

FOREST DISTRIBUTION AT THE ENDS OF THE LAKE CHICAGO BEACHES

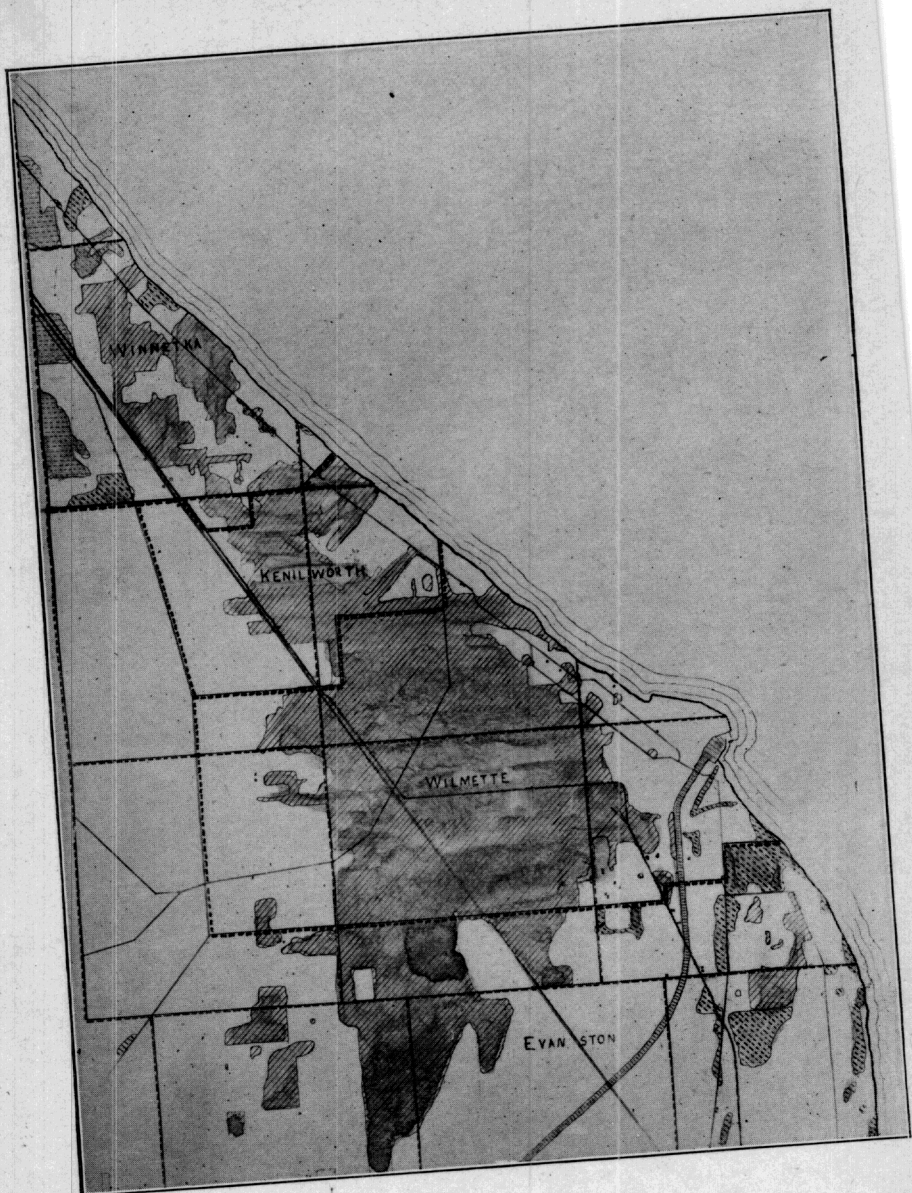
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INTRODUCTION

The work for this study has been carried on in connection with an ecological survey of the same region. The problem undertaken is to determine the location and character of the present forest areas and from the results of this investigation to decide upon the nature of the more extensive forests which occupied this region in the past.

The area covered by the study extends along the shore of Lake Michigan a few miles north of Chicago and includes the northern part of Evanston, all of Wilmette and Kenilworth and the eastern part of Winnetka. Its general shape is somewhat triangular, the lake shore forming the north-east side, Simpson Street, Evanston, the south, and the Gross Point Road and the section lines west of sections 16 and 21 of New Trier Township the west side. The area covers the eastern parts of sections 21, 28 and 33 in New Trier and of section 10 in Niles Township and all of sections 16, 22, 26, 27, 34 and 35 in New Trier, 11 and 12 in Niles and the northern section in Evanston Township. Section 12 of Niles Township is sometimes included as part of Evanston Township, being within the limits of the City of Evanston. Several of these sections are not complete, the north-eastern portions being cut away by the lake (Figure 1.)


This region has been settled for a long time and consequently the natural conditions have been more or less disturbed. The eastern portion at the present time is largely a residence section while the land on either side of the Gross Point Road is under cultivation in truck farms and greenhouses. Because of the building of towns throughout the sections, the natural physiographic and vegetational features have been obscured and in many places destroyed by draining, grading and cultivation.



Distribution of Forests


 Mesophytic
 Upland Forest


 Xerophytic
 Sand Ridge
 Forest


 Morainic
 Swamp Forest

A. LITERATURE

There has been little study made of the forests of this region. Hall and Ingall (7) describes the forests of the northern part of the state, but they made a detailed study of only the uplands of Pike, Calhoun and Jo Daviess counties and the bottomlands along the Mississippi and Illinois Rivers. Cowles (5) has described the vegetation of the Chicago region dividing it into three general types depending upon soil and topographic conditions: the mesophytic upland forest on morainic clay, the hydrophytic lakes and swamps and mesophytic prairies of the Chicago plain and the xerophytic forests of the dunes and ridges. The plant associations found in the area studied come under these general types and the lists of characteristic trees and undergrowth given by Cowles are very valuable.

A similar ecological study has been made of the northern part of Glencoe by Hazel M. Schmoll (11), but her section lies on the morainic upland and does not include any of the Chicago plain and the ridges, which compose the greater part of the Evanston-Winnetka area. Ulrich's study of conditions in the McLeish ravine at Glencoe (13) and Sherff's of the vegetation of the Skokie Marsh (12) also deal with conditions not found in this area.

The only articles which deal directly with the vegetation of this region are those by residents of Evanston and are very enlightening as to the former conditions there. C. B. Atwell (1) in an address before the Evanston Historical Society, described the forests on and between the ridges of Evanston, comparing the different types. Otherwise there has been no investigation made.

B. METHODS

The general limits of the area to be covered in this study were chosen to include the ends of the beaches of Lake Chicago and the land between them. The lines were rather arbitrarily drawn, but an investigation of the forests beyond the borders of the area showed that

they were similar to those studied, where the conditions were the same.

A map of the area was made, built up from the topographic map of the Evanston quadrangle and from the maps of the various towns included. Owing to admitted discrepancies in the topographic sheet and to the lack of a definite scale of miles in the city maps, certain defects are known to occur in the resulting map, even extending so far as to the possible location of some of the section lines. The map is, however, as nearly correct as it was possible to make it and its value is not seriously impaired.

The larger forest areas were located on this map and the position of individual forest trees noted. A more intensive study was then made of the typical areas in which the natural vegetation was least disturbed, or of those which appeared unusual. The chief points considered were the composition of the forest area, both in trees and undergrowth, and its general topographic position, the nature of the soil, drainage conditions, light, exposure and any other factors which might determine that composition. From the results of these investigations and from any other information available, conclusions were drawn as to the probable extent of the original forests before their destruction.

Several difficulties were encountered in making this investigation, one being the possible error in deciding which trees should be considered members of the original forest. All oaks, hickories, and butternuts and such elms, maples, ashes, lindens, cherries, birches and cedars as by their size, apparent age, and location indicate their presence naturally, were noted as forest trees. Mr. Currey (6) however, in the "Plan of Evanston", states that many of the trees of Evanston were planted by the early settlers, being imported from the "Big Woods" two or three miles west for that purpose. If such is the case, there may be some errors in determining the limit of the original forest, but as most of these trees were elms and maples which are not used as absolute criteria, the results should not be far from correct.

Another difficulty was in identifying the difficult species of oaks. The red oaks are so much alike that it is almost impossible to distinguish between them without special study. An investigation is being carried on, at the present time, by some of the students of Northwestern University, under the direction of Dr. W. G. Waterman, to determine the relative proportions of *Quercus rubra*, *Q. velutina* and *Q. ellipsoidalis* in this vicinity. The white oaks of the region, *Quercus alba*, *Q. macrocarpa* and *Q. bicolor* are more distinct species, though even with them identification is sometimes uncertain in individual cases where leaves and acorn cups can not be had for comparison. But in general, the reported distribution of the species of white oaks may be considered reasonably correct.

PHYSIOGRAPHY

A. GEOLOGY

The whole of the region, with the exception of the portion west of the Gross Point Road and its extension north, is located upon the Chicago plain, which was once a part of the floor of Glacial Lake Chicago. The history and description of this plain are given fully by Bannister (3), Leverett (9), Salisbury and Alden (10) and especially by Atwood and Goldthwait (2), so that only the essential features need be discussed here.

As the continental glacier receded from the Lake Michigan trough and the country round about, it appears to have left at its foot a large body of water which extended over a greater territory than the lower end of Lake Michigan and is appropriately called Lake Chicago. Due to possible tilting, changes in outlet and other causes the recession of the lake was not gradual but there were three stages at which the waters of the lake stood for a long time, each stage having its trace in beaches and bars on the lake plain as it was exposed.

At the earliest, or Glenwood stage, the water stood sixty feet higher than the present level of Lake Michigan. The beach can be traced from the water works

at Winnetka, along the east side of the ridge, which the Gross Point Road follows, to a point south of Winnetka where it turns west and north. South from this point a low sand bar was built by the action of the waves and current, almost cutting off the mouth of an embayment to the west which is called the Skokie Bay.

The second, or Calumet, beach follows closely the line of the first and continues along the east side of the Glenwood bar. At this stage, when the lake was twenty feet lower than at the Glenwood stage, or about forty feet above Lake Michigan, a second bar was built, which seems to have extended from some point northeast of the present shore line, southwest to the Rose Hill Cemetery in Chicago. This Rose Hill bar, as it is called, appears at the Wilmette harbor and is followed by Ridge Avenue, Evanston. Between it and the Calumet beach proper was another shallow stretch of water known as the Wilmette Bay.

The Tolleston beach, the latest of the three, appears at the lake on the Northwestern campus and extends southwest approximately parallel to the others. At the time of the formation of this beach, the lake stood about twenty feet above the present lake level. Several slightly lower ridges and the Tolleston bluff are mentioned by Goldthwait, but these do not appear in the territory covered.

Finally the lake fell to the present level and is now causing the destruction of the land which was formerly part of its floor. It seems evident that it has already worn away a large amount for it is cutting into the old morainal clay of the upland between Winnetka and Waukegan, all traces of the three beaches having been entirely obliterated. The Tolleston beach, indeed, has been destroyed between Evanston and Waukegan.

B. TOPOGRAPHY

In general, then, the topography is that of a fairly level plain, sloping from the foot of a bluff at the northwest and interrupted by sand ridges parallel to the bluff. At the north is the morainic upland, descending in per-

ceptible steps to the Skokie Marsh, west of the region. The eastern line of the upland is the Glenwood bluff, starting at the lake south of North Avenue, Winnetka and swinging west and south to the C. & N. W. Ry. which crosses it at about Willow Street. South of this it is followed by the Gross Point Road which continues along the bar built out from the end of the ridge.

From this ridge the land slopes east more and more gradually to the lake where it ends in a steep bluff about thirty to forty feet high. There is also a slight descent toward the south. The second ridge, starting at the Wilmette harbor follows a line a little west of south. It rises ten to twenty feet above the land on either side, which drops away with a gentle slope. A short spur extends northwest from this ridge just north of Maple Avenue, Wilmette. East of the ridge the slope is again to the south and east for the northern portion where the Calumet and Tolleston ridges approach each other is higher. The slope is greater on the west side of the Calumet ridge for here the old Wilmette Bay was protected by the bar.

The Tolleston ridge rises only about five or ten feet above and is not clearly defined north of Simpson Street as the eastern side has been eroded by the lake. A narrow strip of sand and gravel forms the beach below the wave-out bluff which increases from about fifteen feet at this point in Evanston to over sixty feet in Winnetka where the upland appears.

The whole region is underlain by the unworked glacial till covered along the ridges and in local areas by deposits of more or less stratified sand and gravel. The crests and slopes of the ridges are well drained, but drainage in the clay lowlands is very poor and wherever minor depressions occur, water stands for a long time in the spring. An attempt has been made to remedy this condition by the digging of various small drainage ditches and of the North Shore Channel, but numerous small swampy areas still exist.

Some idea of conditions in this region before it was artificially drained is given by Frances Willard (14),

who says that at about 1865 the part of Evanston north of Church Street and west of Chicago Avenue was a marsh standing partially under water for several months of the year. This tract, she says, was later drained and made habitable by her father. In describing Evanston at the founding of Northwestern University, Mary Louise Childs (4) also speaks of this swamp and says that practically all of Evanston was a swamp with a few groves of oaks and maples on the higher ground. Such a patch is that now included in the Northwestern University campus. These swamp conditions extended to the bluff at Winnetka and the present towns of Evanston, Wilmette and Kenilworth would have been impossible without artificial drainage.

INVESTIGATION

A. ASSOCIATIONS

A large part of this region is still covered by an extensive forest which may be divided into three distinct associations, characterized by the predominance of certain tree species and by the accompanying undergrowth; the upland oak-hickory, a more or less xerophytic sand ridge type and the morainic swamp forest. The associations of the Chicago Region have been described by Cowles (5) and his classification is followed here.

No great attempt has been made to differentiate between the types of red oaks, *Quercus rubra*, *Q. Velutina* and *Q. ellipsoidalis*, for, as it has been said, it is very difficult to distinguish the species. In general, *Quercus velutina* (*Q. coccinea-tinctoria* of Cowles) seems to occur very sparingly, while *Q. rubra* and *Q. ellipsoidalis* are found in all the associations in varying proportions. *Q. coccinia*, mentioned by Cowles as a member of the swamp forest, is not found in this region.

The upland oak-hickory association on the moraine west of the Glenwood beach, is composed chiefly of the white and bur oaks (*Quercus alba* and *Q. macrocarpa*, with a small proportion of red oaks, hickories (*Carya ovata*) and a few scattered black cherries (*Prunus*

serotina.) There is little undergrowth remaining, but in a part of the forest beyond the arbitrary boundary line are *Prunus virginiana*, *Podophyllum*, *Viola*, *Geranium* and *Trillium recurvatum*.

In the xerophytic sand ridge forest, the red oaks, *Quercus macrocarpa* and *Quercus alba* are the chief types. The proportions vary but, on the whole, the red oaks are the more common. The shagbark hickory and the black cherry are also found in smaller numbers and one large black walnut (*Juglans nigra*) stands at the corner of Pine Street and Maple Avenue, Winnetka. The undergrowth is very slight, lacking in shrubs, and consists of the more xerophytic herbs, as *Smilacina racemosa*, *Trillium recurvatum*, *Viola*, *Antennaria*, *Achillea*, *Fragaria* and *Potentilla*.

The morainic swamp forest, which is the most extensive, and also the least disturbed, varies in composition in localized areas, but the swamp white oak (*Quercus bicolor*) is dominant everywhere. Other trees typical of the swamp forest are the butternut (*Juglans cinerea*), elm (*Ulmus americana*), ash (*Fraxinus americana*), linden (*Tilia americana*), white maple (*Acer saccharinum*), and various haws (*Crataegus* sp.) although they do not occur in such large numbers. The red oaks and *Carya ovata* are also members of this forest. The undergrowth is very luxuriant with young trees, *Prunus virginiana*, *Rosa*, *Sambucus canadensis*, *Ribes*, *Rubus*, *Xanthoxylum americanum*, *Rhus toxicodendron*, *Celastrus scandens*, *Vitis*, *Ampelopsis quinquefolia*, *Smilax hispida*, *Viola* sp., *Trillium grandiflorum*, *T. recurvatum*, *Claytonia*, *Geranium*, *Phlox*, *Anemone*, *Sanguinaria*, *Cardamine bulbosa*, *Ranunculus* sp. *Smilacina racemosa*, *Podophyllum*, *Maianthemum*, *Allium*, *Fragaria*, *Galium*, *Thalictrum*, *Osmorrhiza*, *Iris* and others.

B. DISTRIBUTION

The upland forest is found only in the northwest corner of the region studied, on the morainal till west of the Glenwood bluff. Only small areas appear in this region,

as shown on the map (Figure 2) but they are continuous with a larger forest west of the arbitrary boundary line.

Along the crests and slopes of the ridges are scattered areas of the xerophytic ridge forest. The land has been cleared along the Gross Point Road leaving only an area north of Winnetka Avenue and a small group of trees south of Central Street, but the forest is more continuous along Ridge Avenue and the lake shore in Evanston, where it has been less disturbed. Other isolated areas are found along the lake shore in Winnetka and one V-shaped patch north of the Northwestern University athletic field.

The greater part of the land between the Glenwood and Calumet ridges is occupied by the morainic swamp forest. This covers the western part of the residence section of Evanston and nearly all of Wilmette and Kenilworth and extends into Winnetka. The outlines of the central area are very irregular and there are smaller patches outlying on the east and west. A somewhat similar but less extensive forest lies between the Calumet and Tolleston ridges.

Although the typical sections of the different associations are very dissimilar, there is in certain places a transition from one association to another, so gradual that a line can hardly be drawn between them. Thus a forest area may be classed as one type on the map, when it is apparently intermediate between that type and another. Such an area is the one at Winnetka Avenue, west of the Gross Point Road. It is classed as xerophytic because of its location on the slope of the ridge and because the red oaks are more numerous than the whites (*Quercus alba*). It resembles the xerophytic forest on the Northwestern University campus south of Simpson Street, but is more mesophytic than the other areas of ridge forest in the region studied. The southern and western limit of this area were not determined.

It is possible also that in such a case the characteristic species have been removed or killed and the resulting type is not the natural one. This is especially likely where the remaining patch is small and the undergrowth

is wanting. Old residents of Evanston state that at one time the ridges were covered with a heavy forest in which the white oak was much more common and that lumbering was the first industry along the North Shore. The white oak, being excellent for building purposes, would be the first removed. Also the artificial conditions, due to the opening of the forest and draining, might destroy some species. Dr. Heminway (8) mentions this as one cause of the dying of the forest trees.

DISCUSSION

The distribution of the forest associations is apparently closely related to soil and drainage conditions although other factors may enter in. The mesophytic upland forest requires a rich but fairly well-drained soil. Such a condition can only be found in this region on the moraine uplands and on them the forest is fully developed. Along the edge of the bluff where the exposure is greater and the conditions more xerophytic the red oaks increase in number and a few scattered birches (*Betula alba*), red and white cedars (*Juniperus virginiana*) and white pines (*Pinus strobus*) are to be found. The red cedars and birches appear to be natural but the *Thuja occidentalis* and *Pinus strobus* may have been introduced. No individuals whose presence naturally was absolutely certain were seen though Mr. Atwell (1) states that some white pines still remain from the old forest.

Where the soil is rather coarse and well-drained, as on the crests and slopes of the ridges the xerophytic forest reaches its highest development. The red oaks are on the whole the predominating species, but at the end of Pine Street, Winnetka, near the lake, is a patch consisting chiefly of bur oaks (*Q. macrocarpa*). There is no apparent reason for this, but Cowles (5) says the bur oak appears to be more abundant on the lower and less drained ridges. The difference in elevation in this case, however, is inappreciable.

The swamp forest is found on the lowland clay where the drainage is very poor. Its composition apparently

varies with the elevation, the red oaks increasing in number and the herbaceous vegetation becoming more xerophytic on the higher ground. An area of this type is located south of Central Street and east of Ridge Avenue. Here the trees are *Quercus bicolor*, red oaks, elms and ashes, and the undergrowth, *Viola*, *Podophyllum*, *Fragaria*, *Potentilla*, *Allium*, *Smilacina* and *Trillium recurvatum*.

Where the ground is lower the swamp forest reaches its climax. The most characteristic patch of this type lies between Colfax and Grant Streets and Bennett and Ewing Avenues in Evanston. This is called the "Lincoln Woods" and is now a part of the Cook County Forest Preserve. Other areas in which the forest is best preserved are in Wilmette near the Electric R. R. between Maple and Linden Avenues and at Chestnut Avenue between Tenth and Eleventh Streets. Nearly (everywhere,) however, the forest trees have been left standing on vacant property and in yards and along the streets. The herbaceous vegetation is also well preserved.

An interesting patch of swamp forest is located at the west side of Nanzig Avenue at the end of Isabella Street where *Iris* and *Caltha palustris* are found under red and bur oaks, *Tilia*, *Crataegus* and *Populus tremuloides*. *Iris* was found in several other places in depressions and in shallow drainage ditches along the edge of the forest. *Caltha* was not found elsewhere although it was reported from the patch north of Winnetka Avenue, east of the New Trier High School.

Where the forest has been opened up or cut over and unused, *Salix*, *Populus tremuloides*, *Cornus stolonifera* and *Crataegus* appear. A typical growth is to be seen on Sheridan Road northwest of Winnetka Avenue.

The slopes of the Lake bluff are covered with *Populus deltoides*, *Salix*, *Alnus incana* and *Rhus*. At the foot of North Avenue Winnetka, a small clump of *Juniperus communis* has taken a foot-hold half way down the slope. This has probably been imported from the Waukegan region where it is common, as has the patch

on the end of the Calumet ridge at the Wilmette harbor. On the sandy beach in Evanston, *Populus balsamifera* grows abundantly.

In many places in the Evanston-Winnetka area large spruces, firs and Norway pines have been introduced. One large hemlock (*Tsuga canadensis*) was found on the Glenwood bluff north of Elm Street, Winnetka. These species are not natural here, their ranges ending farther north.

West of the Rose Hill bar, between it and the swamp forest is an unforested area which is now occupied by the North Shore Drainage Channel. The natural vegetation has been almost entirely destroyed, but was probably similar to that of the swampy tracts west of the C. and N. W. Ry. in Rogers Park. East of the ridge is a similar but smaller and more irregular depression which continues itself in the "Campus Meadow" of Northwestern University and the unforested swale between Sheridan Road and Sherman Avenue, south of Colfax Street. This is a part of the old swamp mentioned by Miss Willard and Miss Childs.

CONCLUSIONS

The distribution and character of the areas of the three different associations at the present time are such as to suggest that the original forest probably covered practically the whole of the region studied, with the exception of the depression west of the Calumet ridge and that between Sherman Avenue and Sheridan Road. The outline of this forest was probably irregular extending into the marshy tracts where the ground rose high enough for the forest trees to live.

This forest was not divided into distinct associations set off by definite lines from each other but was apparently composite, consisting of mesophytic forest on the upland with a gradual transition to the xerophytic forest on the ridges and the swamp forest on the lowland plain. The swamp forest itself was more or less heterogeneous, approaching the xerophytic type on the higher ground and maintaining an almost hydrophytic vegetation in the lower spots.

This transition probably was not only horizontal, but vertical as well, the intermediate areas representing a gradual succession toward the mesophytic oak-hickory association which is apparently the temporary climax of the Chicago Region.

SUMMARY

A survey of the present forests of the Evanston-Winnetka region, which includes the ends of the Lake Chicago beaches, shows that these are three forest associations found: the mesophytic upland forest, the xerophytic sand ridge type and the morainic swamp forest.

These forest association types are not in distinct areas, but there is a gradual transition from one to another.

The location of the association is dependent on the character of the soil and the drainage, the mesophytic forest on rich well-drained soil, the xerophytic forest on sandy, with good drainage and the swamp forest on the poorly drained lowland clay. Where the water stands too long during the year, no forest is found.

Conclusions are drawn as to the probable extent of the original forest and it is suggested that the present associations on the plain represent a succession toward the mesophytic association now found only on the upland.

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