

225. P. arifolium L. Halberd-leaved Tear Thumb.
Some found along Clear Creek, south of the lake.

226. Chenopodium album L. Lamb's Quarters.
Common in waste grounds.

227. C. boscianum Moq.
Only a few plants seen, over near Warsaw.

228. C. urbicum L. Common or City Goosefoot.
Common in waste places.

229. C. hybridum L. Maple-leaved Goosefoot.
Common; somewhat scattered in waste places.

230. C. botrys L. Feather Geranium. Jerusalem Oak.
Not rare along the railroad.

231. Salsola kali L. Common Saltwort.
Found quite abundantly along the railroad.

232. Amaranthus retroflexus L. Rough Pigweed.
Abundant in waste places.

233. A. blitoides S. Wats. Prostrate Amaranth.
Found along the Pennsylvania railroad.

234. A. graecizans L. Tumbleweed. (A. *album* L.)
Found in waste places and along the railroad.

235. Phytolacca decandra L. Pokeberry.
In moist, rich grounds.

236. Mollugo verticillata L. Carpetweed.
Abundant in sandy fields.

237. Portulaca oleracea. Purslane.
Plentiful in fields and gardens.

238. Agrostemma githago L. Cockle. (*Lychnis githago* Scop.)
Abundant in grain fields.

239. Silene stellata (L.) Ait. Starry Campion.
In woods and corners of fields.

240. S. virginica L. Fire Pink.
Found in woods.

241. S. antirrhina L. Sleepy Catchfly.
Common in sandy, open places.

242. Saponaria officinalis L. Bouncing Bet.
Abundant, especially along the embankment of the Pennsylvania railway.

243. Alsine media L. Common Chickweed (*Stellaria media* Cyr.)
Abundant, especially in the park.

244. A. longifolia (Muhl.) Britton. Long-leaved Chickweed. (*Stellaria longifolia* Muhl.)
Found in moist ground.

245. Cerastium longipedunculatum Muhl. Nodding Chickweed. (*C. nutans* Raf.)
Found near Cherry Creek.

246. Anychia canadensis (L.) B. S. P. Slender-forked Chickweed. (A. *capillacea* D. C.)
Scattered in open, sandy woods.

247. Brasenia purpurea (Michx.) Casp. Water Shield. (B. *Peltata* Pursh.)
A little in Eagle Lake; much, and profusely flowering, in Market-street pond.

248. Nymphaea advena Soland. Spatterdock. (*Nuphar advena* R. Br.)
Quite plentiful in Eagle Lake.

249. Castalia odorata (Dryand) Woodv. and Wood. White Water Lily. (*Nymphaea odorata* Ait.)
Abundant in Eagle Lake.

250. Ceratophyllum demersum L. Hornwort.
Abundant in Eagle Lake.

251. Liriodendron tulipfera L. Yellow poplar. Tulip tree.
In woods, no longer particularly abundant.

252. Asimina triloba (L.) Dunal. Pawpaw.
Not many trees seen.

253. Caltha palustris L. Cowslip.
Common in marshy places.

254. Coptis trifolia (L.) Salisb. Gold-thread.
In a tamarack swamp southeast of the lake.

255. Actaea alba (L.) Mill. White Baneberry.
Common in woods.

256. Anemone cylindrica A. Gray. Long-fruited Anemone.
Found abundantly, principally along the Pennsylvania railway.

257. A. virginiana L. Tall anemones.
Plentiful in open places.

258. A. canadensis L. Canada Anemone. (*A. pennsylvanica* L.)
Found in moist ground along the Pennsylvania railroad.

259. A. quinquefolia L. Wind Flower. (A. *nemorosa Michx.*)
Plants found, out of flower, along Clear Creek.

260. Hepatica hepatica (L.) Karst. Round-leaved Liverwort. (*H. triloba* Chaix.)
Scattered in woodlands about the lake.

261. H. acuta (Pursh.) Britton. Liverwort. (*H. acutiloba* D. C.)
Found at some distance from the lake; none seen near.

262. Syndesmon thalectroides (L.) Hoffmng. Rue Anemone.
Found in woods; abundant.

263. Clematis virginiana L. Virgin's Bower.
Abundant in places, generally in rich, damp places.

264. Ranunculus abortivus L. Kidney-leaved Crowfoot.
Abundant in shaded places.

265. R. recurvatus Poir. Hooked Crowfoot.
Common in the regions at some distance from the lake.

266. R. pennsylvanicus L. Bristly Buttercup.
Some found north of the lake, near Clear Creek.

267. Caulophyllum thalictroides L. Blue Cohosh.
Found in the Clear Creek region.

268. Podophyllum peltatum L. Mayapple.
Scattered in woods.

269. Menespermum canadense L. Moonseed.
Not very abundant in the region of the lake.

270. Sassafras sassafras (L.) Karst. Sassafras. (*S. officinale* Nees.)
Abundant in open places.

271. Benzoin benzoin (L.) Coulter. Spice Bush. (*Lindera benzoin* Blume.)
Not rare in moist, rich woods.

272. Papaver somniferum L. Garden Poppy.
A few were found growing in the railroad gravel pit northeast of the lake.

273. Sanguinaria canadensis L. Blood Root.
Common in open woods, by bluffs and Clear Creek.

274. Stylophorum diphyllum (Michx.) Nutt. Celandine Poppy.
One seen, out of flower, up Clear Creek gully.

275. Bicuculla cucullaria (L.) Millsp. Dutchman's Breeches. (*Dicentra cucularia* Torr.)
Old plants and roots found, Clear Creek gully.

276. Lepidum virginicum L. Pepper Grass.
Common in dry ground.

277. Sisymbrium officinale (L.) Scop. Hedge Mustard.
Common in dry ground in waste places.

278. Brassica juncea (L.) Cooson. Indian Mustard.
A plant found along the Pennsylvania railroad.

279. Roripa palustris (L.) Bess. Marsh Cress. (*Nasturtium palustre* D. C.)
Common in flat, marshy ground.

280. R. nasturtium (L.) Rusby. Water Cress. (*Nasturtium officinale* R. Br.)
Common, especially near springs.

281. Bursa bursa-pastoris (L.) Britton. Shepherd's Purse. (*Capsella bursa-pastoris* Moench.)
Some plants seen; dry ground.

282. Arabis laevigati (Muhl.) Poir. Smooth Rock Cress.
On bluffs along Clear Creek.

283. Polanisia graveolens Raf. Clammy Weed.
Abundant in the railroad gravel pit.

284. Sarracenia purpurea L. Pitcher Plant.
In tamarack bogs.

285. Saxifraga pennsylvanica L. Swamp Saxifrage.
Occasional in wet places.

286. Heuchera hispida Pursh. Rough Heuchera.
Some plants found, Chapman's Hill.

287. Mitella diphylla L. Bishop's Cap.
On a bank along Cherry Creek.

288. Parnassia caroliniana Michx. Grass of Parnassus.
Tolerably plentiful in low, wet grounds.

289. Ribes cynosbatti L. Wild Gooseberry.
Common in woods.

290. R. oxyacanthoides L. Northern Gooseberry.
Found especially in tamaracks.

291. R. floridum L. Her. Wild Black Currant.
Occasional in moist, flat woods north of Eagle Lake.

292. Hamamelis virginiana L. Witch Hazel.
On dry hills southeast of the lake.

293. Platanus occidentalis L. Sycamore.
On low ground common; a few on high ground.

294. Spiraea salicifolia L. Meadow Sweet.
Common in low, flat ground, as the lake plain.

295. S. tomentosa L. Hardhack.
Sparingly found in moist grounds.

296. Rubus strigosus Michx. Wild Red Raspberry.
None near the lake; some found in a tamarack swamp some distance away.

297. R. occidentalis L. Black Raspberry.
Very common in neglected fields and open woods near the lake.

298. R. americanus (Pers.) Britton. Dwarf Raspberry.
Quite abundant in a tamarack northeast of the lake.

299. R. villosus Ait. High Bush Blackberry.
Abundant near the lake.

300. R. hispidus L. Running Swamp Blackberry.
Common in the marsh along the steamer canal, near Warsaw.

301. R. canadensis L. Dewberry. Low Blackberry.
Common on sandy banks and in sandy fields.

302. Fragaria virginiana Duchesne. Wild Strawberry.
Common in dry ground.

303. Potentilla argentea L. Hoary Cinquefoil.
In a field east of Eagle Lake.

304. P. monspeliensis L. Rough Cinquefoil. (*P. norvegica* L.)
Common in low grounds.

305. P. fruticosa L. Shrubby Cinquefoil.
Common in wet grounds.

306. P. canadensis L. Five-finger.
Common everywhere in open places.

307. Comarum palustre L. Marsh Five-finger. (*Potentilla palustris* Scop.)
Common in tamarack bogs.

308. Geum canadense Jacq. White Avens. (*G. album* Gmelin.)
At edges of woods and shady places.

309. G. strictum Ait. Yellow Avens.
At the southeast edge of the lake plain.

310. Agrimonia mollis (T. and G.) Britton. Soft Agrimony. (*A. eupatoria mollis* T. and G.)
Common in light woods.

311. A. parviflora Soland. Small-flowered Agrimony.
Abundant in low, flat ground.

312. Rosa setigera Michx. Climbing Rose. Prairie Rose.
Not very common. I have seen only one plant in the region.

313. Rosa carolina L. Swamp Rose.
Very abundant in low places.

314. R. humilis lucida (Ehrh.) Best. (*R. lucida* Ehrh.)
Abundant in dry ground.

315. R. rubignosa L. Sweet Briar.
A few scattered plants were noted.

316. Malus coronaria (L.) Mill. Crab Apple. (*Pyrus coronaria* L.)
A few scattered trees.

317. Aronia nigra (Willd.) Britton. Black Choke Berry. (*Pyrus arbutifolia melanocarpa* Hook.)
Not rare in tamarack swamps.

318. Amelanchier canadensis (L.) Medic. June Berry.
Found on the brows of hills and bluffs.

319. A. botryapium (L. F.) D. C. Shad Bush.
A small bush found in the tamarack swamp northeast of the lake.

320. Crataegus coccinea L. Red Haw.
Scattered; generally found along in open woods and fence rows.

321. Prunus americana Marsh. Red Plum.
Scattered.

322. P. serotina Ehrh. Wild Cherry.
Some trees noted, scattered about in forests.

323. Cercis canadensis L. Red Bud. Judas Tree.
Some trees near the lake up Cherry Creek a little way from the lake.

324. Cassia marylandica L. Wild Senna.
Common in wet places.

325. Gymnocladus dioica (L.) Koch. Coffeenut. (G. *canadensis* Lam.)
Common up Cherry Creek gully.

326. Baptisia tinctoria (L.) R. Br. Wild Indigo.
One plant seen along the railroad, 1899.

327. Lupinus perennis L. Wild Lupine.
Common along the railroad.

328. Medicago sativa L. Alfalfa.
Along the road near the Assembly grounds; probably an escape.

329. Melilotus alba Desv. White Sweet Clover.
Abundant about the park entrance.

330. Trifolium procumbeus L. Low Hop Clover.
Found along streets in Warsaw.

331. T. arvense L. Rabbit's Foot Clover.
Scattered, in sterile soil.

332. T. pratense L. Red Clover.
Abundant in open places.

333. T. hybridum L. Alsike.
Scattered at edge of roadsides.

334. T. repens L. White Clover.
Abundant in open places.

335. Amorpha canescens Pursh. Lead plant.
A few plants growing in the park.

336. Robinia pseudacacia L. Black Locust.
Planted in various places.

337. Meibomia nudiflora (L.) Kuntze. Naked Flowered Tick Trefoil. (*Desmodium nudiflorum* D. C.)
In open woods.

338. M. michauxii Vail. Prostrate Tick Trefoil. (*Desmodium rotundifolium* D. C.)
In an open, dry thicket.

339. M. canadensis (L.) Kuntze. Showy Tick Trefoil. (*Desmodium canadense* D. C.)
Common in damp situations.

340. Lespedza violacea (L.) Pers. Bush Clover.
Abundant in open, dry places.

341. L. capitatata Michx. Round-headed Bush Clover.
Common in dry soil.

342. Vicia americana Muhl. Pea-vine.
In damp places near the lake.

343. Falcata comosa (L.) Kuntze. Hog Peanut. (*Amphicarpaea monoica* Ell.)
Common in rich woods.

344. Apios apios (L.) MacM. Groundnut. (*A. tuberosa* Moench.)
Common in various parts of the lake plain.

345. Geranium maculatum L. Wild Geranium.
Common in open woods.

346. G. carolinianum L. Carolina Crane's Bill.
Along the tracks in the railroad gravel pit.

347. Oxalis stricta L. Sheep Sorrel. (*O. corniculata stricta* Sav.)
Abundant.

348. Linum virginianum L. Wild Yellow Flax.
In dry ground, on hillsides, in open woods.

349. Xanthoxylum americanum Mill. Prickly Ash.
In woods; not abundant.

350. Ptelea trifoliata L. Hop Tree.
A few plants noticed in open woods.

351. Polygala verticillate L. Whorled Milkwort.
On hillsides.

352. Polygala viridescens L. (*P. sanguinea* L.)
Found on open hillside, east of the lake.

353. Acalypha virginica L. Three-seeded Mercury.
Found growing in the park.

354. Euphorbia humistrata Engelm. Hairy Spreading Spurge.
Common in dry, open, sandy places.

355. E. nutans Lag. Large or Upright Spotted Spurge. (*E. preslii* Guss.)
Common on dry banks and embankments.

356. E. corollata L. Flowering Spurge.
Very common in dry, open places and old fields.

357. E. cyparissias L. Cypress Spurge.
Escaped from an old cemetery near Warsaw.

358. Rhus copallina L. Dwarf or Black Sumac.
In scattered clumps, various places in dry soil.

359. R. hirta (L.) Sudw. Staghorn Sumac. (*R. typhina* L.)
Occasional in clumps in open places.

360. R. glabra L. Scarlet Sumac.
Grows in clumps, frequently on dry hill sides at the edges of fields.

361. R. vernix L. Poison Sumac. (*R. venenata* D. C.)
Common in tamarack swamps.

362. R. radicans L. Poison Ivy. (*R. toxicodendron* L.)
Common.

363. Ilex verticillata (L.) A. Gray. Winterberry.
Not rare in low marshes, as tamarack swamps.

364. Ilicioides mucronata (L.) Britton. (*Nemopanthes fascicularis* Raf.)
Not rare in tamarack marshes.

365. Euonymus obovatus Nutt. Running Strawberry Bush. (*E. americanus obovatus* T. and G.)
In moist woods, near hillsides or slopes.

366. E. atropurpureus Jacq. Burning Bush.
Common up Cherry Creek gully on flat, rich ground.

367. Celastrus scandens L. Bittersweet.
In woodlands, especially near the edges.

368. Staphylea trifolia L. Bladdernut.
Found growing in moist, shady woods.

369. Acer saccharinum. Silver Maple. (*A. dasycarpum* Ehrh.)
In moist situations.

370. A. saccharum Marsh. Sugar Tree. (*A. saccharinum* Wang.)
In dry ground, in woodlands.

371. A. negundo L. Box Elder. (*Negundo aceroides* Moench.)
Up Clear Creek valley.

372. Aesculus glabra Willd. Ohio Buckeye.
A few trees noted, not very near the lake.

373. Impatiens aurea Muhl. Pale Touch-Me-Not.
Some plants noted some distance from the lake.

374. I. biflora Walt. Spotted Touch-Me-Not. (*I. fulva* Nutt.)
Common about the lake.

375. Ceanothus americanus L. New Jersey Tea.
Abundant in dry sand.

376. Vitis aestivalis Michx. Summer Grape. Small Grape.
Common.

377. Vitis bicolor LeConte. Blue or Winter Grape. (*Vitus aestivatis var bicolor* LeConte.)
Common, but I have seen very little in fruit.

378. Parthenocissus quinquefolia (L.) Virginia Creeper. Wild Ivy. (*Ampelopsis quinquefolia* Michx.)
In woodlands and on fences.

379. Tilia americana L. Basswood. Lin.
Not very common; a few trees seen.

380. Malva rotundifolia L. Common Mallow Cheeses.
Common in waste places, about houses, etc.

381. Abutilon abutilon (L.) Rusby. Velvet Leaf. (*A. avicennae* Gaertn.)
Common in rich grounds.

382. Hypericum prolificum L. Shrubby St. John's Wort.
Abundant in moist places.

383. H. mutilum L. Dwarf St. John's Wort.
Common near the lake.

384. Triadenum virginicum L. Marsh St. John's Wort. (*Elodes campanulata* Pursh.)
Abundant in marshes.

385. Helianthemum canadense (L.) Michx. Frost Weed.
Abundant on dry hills.

386. Lechea villosa Ell. (*L. major* Michx.)
Not rare on dry hills.

387. Viola obliqua Hill. Common Blue Violet. (V. palmata cucullata.)
Common.

388. V. pedata L. Bird's-foot Violet.
On dry hills.

389. V. blanda Willd. Sweet White Violet.
Common in tamarack bogs.

390. Decodon verticillatus (L.) Ell. Swamp Loosestrife.
Common in wet places, especially in a tamarack southeast of the lake.

391. Lythrum alatum Pursh. Loosestrife.
Common in the lake plain.

392. Isnardia palustris L. Water Purslane. (*Ludwigia palustris* Ell.)
In ditches and pools. In Cherry Creek.

393. L. alternifolia L.
Not rare about a pond near the lake plain and northeast of the lake.

394. Chamaenrion angustifolium (L.) Scop. Great Willow Herb. (*Epilobium angustifolium* L.)
Low grounds near Warsaw.

395. Epilobium coloratum Muhl.
Common in low flat grounds.

396. E. adenocaulon Haussk.

A specimen collected by a student and examined in the laboratory was of this species.

397. Onagra biennis (L.) Scop. Common Evening Primrose.

Abundant. A patch, probably of recent introduction, of var grandiflora was found in moist ground near Warsaw.

398. Knieffia pumila (L.) Spach. (Œnothera pumila L.)

A few plants found along the Pennsylvania Railroad.

399. Circaea lutetiana L. Enchanter's Nightshade.

In shady woods.

400. C. alpina L. Smaller Enchanter's Nightshade.

In moist woods.

401. Proserpinaca palustris L. Mermaid Weed.

Common in swamps near the lake.

402. Myriophyllum verticillatum L. Whorled Water Milfoil.

Common.

403. Aralia nudicaulis L. Wild Sarsaparilla.

Found in damp woods.

404. Heracleum lanatum Michx. Cow Parsnip.

Common in wet grounds.

405. Eryngium aquaticum L. Button Snakeroot. (*E. yuccaefolium* Michx.)

In wet soil along the railroad.

406. Sanicula marylandica L. Black Snakeroot.

In damp woods.

407. Pimpinella integerrima (L.) Gray. Yellow Pimpernel.

In sandy places.

408. Washingtonia claytoni (Michx.) Britton. Woolly Sweet Cicely. (*Osmorrhiza brevistylis* D. C.)

In damp woods.

409. Sium cicutaefolium Gmel. Hemlock Water Parsnip.

Abundant south of the lake.

410. Cicuta maculata L. Water Hemlock.

Common in low grounds about the lake.

411. Deringa canadensis (L.) Kuntze. Honewort. (*Crypotaenia canadensis* D. C.)

Common in rich woods.

412. Hydrocotyle umbellata L. Marsh Pennywort.

Found within the county, but not near Eagle Lake.

413. Cornus florida L. Flowering Dogwood.
In woods, frequent.

414. C. amonum. Mill. Silky Cornel. (*C. sericea* L.)
A species, thought to be this, common at the edge of the lake.

415. C. stolonifera Michx. Red Osier Dogwood.
Very common at the edge of the lake.

416. C. candidissima Marsh. Panicled Cornel. (*C. paniculata* L'Her.)
Some bushes seen near a marsh east of the lake.

417. C. alternifolia L. f.
A few trees seen far up Cherry Creek gully.

418. Nyssa sylvatica Marsh. Sour Gum.
A few scattered trees seen.

419. Pyrola elliptica Nutt. Shin Leaf.
Seen in woods, on hillsides.

420. Monotropa uniflora. Indian Pipe.
Scrace, in woodlands.

421. Andromeda polifolia L. Wild Rosemary.
Found in a tamarack swamp southeast of the lake.

422. Gaylussacia resinosa Lam. Black Huckleberry.
At the edges of woods in sandy soils.

423. V. pallidum Ait. Mountain Blueberry. V. corymbosum pallidum Gray.
In sandy soils in woods.

424. Oxycoccus macrocarpus (Ait.) Pers. Large Cranberry.
Found in tamarack swamps; not common.

425. Samolus floribundus H. B. K. Water Pimpernel.
Occasional in moist places.

426. Lysimachia terrestris (L.) B. S. P. Bulb-bearing Loosestrife.
At the edge of the lake in various places.

427. Steironema ciliatum (L.) Raf. Fringed Loosestrife.
Common in damp situations.

428. S. lanceolatum (Walt.) Gray. Lance-leaved Loosestrife.
Common in wet places.

429. Trientalis americana Pursh. Chickweed. Wintergreen.
Found in a tamarack east of the lake.

430. Dodecatheon meadia L. Shooting Star.
Found east along the Pennsylvania Railroad.

431. Fraxinus americana L. White Ash.
Common in woods.

432. Sabbatia angularis (L.) Pursh. Rose-Pink.
Occasional, open woods.

433. Gentiana andrewsii Griseb. Closed Gentain.
A few plants found north of the lake.

434. Frasera carolinensis Walt. American Columbo.
Occasional in open woods.

435. Bartonia virginica (L.) B. S. P. Yellow Bartonia. (*B. tenella* Muhl.)
Found in the county, but not near Eagle Lake.

436. Menyanthes trifoliata L. Marsh Bean.
In a tamarack northeast of the lake.

437. Apocynum androsaemifolium L. Spreading Dogbane.
Common at the edges of fields.

438. A. canabinum L. Indian Hemp.
In similar situations to the preceding.

439. Asclepias tuberosa L. Butterfly Weed.
Common in dry sandy places.

440. A. incarnata L. Swamp Milkweed.
So abundant its blossoms give their color, when in bloom, to the southern part of the lake plain, in places.

441. A. syriaca L. Common Milkweed. (*A. cornuti Decaisne.*)
Abundant in dry soils.

442. Ipomoeca pandurata (L.) Meyer. Man-of-the-Earth.
Found west of the lake.

443. Convolvulus sepium L. Hedge Bindweed. (*C. sepium americanus* Sims.)
Common in parts of the lake plain.

444. C. spithaemus L. Upright Bindweed.
Common on the Pennsylvania Railroad embankment. Not seen in flower.

445. Cuscuta polygonorum Engelm. Smartweed Dodder. (*C. chlorocerpa* Engelm.)
In moist grounds near the lake on various plants.

446. C. gronovii Willd. Common Dodder.
Common on various plants in low places.

447. Phlox pilosa L. Downy Phlox.
Not rare; found along the Pennsylvania Railroad.

448. Polemonium reptans. L. Jacob's Ladder. Blue Bells.
In moist, shady places.

449. Hydrophyllum appendiculatum Michx.
In various places in damp woods.

450. Cynoglossum officinale L. Hound's Tongue.
Common on dry, open hills.

451. Lappula lappula (L.) Karst. Stickseed. (*Echinospermum lappula* Lehm.)
Common in open places.

452. L. virginiana (L.) Greene.
Common in dry places.

453. Lithospermum arvense L. Corn Gromwell.
Not rare in Winona Park in places.

454. Verbena urticifolia L. White Vervain.
Quite common.

455. V. hastata L. Blue Vervain.
Very abundant in low, flat places, at various parts of the lake plain. In places, its blossoms lend great blue unbroken stretches to the landscape.

456. V. stricta.
Common along the railroad.

457. V. bracteosa.
Some found along the railroad.

458. Teucrium canadense L. Wood Sage.
Quite common in low grounds.

459. Scutellaria lateriflora L. Mad-dog Skullcap.
Common in wet places in the lake plain.

460. S. galericulata L. Marsh Skullcap.
Quite common in parts of the lake plain.

461. Marrubium vulgare L. White Horehound.
Common on a bank about a mile up Cherry Creek.

462. Agastache nepetoides (L.) Kuntze. Giant Hyssop. (*Lophanthus nepetoides* Benth.)
Some plants found in the county (up by Chapman's Lake).

463. A. scrophulariaefolia (Willd.) Kuntze. Figwort. Giant Hyssop. (*Lophanthes scrophulariaefolius* Benth.)
In dry soils near Eagle Lake.

464. Nepeta cataria L. Catnip.
Common in dry soil.

465. Stachys palustris L. Common Hedge Nettle.
Common in damp soil.

466. Monarda fistulosa L. Horsemint. Wild Bergamot.
Common on dry hills.

467. M. punctata L. Spotted Horsemint.
A few patches along the Pennsylvania Railroad.

468. Blephilia hirsuta (Pursh.) Torr.
Abundant in woods near Clear Lake gully.

469. Koellia virginiana (L.) MacM. Mountain Mint. (*Pycnanthemum lanceolatum* pursh.)
Abundant, especially in low, flat places, and parts of the lake plain.

470. Lycopus americanus Muhl. Cut-leaved Water Horehound. (*L. sinuatus* Ell.)
In various places along the shore of the lake.

471. Mentha spicata L. Spearmint.
A large patch noted in a low place along the Pierceton Road.

472. M. piperita L. Peppermint.
Rather common in moist places.

473. M. canadensis L. Wild Mint.
Quite common in moist places.

474. M. rotundifolia.
A patch of this near the station at Winona Lake.

475. Collinsonia canadensis. Horsebalm.
In moist soil near Chapman's Lake.

476. Physalis pubescens L. Low Hairy Ground Cherry.
Abundant in dry soils.

477. P. lanceolate Michx. Prairie Ground Cherry.
Rather common in dry soils.

478. Solanum nigrum. Black Nightshade.
Scattered in dry soils.

479. S. carolinense L. Horse Nettle.
Found along the railroad.

480. S. dulcamara L. Bittersweet. Nightshade.
A few plants found along the south shore of the lake.

481. Datura tatula L. Purple-stemmed Jimson.
Common in waste places, about barnyards.

482. Verbascum thapsus L. Common Mullein.
Common in dry places.

483. V. blattaria L. Moth Mullein.
In dry places; not so common as the preceding.

484. Scrophularia marylandica L. Pilewort. (*S. nodosa marylandica* Gray.)
Common in dry places.

485. Chelone glabra L. Snake-head. Turtle-head.
Common in moist or wet places.

486. Mimulus ringens L. Monkey Flower.
Common in low places, especially abundant about the Market-street pond.

487. Ilysanthes gratioloides (L.) Benth. False Pimpernel. (*I. riparia* Raf.)
Common in wet places.

488. Veronica anagallis aquatica L. Water Speedwell.
Scattered, in wet places.

489. V. officinalis L. Common Speedwell.
In various places in the Assembly grounds.

490. V. serpyllifolia L. Thyme-leaved Speedwell.
In open places, in dry soil, common.

491. V. peregrina L. Purslane Speedwell.
Common in cultivated places.

492. Leptandra virginica (L.) Nutt. Culvers Root. (*Veronica virginica* Nutt.)
Growing in clumps, in moist soils.

493. Afzelia macrophylla (Nutt.) Kuntze. Mullein Foxglove. (*Seymeria macrophylla* Nutt.)
In woods, near Hamilton Mound.

494. Dasystoma flava (L.) Wood. Downy False Foxglove. (*Gerardia flava* L.)
Not rare in dry woods.

495. D. virginica (L.) Britton. Oak-leaved False Foxglove. (*Gerardia quercifolia* Pursh.)
Common in dry woods.

496. Gerardia purpurea L. Large Purple Gerardia.
Common in low places and in parts of the lake plain.

497. Utricularia vulgaris L. Greater Bladderwort.

Abundant in ditches along the railroad and in Market-street pond; some, but not very abundant, in the neck of Eagle Lake.

498. U. intermedia Hayne. Flat-leaved Bladderwort.

Common in the lake plain south of the neck of the lake, and in a flat about one-half mile southeast of the lake.

499. Leptamnium virginianum (L.) Raf. Beech-drops. (*Epiphegus virginiana* L.)

Some found in dry woods south of Eagle Lake, near Clear Creek.

500. Phryma leptostachya L. Lopseed.

Common in moist woodlands.

501. Plantago rugelli Decaisne. Rugel's Plantain.

In cultivated grounds, common.

502. P. lanceolata L. English Plantain.

Not very common; found in cultivated fields.

503. Cephalanthus occidentalis L. Button Bush.

Common near the lake on the lake plain at various places, and at the edge of woodland ponds.

504. Galium aparine L. Cleavers.

Found in damp places up Cherry Creek valley.

505. G. circaezans Michx. Wild Liquorice.

Common in dry woods.

506. G. trifidum L. Small Bedstraw.

Found in flat, damp places; some at the outer edge of the lake plain.

507. G. asperellum Michx.

Some found east of Eagle Lake.

508. Sambucus canadensis L. Elder.

Rather common in clumps in open places, or more scattered in low, damp woods.

509. Viburnum acerfolium L. Maple-leaved Viburm.

Found growing in forests, rather common.

510. V. lentago. Sheepberry.

Grows along the south side of the lake.

511. Triosteum perfoliatum L. Horse Gentian.

Some found in open places.

512. Lonicera hirsuta Eaton. Hairy Honeysuckle.
Found, but not in flower, in the tamarack northeast of the lake.

513. Micrampelis lobata (Michx.) Greene. Wild Cucumber. (*Echinocystis lobata*, Torr. and Gray.)
Common in damp places and parts of the lake plain.

514. Companula aparinoides Pursh. Marsh Bell-flower.
Common in parts of the lake plain.

515. C. americana L. Tall Bellflower.
Common in woods.

516. Legouzia perfoliata (L.) Britton. Venus's Looking-glass.
In open sandy soil.

517. Lobelia cardinalis L. Cardinal Flower.
Common in damp situations.

518. L. syphilitica L. Great Lobelia.
Very common in the lake plain and damp grounds elsewhere.

519. L. leptostachys A. D. C.
In dry sandy soils, in open places.

520. L. kalmii L.
Common in the lake plain.

521. Cichorium intybus L. Chicory.
Escaped cultivation in various places.

522. Adopogon virginicum (L.) Kuntze. Virginia Goatsbeard. (*Krigia amplexicaulmis* Nutt.)
Not rare in open woods.

523. Taraxacum taraxacum (L.) Karst. Dandelion. (T. officinale Weber.)
Common everywhere.

524. Lactuca scariola L. Prickly Lettuce.
Common in waste places.

525. L. canadensis L. Wild Lettuce.
Common.

526. L. spicata (Lam.) Hitchk. Fall Blue Lettuce.
Not common, found in moist rich soil.

527. Hieracium scabrum Michx. Rough Hawkweed.
Scattered in dry woodlands.

528. H. gronovii L. Hairy Hawkweed.
In dry open woodlands.

529. Ambrosia trifida L. Great Ragweed. Horseweed.
Found in moist rich soil.

530. A. artemisiaefolia L. Ragweed.
Common, especially along roadsides.

531. Xanthium strumarium L. Cocklebur.
Common in rich moist places.

532. Vernonia gigantea (Walt.) Britton. Tall Ironweed. (*V. altissima* Nutt.)
Common in moist rich soils.

533. V. fasciculata Michx. Western Ironweed.
Common in open places.

534. Eupatorium purpureum L. Joe-Pye-Weed.
Very common in moist places, especially on the southern lake plain.

535. E. perfoliatum L. Boneset.
Common in moist ground.

536. Lacinaria scariosa (L.) Hill. Large Blazing Star. (*Liatris scariosa* Willd.)
Not common. Found along the railroad.

537. L. spicata (L.) Kuntze. *Liatris spicata* Willd.)
Quite common in parts of the lake plain, especially the southeastern part.

538. Solidago caesia L. Blue-stemmed Golden Rod.
In moist woodlands.

539. S. ulmifolia Muhl. Elm-leaved Golden Rod.
Common in open places.

540. S. canadensis L. Canada Golden Rod.
Common in dry soils.

541. S. nemoralis Ait. Field Golden Rod.
Quite abundant in open places.

542. S. riddelli Frank.
Not rare in portions of the lake plain.

543. Euthamia graminifolia (L.) Nutt. Fragrant Golden Rod. (*Solidago lanceolata* L.)
Common in low grounds.

544. Aster macrophyllus L. Large-leaved Aster.
A few plants found along the bluff, north of Cherry Creek.

545. A. shortii Hook.
Common in dry, open places.

546. A. nova-angliae L.
Common along the railroad.

547. A. ericoides L. White Heath Aster.
Common along the railroad.

548. Erigeron annuus (L.) Pers. Daisy Fleabone.
An abundant weed in fields.

549. Leptilon canadense (L.) Britton. Horseweed. (*Erigeron canadensis* L.)
Common in open places.

550. Antennaria plantiginifolia (L.) Richards. Plantain-leaved Everlasting.
Quite common in dry places and open woods.

551. Gnaphalium oblusifolium L. Common Everlasting. (*G. polycephalum* Michx.)
Common in dry places.

552. Silphium perfoliatum L. Cup Plant.
Some found in low, rich ground up Cherry Creek.

553. S. integrifolium Michx. Entire-leafed Rosinweed.
Rather common in low places along the railroad.

554. S. terebinthinaceum Jacq. Prairie-dock.
Not rare in damp places.

555. Heliopsis scabra Dunal. Rough Ox-eye.
A few scattered patches noted in dry places.

556. Rudbeckia hirta L. Black-eyed Susan.
Common in both dry and moist soil.

557. R. laciniata L. Tall Cone Flower.
A few plants noted; grows in moist ground.

558. Ratibida pinnata (Vent.) Barnhart. Gray-headed Cone Flower. (*Lepachys pinnata* T. and G.)
Rather common along roadsides.

559. Helianthus giganteus L. Giant Sunflower.
Common and widely scattered in moist rich soil.

560. H. divaricatus L. Rough Sunflower.
Common in dry woods.

561. Verbesina alternifolia (L.) Britton. (*Actinomeris squarrosa* Nutt.)
Not rare in low woods.

562. Coreopsis tripteris L. Tall Tickseed.
Some noted in open waste places.

563. Bidens connata Muhl. Swamp Beggar Ticks.
Common in wet places.

564. B. frondosa L. Common Beggar Ticks.
Common, especially in moist soil.

565. B. trichosperma (Michx.) Britton. Tall Tickseed Sunflower. (*Corcopsis trichosperma* Michx.)
Very common in some swamps; sometimes the flowers make the whole landscape yellow.

566. Helenium autumnale L. Sneezeweed.
Common along the lake shore.

567. Achillea millefolium L. Yarrow.
Common in old orchards.

568. Anthemis cotula L. Dog-fennel.
In dry soils in waste places.

569. Chrysanthemum leucanthemum L. Ox-eye Daisy.
Some plants found in dry soil.

570. Erechtites hieracifolia (L.) Raf. Fire Weed.
Not rare in open woods.

571. Mesadenia atriplicifolia (L.) Raf. Pale Indian Plantain. (*Cacalia atriplicipolia* L.)
Some plants noted up Cherry Creek in dry soil.

572. M. tuberosa Nutt.
A few plants noted in boggy ground southeast of Eagle Lake.

573. Arctium lappa L. Burdock.
Common in waste places and about dwellings.

574. Carduus lanceolatus L. Common Thistle. (*Cnicus lanceolatus* Willd.)
Common everywhere in open and waste places.

575. C. altissimus L. Tall or Roadside Thistle. (*Cnicus altissimus* Willd.)
Rather common in open and waste places.

576. C. muticus (Michx.) Pers. Swamp Thistle. (*Cnicus muticus* Pursh.)
Common in swampy ground.

577. C. arvensis (L.) Robs. Canada Thistle. (*Cnicus arvensis* Hoff.)
A large patch in a pasture one-fourth mile east of the lake. Plants scattered at various places about the region of the lake.

ADDITIONS AND CORRECTIONS.

578. Anaphalis margaritacea (L.) Benth. and Hook. Pearly Everlasting. (*Antennaria margaritacea* Hook.)

Scattered, in dry places. Out of flower during the season at Eagle Lake, but noted, and found and determined in subsequent work. The patch of *Mentha rotundifolia* was noted too late to press, so the identification is doubtful.

SUMMARY.

The area included within a line along the crest of the hills surrounding Eagle Lake presents for study a remarkable variety of conditions and ecological regions, as (1) upland forest, with native trees and shrubs; (2) cleared and abandoned upland with the flora that has subsequently taken possession; (3) creek, valleys and gullies, with their peculiar soil and flora; (4) railroad and introduced flora; (5) lowland forest; (6) lake plain; (7) tamarack swamp; (8) ponds, temporary and permanent, and quaking bogs and bayous; (9) ice ridge; (10) beach; (11) the lake, with several zones of plants.

The upland forest is much like forests in general throughout Northern Indiana. In some places there is underbrush and herbs, in others a thick carpet of dried leaves. The soil is sandy, and many of the herbs of xerophytic habit. Fungi are abundant.

The cleared land is covered with sassafras, sumac, scrub oaks, Russian mulberry and so on. Many mat plants are present, and there is a tendency of various species of herbs to occupy exclusively the ground they grow on. Among these plants are five-finger and dewberry. Just at the base of the slopes *Fimbristylis* is abundant.

Creek valleys and gullies have a peculiar flora on their slopes, and also in the rich alluvial soil of their bottoms. In many cases they resemble extensions of the lake plain. Among many characteristic plants are skunk cabbage, *Conocephalus*, *Blephilia*, and so on.

The railroad has an interesting introduced flora of wild lupine, *Salsola kali*, squirrel-tail grass, white amaranth, and many other species.

The Lowland Forest, a dense, tangly jungle with a rich sandy loam soil, contains numerous and interesting species. Quaking asp, elm and sycamore are representative trees. The herbs are various, rank, shade and moisture loving species.

The lake plain is a perfectly flat area composed of muck and marl. In many places it is covered with copses of low willows, *Cornus*, *Cephalanthus Spirea* and carolina rose, and this is perhaps its original form. In other places it is a sedgy meadow. Peculiarities are (1) the distribution of plant species in horizontal strata, as, bushes above, then sedges, then ferns, and lower, mosses and *Selaginella*. (2) The flora is so crowded that when a predominant species is in flower it frequently gives its tint to the whole landscape, so we have a succession of "color waves" during the year, as the blue of blue vervain, deep purple of *Lythrum alatum*, light purple of swamp milkweed or joe-pye-weed, brown of *Osmunda regalis*, or yellow of tickseed sunflower or *Rudbeckia*.

The tamarack was nearly extinct, but others near by showed probable former flora of *Sphagnum*, pitcher plants and an interesting assortment of heaths and orchids.

Temporary woodland ponds are mostly bare of bottom except for dead leaves and some shrubs and water crowfoot. The temporary ponds in the open are overgrown with *Scirpus cyperinus* and various species of Eleocharis. These temporary ponds are interesting as they contain plants showing *seasonal* dimorphism, an aquatic form during wet seasons and a land form during dry periods of the year. They also contain plants, the lower leaves of which are fitted to submersed life, and the upper to aerial life, as water parsnips and water crowfoot.

Permanent ponds, quaking bogs and bayous are similar to the lake, except that they contain a greater number and variety of duckweeds.

The Ice Ridge is interesting in many ways, but does not contain many plants peculiar to itself.

The Beach contains a mixed flora. Sometimes its flora is of such plants as *Scirpus Americanus* or various *Elcochari*, sometimes it is seedlings of elms, maples, etc., which have been deposited by waves.

The lake has several zones of plants. Near the shore and extending both ways are plants with well marked dimorphism—a well developed land form, and an aquatic form. Among such plants are, spatterdock, white water lily, *Utricularia intermedia*, water plantain, *Heteranthera dubia*, and many others. *Scirpus lacustris* has two well marked forms which frequently grow side by side and form a distinct contrast. At other places what appear to be intermediate forms are found. Many of the *Potamogetons* have emersed leaves dissimilar in form and structure from the submersed ones. Among the various zones of plants are:

(1) The shore plants, as some species of *Eleocharis*.

(2) Aquatic with emersed leaves (or culms) as *Scirpus lacustris*, spatterdock, water lilies and pontederia, also many *potamogetons*.

(3) Short stemmed aquatics; species near shore as *Naias* and species of *Chara* and *Nitella*.

(4) Long stemmed aquatics, in deep water, as various *Potamogetons*, *Ceratophyllum* and *Myriophyllum*.

(5) Beyond these Phanerogams, and intermixed with them, are the Algae.

The lake disseminates such winged seeds as those of elm and maple, and sows them on the beach.

Various water plants, as *Scirpus* and species of *Potamogeton*, protect the shore from waves. They also serve as points for the attachment of various organisms.

D. The Plant Ecology of Winona Lake.

Lucy Youse.

In the following discussion of plant societies and their distribution about Winona Lake, Warming's system of classification of plant societies will be used. This system of classification, now in general use by botanists, groups plants, except in the case of salt plants, on the basis of their relation to moisture. He distinguishes the following types: Xerophytes, those requiring least moisture; hydrophytes, those requiring most; mesophytes, those of medium moisture conditions; and halophytes, plants of alkaline soil or salt water.

Many things besides climate help to determine the amount of moisture. The quality of the soil has a marked influence upon the water content; clay, for instance, holds water and sand does not. Of all such factors, the topography of the country, since it plays so important a part in determining not only the drainage and the humus content of the soil, but also exposure to the wind, to light and to heat, is held by some to be more important even than surface geology in its influence upon the character of the vegetation. Dr. Henry C. Cowles, in his report upon the plant societies of Chicago and vicinity, has shown this influence to be secondary to that of topography. In his discussion of the same he says: "The flora of a youthful topography in limestone, so far as the author has observed, more