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THE SWAMPS OF OSWEGO COUNTY, N. Y., AND THEIR FLORA.

BY W. W. ROWLEE,
CORNELL UNIVERSITY ITHACA, N. Y.

POSITION OF OSWEGO COUNTY.

Oswego County lies in the extreme northeastern corner of the Finger Lake Basin of central New York. Lake Ontario makes, at this point, a great bend to the north after having its shore line almost due east and west for upwards of one hundred and fifty miles. The lake consequently forms the northern and a large part of the western boundary of the county. On the northeast are the foot-hills of the Adirondacks, some of which extend into the corner of the county. On the southeast is Oneida Lake and Oneida River, which occupy the lowest part of the general basin toward its eastern end, and south of which lie the hills forming the divide between this and the Susquehanna Basin. On the southwest there are no physical boundaries separating this county from adjoining ones. The county is part of the plain which extends west and southwest through several counties, the lowest points in which are occupied by Onondaga Lake, Seneca River, the Montezuma Marshes and Cayuga Lake. The plain narrows rather abruptly to the southeast and leads over a very low divide into the valley of the Mohawk River. A comparatively narrow plain follows the lake shore north through Jefferson County.

DRAINAGE SYSTEM OF THE COUNTY.

The present drainage of Oswego County is peculiar. Oswego River, flowing as it does directly through the county, would naturally be expected to receive a considerable amount of the drainage. It, however, receives very little. A low divide extends from east to west through the central and western parts of the county, the summit of which is about half-way between the north shore of Oneida Lake and the south shore of Lake Ontario. The summit of this divide is well-

5 *Contributions*
H. W. Rowlee

marked east of the river and extends through Fulton and Palermo center. South of the divide the country is very level, only occasionally relieved by gentle undulations. The streams here are very sluggish and often very crooked, some of them flowing through extensive swamps, as, for instance, the Peter Scott swamp in the town of Schroepfel, which in extent rivals the celebrated Cicero swamps in Onondaga County.

North of the divide the surface of the country is very different. Parallel ridges separated by narrow valleys constitute the distinctive features of the topography of the region. The ridges, and more especially the valleys, have their longitudinal axes at right angles to the shore of the lake and nearly parallel with the river. To the ridges local names are applied as "Paddy Ridge" where an Irish settlement occurs, "Ridge Road" and "The Hog Back," the last name being applied to at least two ridges in different parts of the county. The streams of this northern slope follow the valleys between the ridges and consequently flow into the lake rather than into the river. Black Creek, the only stream of any size that empties into the river from the east is deflected at one part of its course several miles before it finds a break between the ridges through which to flow. The ridges, technically known to geologists as drumlins, are not continuous for any considerable distance, the longest being sometimes several miles, the shorter often being less than a mile; they are, as a usual thing, terminated much more abruptly at their northern than at their southern end. Good examples of the abrupt termination is afforded at Seneca Hill where the river passes so near the hill as to cut away a portion and form a bluff. Another striking example occurs at the northern terminus of Jackson Hill, about three miles north of the village of Fulton. Their southern end usually flattens out gradually, and may be entirely lost in the confluence of several hills.

THE SWAMPS AND LAKES.

The furrowed character of the northern slope just described afforded exceptional opportunities for the formation of lakes and swamps. The underlying drift of the whole region is a

blue hardpan, very impervious to water, and we may suppose that as the water in post-glacial times receded, every depression was left full of water. Many were shallow and were soon filled to the brim with vegetable mould; others were deeper and are even now barely full, while some still contain lakes which the invading plant-life is constantly making smaller. There are presented here all gradations between wooded swamps and open lakes. Some swamps, now mostly wooded, as for example, the Wine Creek swamp near Oswego, still have sphagnum persisting in them, and are, no doubt, lakes filled only at a comparatively recent date, while the vegetable accumulations are so shallow in other wooded swamps as to lead one to believe that the ponds which originally occupied them were relatively soon displaced.

Not only does the contour of the country in the northern part of the county determine the flow of the streams, but it likewise determines the form of the lakes and swamps. They are, so far as I am aware, always elongated in a northerly and southerly direction, some of them being several miles long and less than a mile wide.

TYPICAL SWAMPS.

I have selected three swamps from the score or more within the limits of the county, not because they illustrate better than others the observations to be recorded, but rather because they illustrate swamps in different stages of maturity. I have already hinted at what is meant by the maturity of a swamp. The wooded swamps with shallow accumulations of vegetable material, sometimes called muck, matured early in the post-glacial history of the region. Some are just coming to maturity, examples of which have already been cited, and there are still others which are maturing, but will still require many years for their completion.

For want of a better term I have used the word swamp in an extended sense to indicate the whole depression, whether it be covered with water, woods or moor.

MUD LAKE.

Mud Lake is situated in the southwestern corner of the town of Oswego. It is about eight miles southwest of Oswego City,

and perhaps four miles from the shore of Lake Ontario. The depression in which it lies is one of the largest in the northern part of the county, as indeed, the lake is one of the largest of the numerous small lakes in that section. It is about a mile long by somewhat less than three-fourths of a mile wide. The lake lies in a region where the fluted character is not so pronounced as it is in some other sections, nevertheless the lake itself is elongated in a northerly and southerly direction, and the whole depression of which the lake forms but a small fraction is more than twice as long as wide. This lake has withstood the encroachment of the land-making forces better than many of the lakes in the country, probably on account of its greater depth, yet, if the testimony of old residents is to be trusted, and in this respect at least I have no doubt it is, the surrounding moor is encroaching upon the lake very fast. The moor surrounding the lake is the most extensive one in that section.

THE LILY MARSH.

The swamp known by this name is better known to the people living in that vicinity than other moors as large, or even larger, and probably for two reasons. One is that for many years it has been a famous hunting ground for white rabbits in winter; the other is because a highway was constructed many years ago directly across the open part of the swamp, the open, softer portion being bridged with a long plank bridge. Few people in that part of the county but have had occasion to drive across it, an experience not soon forgotten, at least by a timid person. The Lily Marsh is situated in the southwestern corner of the town of New Haven. It presents the phenomena of a lake just disappearing. The lake in the center is reduced to a mere pool not more than twenty rods long and half as many wide. I have had very definite statements from men who could remember well when the bridge was built, and they assured me that at that time the lake reached to the bridge; now it does not reach within fifteen rods of it. Notwithstanding the fact that the lake in the Lily Marsh is almost overgrown, the swamp itself is a very extensive one. The whole depression in which it lies is very long and narrow. I did not

attempt to get actual measurements of its length and width. From what I could see in it and from the highway I should judge it to be not far from four miles long, and in no place more than three-quarters of a mile wide. In this, as in the other swamps which are nearly mature, the wooded belt covers by far the greater portion of the marsh. There is left here, however, an open bog nearly, if not quite, a mile long, and from twenty to thirty rods wide.

GRANNY'S ORCHARD.

This is the last of the three depressions selected for illustration. It is a marsh in which there is no lake, nor has there been one in the memory of the persons living thereabouts. It takes its name through the resemblance the open portion of it bears to an orchard and a well-confirmed story that a man known universally in those parts as "Granny" attempted at one time to reclaim some of this land by draining it. It is in the eastern part of the town of Palermo, and lies well up toward the divide between Oneida Lake and Lake Ontario. There are more large swamps in this vicinity than in any other part of the county. To these some of the residents apply indiscriminately the term *Granny's Orchard*, but I feel sure the name originated in the manner I have described, and is restricted by a majority of the people to this single swamp. Yet the appropriateness of the name might easily lead to its more general use.

It is a very extensive swamp. In fact it must be confessed that we had hard work to estimate distance in this place, the view was so intercepted by trees and shrubs. The open portion of the swamp is surrounded by a densely wooded belt, and shrubs and trees of the most aggressive species have invaded the moor until it presents the appearance of an orchard, the trees of which are here represented by tamaracs and spruce. The level openings between are carpeted with sphagnum. The extent and nature of the wooded belt repels visitors even in summer, so that it is seldom visited except by adventurous huckleberry gatherers in August. The man who guided me into the bog, the first time I visited it (himself an old resident),

thought it would be unsafe to venture in there in spring or autumn. To the north of Granny's Orchard proper the wooded belt stretches away for several miles. Catfish Creek, a small stream, flows through the northern end of the swamp, flowing north into Lake Ontario. The small, sluggish stream draining Granny's Orchard flows south into Oneida Lake. It is evident that the whole swamp was once a large lake, and whether it drained into Lake Ontario or Oneida Lake remains to be investigated. The gulf cut through the whole hill where Catfish Creek leaves the swamp suggests that it may have been cut through after the lake had partially filled. I have not yet had an opportunity to study the outlet to the south.

ORIGIN OF THE MOOR FLORA.

If we may judge from the actual conditions existing now in Arctic regions, immediately succeeding the glacial epoch this whole region was clothed with a vegetation resembling that now existing in our moors, indeed, resembling it much more than does any other feature of our present flora with the possible exception of the Alpine plants still persisting on our mountain tops. It is indeed an extraordinary circumstance that our lowest (in altitude) regions and our highest regions should have preserved to us a flora which is, for the most part, extinct. Since the Alpine plants and many of the bog plants draw nearer and nearer together so far as situation goes, as we go northward, until finally we find them mingled, our statement of the case is a correct one, and confirms the idea that our moor floras are remnants of an Arctic vegetation once predominating here.

THE RAPID ACCUMULATION OF MATERIAL IN THE DEPRESSIONS.

Although such a condition may not have actually existed, we may assume, for the purpose of illustration, that one of the depressions caused by the ice in this movement was left naked by the sudden lowering of the water level in the region. A lake would be left in the depression. The moisture held in the soil of the surrounding hills would steadily gravitate toward the lake and form springs. The water from these would often more than offset the loss of water from the surface of the

lake by evaporation. On the shores of these lakes would be afforded a congenial place for the first plants, among which, no doubt, sphagnum was prominent. The available food supplies in the soil of the hills around was washed and afforded food for these plants. As plants grew upon the hills, vegetable humus accumulated, and the wash from this further enriched the soil at the shore. But while this washing contributed something to the accumulations of the swamp, it, under no circumstances, can be compared to the soil washed down upon the flood plains of upland streams, and for the reason that these streams are not rapid enough to carry much solid material. The accumulations in the swamps are almost entirely the decayed plants that have grown there.

ABILITY OF THE LAKE TO RESIST INVASION.

The factors which determine the ability of the lake to resist invasion are its depth and the character of its shores. If the conditions are right, a lake even of considerable depth will be steadily encroached upon by vegetation. On the other hand a shallow lake will grow over much more rapidly. There is a popular notion that a cranberry bog may grow right over a lake, and that the flexible turf is like a blanket spread over the surface of the water. Walking on these places certainly gives one that impression. I have never seen a case where this was the actual condition of affairs. If you penetrate the turf anywhere you will find the blackest and softest kind of mud, almost as mobile as water, but as a plant food much more nutritious. From a boat there sometimes appear deep recesses far under the turf, but these are more apparent than real. There are often recesses under the turf, just as there are under harder shores, but these are not deep, and I feel reasonably sure that the floating moors float upon mud rather than upon water.

THE EFFECT OF WIND UPON THE RELATIVE POSITION OF LAKE AND BOG.

The position of the lake, with reference to other parts of the swamp has attracted my attention for some time. The lakes in the northern and western parts of Oswego County have, as

a general rule, their eastern shore hard, while the others are bordered by moors or by wooded swamps which are but matured portions of a moor. This is true of Mud Lake, Lake Neatahwantah, Paddy Lake, and the small lake in the Lily Marsh, all within twelve miles of Lake Ontario. At one time I thought the scarceness of springs might account for the failure of moors to form. But further observation led me to think their meagre occurrence on this shore the result, rather than the cause, of the absence.

There is what seems to me sufficient evidence to show that it is the action of the waves upon the eastern shore that prevents the formation of bogs there. At Mud Lake I have seen large masses of sphagnum and other plants from the west side of the lake lodged upon the east shore. Instead of taking root and growing they were soon washed to death by the waves. The action of the waves is very vigorous on the east shore of all the larger lakes. It is true also that where lakes are well-nigh filled up and the force of the waves is comparatively slight, the moor will begin to build from the eastern shore, but the belt constructed will be narrow compared with that on the other shores. This is the condition now existing in the Lily Marsh. Still another consideration points in the same direction. The small lakes in this particular region and the larger ones more remote from Lake Ontario have bogs on all sides of them.

Anyone who has lived in the region need not be told that prevailing winds are from the west. Their intensity, which, by the way, is often considerable, depends upon the long stretch of open lake to the west, and also, perhaps, somewhat upon the saturated condition of the atmosphere as it is swept in from the lake. The wind from Lake Ontario is so strong as to produce a decided effect upon the trees growing near the shore. They stretch their branches and often, indeed, lean toward the southeast. Another striking illustration of the power of the winds on the lake shore is seen in the great drifts of sand along the shore, sometimes called sand-dunes. Nor is the drifting of sand confined to the immediate shore of the lake. There is a sand hill in the town of Albion near a ham-

let called Dugway, quite as far from the lake shore as the lakes we are discussing, where the wind drifts the sand very considerably. Another one is said to occur between Sand Bank and Centerville in the same town. A visit to the former showed that the wind was actually moving a hill east, moving it grain by grain, but nevertheless very rapidly. The highway running north from Dugway formerly passed along the east side of the hill near its base. Old residents told me that the hill was originally wooded. After being cleared away it was cultivated and finally was seeded and used as a pasture. The work of the wind began when it was used as a sheep pasture. The sand drifted into the road until the people were hardly able to haul loads over it. An attempt was made to stop the sand by building a high board fence. The sand immediately began to drift against the fence and finally drifted over it, so that now only the tops of the boards can be seen. Failing in their attempt to fence out the sand, the people have bridged it over with planks for a distance of forty rods or more. All this goes to show that the west winds in this region are unusually strong, and produce a decided effect upon other features of the region as well as upon the lakes.¹

UNIFORMITY IN MOOR FLORA.

One of the strongest pieces of evidence to support the view that the whole face of the country was once covered with a vegetation much more like that in our moors than like that upon our highlands, is the uniformity of the moor flora. The sphagnous moors are isolated, but we find the same species of plants in them all. It is impracticable for plants to migrate from one to another at the present time. The moors remind one of an island in the open sea—*islands which preserve to us a primitive flora.*

So constantly are certain species present in the moors of the whole eastern United States, that upon entering a moor one begins to look for certain species, and at once misses any one that does not happen to occur in that particular moor. An

¹ Since writing the above, Warming's *Oekologische Pflanzengeographie* has appeared, and in it, p. 365, is described the effect of the wind upon the lakes and moors of Denmark. The effect is the same as here described.

example: *Kalmia glauca* does not now occur in the Cayuga Lake Basin, but it occurs in many of the moors to the east and north, even appearing in the adjoining county, i. e., Cortland.

THE ZONES OF A SWAMP.

The character of the vegetation enables us to divide a complete swamp into three natural zones:

First, the *lake* in the center, which, although not a belt at all, may, for convenience sake, be so designated.

Second, the *moor* comprising the open area surrounding the lake and generally grown over with sphagnum. There are no shrubs or trees here capable of casting extensive shade.

Third, the *wooded belt* comprising the remainder of the swamp. It varies in width, and in this particular region is apt to be of considerable width north and south of the lake.

In the maturing of the swamp these disappear in regular succession from one to three. Local conditions bring about a great variation in the relative extent of the several zones. At Malloryville, Tompkins County, N. Y., is a swamp with a very narrow wooded belt, due, no doubt, to the steepness of the shores of the depression; the lake here has been completely filled up, so that we really have a moor surrounded by high ground. The wooded belt is, however, a marked feature of the swamps in Oswego County.

(*To be continued.*)

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THEIR FLORA.

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(Concluded from page 699.)

THE LAKES.

In the region of our typical swamps these lakes are frequently of considerable depth. Usually, however, they are comparatively shallow. Stories are told here, as elsewhere, of "bottomless lakes" where a line, no matter how long, would not reach the bottom. The fine mud in the bottom was, in all probability, the cause of the deception. At the bottom of the lake the mud is as mobile as water, and it is difficult to determine where fluid ends and solid begins, and hence the difficulty in sounding. There are at least three lakes in this region called Mud Lake, a fact which testifies to their character. One is Mud Lake in Oswego town already described, another is in Scriba in the same county two or three miles south of the

Lily Marsh, and the third is near Baldwinsville in Onondaga County.

The mud of the swamps gives a decided character to the streams of the region. Whether a stream rises in the lake or flows through it or any other part of the swamp, the water is colored by the mud a dark yellow or wine color. This color of the water of many of the streams led to the application of appropriate names, such as Wine Creek, Mud Creek and Black Creek.

THE LAKE FLORA.

While the flora of the lakes present many interesting features, the plants are much less unique than those of the surrounding moor. Aquatic plants have long been noted for their wide distribution. Darwin has pointed out that this depends upon the distribution of their seed by birds. While we are ready to accept this as one of the means by which the plants disseminate themselves, we must also assert that the ultimate causes of this is the similarity of conditions presented by aquatic conditions generally. The conditions are very much the same in our lakes as in other similar bodies of water, such as slow flowing streams and lakes with hard shores. Aquatic floras are, however, quite distinct from terrestrial ones of the same region. The moors surrounding our lake come very near affording aquatic conditions. Nevertheless the shore line between lake and moor is a pretty definite one. The following are species representative of the lake flora:

The *Naiadaceæ* afford a characteristic group belonging here. None of them find congenial conditions outside the bounds of the lake, and most of them are confined to water several feet deep. *Potamogeton amplifolius*, *P. lonchites* and *P. heterophyllus* are in the latter class, while *Naias flexilis* and *P. foliosus* approach nearer the shores.

Vallisneria spiralis is a plant which does not appear very near the shores.

Eleocharis mutata must be considered, at least in this region, a lake plant, as at Lake Neahahwantah and Paddy Lake, our only stations for it, it grows only in water. It seems essential, however, that its roots only should be submerged; the culms

always appear above water, and consequently it occurs only upon rather shallow shores.

The Lemnaceæ are represented in the lakes by *Lemna trisulca*, *L. minor* and *Spirodela polyrhiza*, none of which make any attempt to grow in the bog.

Eriocaulon septangulare is one of the few plants that are common to the lake and the moor, in fact, it is about the only one. Whether it grows upon sand in a few inches of water, or upon the soft mud in the newest portions of the moor, it seems equally at home. I have found it growing in four lakes in the county, but never saw it in a swamp where there was no lake. Paine says (Cat. of Plants of Oneida Co.), of the distribution of this plant, "Lakes and ponds of the north woods, throughout and common." I conclude, therefore, that the plant is, in this region, a lake plant.

Heteranthera dubia is a deep water plant, and grows in these lakes as well as in slow flowing streams.

The whole order Nymphaeaceæ is a water-loving group. With rare exceptions it is confined to the shallower portions of the lake. The exceptions are cases where the strong rootstock of *Nymphaea* and *Castalia* have persisted after the moor has advanced into the lake beyond them and sends up, for a few years, its leaves and flowers through the thin turf. The contrast between the black mud of the moor and the pure white flowers of *Castalia* is very striking. *Brasenia purpurea*, *Castalia odorata*, *Nymphaea advena* are the representative plants. The depth of water in which these plants grow ranges from one to six feet, only rarely going outside these limits.

Myriophyllum spicatum is a well-known aquatic finding a place here.

The Lentibulariaceæ is represented by two species in the lakes and several others in the moor. None of its species are common to both lake and moor. *Utricularia vulgaris* and *U. minor* are the lake plants. While occurring in other places, they thrive particularly well in the muddy lakes surrounded by moors.

And, finally, for the order Compositæ, we have, in our lakes, a single representative in *Bidens beckii*.

THE FLORA OF THE MOOR.

There is no group of plants more interesting from the point of view of their geographical distribution than the one which constitutes the moor flora. Allusion has already been made to the probable post-glacial history of the flora; and attention has also been called to its relation to the Alpine flora of New York State. The general fact that the two floras approach each other toward the north until we find them closely associated in Arctic regions, is pretty conclusive evidence of closer association in post-glacial times. But their limited distribution and their relation to our Alpine flora is no more interesting than their distribution in the moor itself. Some of the plants are restricted to the newer portions of the bog; others are only found in the older portions. Those of the newer portion are, in general, the invading plants; those of the older portion sometimes persist in the wooded belt. In the older portions of the bogs there sometimes appear upland plants. A general survey of the species may here be made.

The *Juncaginaceæ* are all marsh plants. In our region they are, so far as I know, mainly confined to the newer portion of the sphagnous moors. *Triglochin maritima* occurs at Mud Lake, Oswego town, "Paradise," So. Mexico, Granny's Orchard, Palermo, and other places. According to the Manual (Gray's) it occurs at the seashore and in saline places across the Continent. Mud Lake is by no means a saline place. *T. palustris* has not been seen, so far as I know, in Oswego County, but occurs at Junius, Seneca County, in the same basin, also upon the "boggy borders of Onondaga Lake; at Salina, and northward beyond Liverpool" (Paine, l. c., p. 81). *Scheuchzeria* occurs in the newer portions of all our sphagnous moors.

There are but few *grasses*: *Phragmites*, *Muhlenbergia racemosa*, *Panicularia canadensis* and *Calamagrostis canadensis* are frequently found in the moors, but are not confined to them.

On the other hand the *Cyperaceæ* is one of the best represented orders. Here, and here almost exclusively, the species of woolgrass (*Eriophorum*) grow. One of the most effective bog-making plants in this region is *Carex filiformis*, the rootstocks of which form a very strong warp into which other

plants are woven. It presses up close to the margin of the lake, and affords a pretty sure indication as to whether it is safe to venture upon the place or not. Other characteristic carices are *C. pauciflora*, *C. teretiuscula*, *C. magellanica*, *C. limosa*, *C. exilis* and *C. redowskyana*. Other species of *Carex*, as well as some species belonging to other genera in this order, are often found in the bog.

Peltandra virginica is in the moors, but occurs as well along all our streams. *Calla*, while perhaps not exclusively a moor plant, occurs here more frequently than anywhere else.

But a single species of the *Liliaceæ* is found, viz.: *Tagnera trifolia*.

In distinct contrast we find this the chosen home of our rarest orchids. The representative species are: *Habenaria blephariglottis*, *H. clavellata*, *H. dilatata*, *H. leucophaea*, *Cypripedium virginæ*, *Pogonia ophioglossoides*, *P. verticillata*, *Arethusa bulbosa*, *Gyrostachy romanoffiana*, *Listera australis* and *Limodorum tuberosum*.

Two willows, *Salix myrtilloides* and *S. candida*, are exclusively moor plants in this region.

Sarracenia purpurea is confined to the moors, and is one of the most unique in appearance and habits of moor plants.

Drosera intermedia occurs only in the newest portions of the moor, while *D. rotundifolia* is more often in the drier portions, sometimes even growing upon rotten logs at the margin.

Three of the *Rosaceæ* are conspicuous moor plants. *Comarum palustre* is usually upon the water's edge, and is a pretty effective moor builder. The other species are *Genm rivale* and *Sanguisorba canadensis*, both of which are in the more mature portions.

Decodon verticillatus occurs in considerable abundance in most of the lake-containing swamps, but, as is well-known, is not confined to them. It is also an important moor builder.

Two species of *Epilobium* are confined to the moors--*E. lineare* and *E. strictum*.

Proserpinaca palustris must also be included here.

The *Ericaceæ* is one of the three most conspicuous orders in the moors. The other two are the sedges and the orchids.

The species here which are exclusively moor plants are: *Ledum Groenlandicum*, *Kalmia glauca*, *Andromeda polifolia*, *Chamaedaphne calyculata*, *Chiogenes hispidula*, *Schollera oxycoccus* and *S. macrocarpa*. Many others, especially species of *Vaccinium*, live in the moor, but are not confined to them.

Menyanthes trifoliata is a moor plant, and is not uncommon in our region.

The *Lentibulariaceæ* contribute to this group *Utricularia cornuta*, *U. gibba*, *U. intermedia* and *U. resupinata*, all of which are rare plants and grow only in the newer portions.

In the order *Compositæ*, but three species can lay claim to being exclusively moor plants. These are *Solidago ohioensis*, *S. uliginosa* and *Aster juinceus*.

THE FLORA OF THE WOODED BELT.

The third zone of the whole swamp is still to be considered. To attempt to enumerate the species as has been done in the case of the bog and the lake would contribute little to our picture of the swamp as a whole. The species are, for the most part, the same as may be found upon the surrounding uplands, especially in low places. In fact, we may say that just as the moor is steadily invading the lake, so the wooded belt is invading the moor, and there is by no means the sharp limitation to the outer edge of the wooded belt that there is to the outer edge of the moor or of the lake. It is always a tree-covered tract in the natural state, the size of the trees increasing as one passes from the edge of the moor to the hard shore. The trees which appear most frequently are *Ulmus americana*, *Acer saccharinum*, *Fraxinus nigra*, *Pinus strobus*, *Thuja occidentalis*, *Larix laricina*, *Picea mariana* and *Betula lenta*. Of these the predominating species are the first three or four. Shrubs are more abundant in the more open portions near the moor. *Lindera Benzoin*, *Ilex verticillata*, *Ilicoides mucronata* and several species of *Vaccinium* are the most prominent. The herbaceous the wooded belt is not a very rich one. *Caltha* often covers flora of the ground. The most prominent plants are the *Osmundas*, which grow in rank profusion. *Smilax hispida*, *Arisæma triphyllum*, *Dolibarda repens*, *Trientalis americana*, *Medeola vir-*

giniana and many others also grow here. As might be expected, it is a flora made up of species which are by no means confined to this particular place. Some of them flourish equally well upon the surrounding uplands; a few grow in the open moor; many grow in low grounds that do not have the vegetable accumulations characteristic of these swamps.

THE DISAPPEARANCE OF SPECIES WITH THE MATURING OF THE
BOG.

The rareness of some of the bog plants attest the gradual disappearance of species from these places. Specimens of *Listera australis* were found by Father Wibbe at the Lily Marsh in New Haven in 1877, where he reported it as growing abundantly.² The writer has visited the same place several times

² Bull. Torr. Bot. Club, VI, 192.

since 1888, and has failed to find it again. It is safe to say that it is not abundant there now. A few plants were found by the writer in "Granny's Orchard," in Palermo, in 1895. Here continued and careful search resulted in the finding of but a few plants. Dr. W. M. Beauchamp has found the same species growing at Mud Lake near Baldwinsville, Onondaga County. Here, too, only a few specimens were found. These are, so far as known, the only stations for this species north of New Jersey. It is significant that a considerable number of species, not only those that affect bogs, but some Upland ones, have the same general range as *Listera australis*. The most conspicuous of these are: *Rhexia virginica*, *Nyssa aquatica*, *Eriocaulon septangulare*, *Triglochin maritima*, *Xyris montana*, *Scheuchzeria palustris* and several of the *Utricularias*. It seems a reasonable inference that formerly there existed in these regions conditions much more congenial to these plants; that then they were more abundant and continuous in their range than now, and that they have settled in the limited tracts which afford them a congenial home. The conditions which conduce to their persistency are no doubt complex. The main ones, however, seem to be a constant and abundant humidity in the air and abundant moisture in the soil, and, at the same time, a relatively even temperature throughout the year. Humidity

in the air is maintained by the extensive surface of the sphagnum moss from which it steadily evaporates great quantities of water. Many plants, especially the delicate orchids, are found only in the moss. The humidity of the air immediately at the surface of the moss at once suggests the conditions in the tropics where the epiphytic orchids thrive.

COMMERCIAL VALUE OF THE BOGS.

The capacity of the moss to hold moisture and the evenness and freedom with which it gives it up, has led to its extensive use in packing the roots of plants during shipment. In the Lily Marsh and Mud Lake in Oswego township, the moss has been removed from a large part of the moors. The effect upon the bog itself is anything but wholesome. By this treatment a clean, mossy moor is turned into a stinking, sour, unsightly and treacherous mud-hole. Nowhere did I ever see such violence done to nature as where the moss is removed from a moor. The traditional woodman's axe does not compare; a burnt forest soon recovers itself to a certain extent; but a bog from which the moss has been taken reclothes itself very slowly, and will probably never become a thick turf as originally. Certainly none of the rarer plants will endure such treatment.

CONCLUSIONS.

1. Swamps form one of the striking and important topographical features of Oswego County.
2. These may consist of a lake, a moor and a wooded belt; but in many the lake has been converted into a moor, and in others both lake and moor have passed over into wooded tracts.
3. The surface of the county was fluted by the ice; this determines the outline of all the swamps.
4. The finely pulverized remains of plants (mud) are stirred up with every wind, so that material is constantly shifted from the muddy shores to deeper water.
5. The agitation of the water by the wind has two important influences on the shore: its violence prevents sphagnum from growing at the water's edge; *Cassandra*, sedges and *Decodon*, with others, form a barrier at the edge; second, it pre-

vents plants from gaining a foot-hold on the eastern shores where the lakes are of considerable size.

6. The flora of the moor has among its species some of the rarest plants of the region.

7. A considerable number of species otherwise confined to the Atlantic coast occur here. It does not follow, as Paine asserts (*l. c.*, p. 92), that a maritime bay occupied this depression.

8. The distribution of moor-loving plants suggests that once conditions of humidity and temperature enabled them to grow very much more abundantly than now.

9. The commercial value of the moss bids fair to devastate the moors, and their recovery will, of necessity, be very slow.

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