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NEW YORK STATE MUSEUM

CHARLES C. ADAMS, *Director*

A BOTANICAL SURVEY OF THE TUG HILL PLATEAU

BY NEIL HOTCHKISS

Assistant Botanist, New York State Museum

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ILLUSTRATIONS

All photographs were taken and maps prepared by the writer.

A BOTANICAL SURVEY OF THE TUG HILL PLATEAU

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INTRODUCTION

Location of the region; purpose of the study

The Tug Hill plateau, an erosion remnant of the Cretaceous peneplain which at one time included all of New York State (Miller, '24, p. 24), lies between the Ontario plain, the valley of the Black river, and the valley of the upper Mohawk. The region includes parts of four counties, Lewis, Jefferson, Oswego and Oneida, the greater part being in Lewis. Figure 1 shows the limits of Tug Hill as a physiographic province (Miller, '17, p. 19; and '24, p. 24 and figure 2) and its relations with the other major physiographic provinces of the State.

In this paper the preliminary discussion of the physiography and climate covers all of the country lying between the Black river on the north and east, Lansing Kill and the Mohawk river on the southeast, the lake plain on the south, the west branch of Fish creek on the southwest, and the plain along the eastern end of Lake Ontario on the west. This territory has an area of approximately 1400 square miles and is roughly oval in shape with the long axis of the oval extending in a nearly north and south direction. The length is 50 and the breadth 35 miles. The altitude of the region ranges from 500 feet above sea level on its southern border at Fish creek and on the northwest at the Black river, to slightly under 2100 feet in several small areas toward the eastern side of the plateau. These points

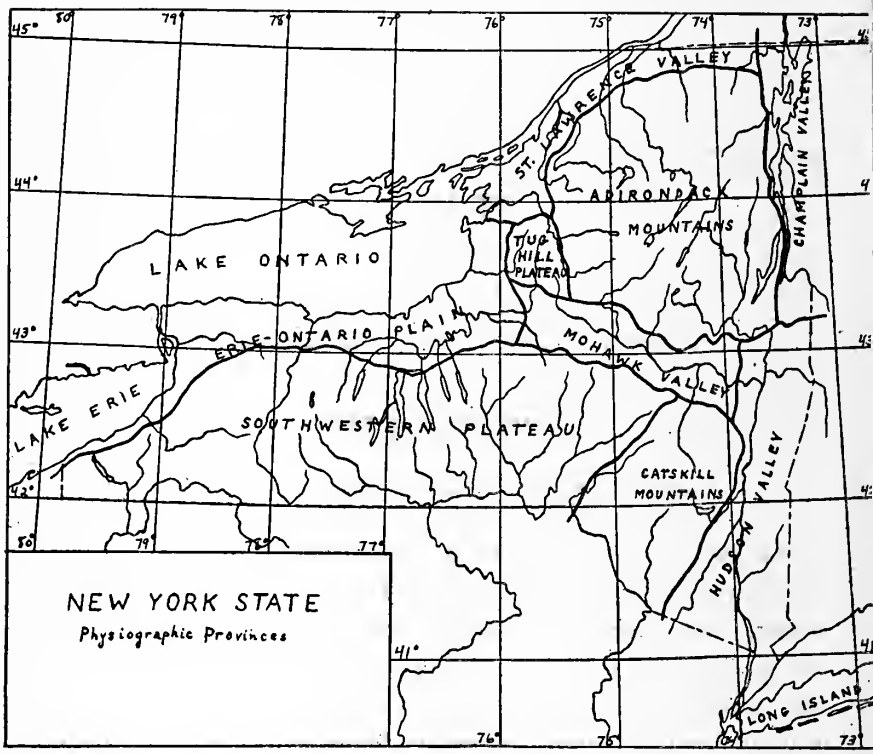

Figure 1 Map of New York State showing the physiographic provinces. (From Miller, Geological History of New York State, figure 2.)

are shown on the contour map of the region (figure 2). The more detailed study of the vegetation has been confined almost entirely to the higher, central part of the plateau.

The proximity of the Tug Hill plateau to the Adirondack region has apparently helped in diverting the attention of biologists from it as an isolated area. For the purpose of making a preliminary study of the flora and the vegetation the writer spent parts of three summers, 1922, 1923 and 1927, in the field collecting flowering plants and ferns and making a brief observational study of the more conspicuous types of plant association. These data, together with general information regarding the environment, have been the basis of an attempt to correlate the vegetation of Tug Hill with that of the Adirondacks and the Allegheny plateau (Southwestern plateau in figure 1).

Previous botanical investigations; recent field work

Due to its isolation, sparse population, general absence of lakes and hills which prevents the region from becoming a popular summer resort, and possibly for other reasons, there seems to have been a lack of interest in the Tug Hill region. Considerable careful geological work has been done on various parts of the plateau but, excepting some of the very early taxonomic work, practically nothing has been published on the plants (see House, '16).

In 1846 F. B. Hough published a catalog of the plants of Lewis county, the first work to include a detailed account of the flora of a large part of the plateau. The only other floristic work which contains records from the Tug Hill plateau is Paine's ('65) Catalogue of Plants Found in Oneida County and Vicinity (preceded in 1842 by a less detailed flora by P. D. Kneiskern).

A few brief papers of an ecological nature have been written more recently. A bulletin of the State Conservation Commission by Stephen ('11) contains interesting information on the forest conditions in the southern part of the region, in Oneida county, together with a map of forest types. Bendrat ('13) has published the only strictly ecological paper noted by the writer for any part of the summit of the plateau. This, however, is rather brief and appears to be inaccurate. Other references to the plants of the region have been made in areal geology bulletins and in county histories (Churchill, '95; Emerson, '98; Hough, '60; Jones, '51).

The basis for this study has been the field work of the writer carried on during parts of three summers, mainly on the high, rolling, central part of the plateau. Nearly two months, beginning with July 4, 1922, were spent in collecting the plants of the plateau summit, with Parkers in Montague township, Lewis county, as headquarters. Brief notes were also taken on plant associations. About three weeks in June and a month more in August and September 1923, were occupied in collecting plants and in taking more notes on the vegetation as a whole. In 1927, with emphasis on collecting, the writer worked in the region for about three weeks in June and ten days in July. During these three seasons several collecting trips were taken into the outlying parts of the area, but headquarters were kept at Parkers through nearly the whole period.

Acknowledgments

Most of the work was done under the direction of Dr W. L. Bray of Syracuse University, whose advice and help were invaluable. The

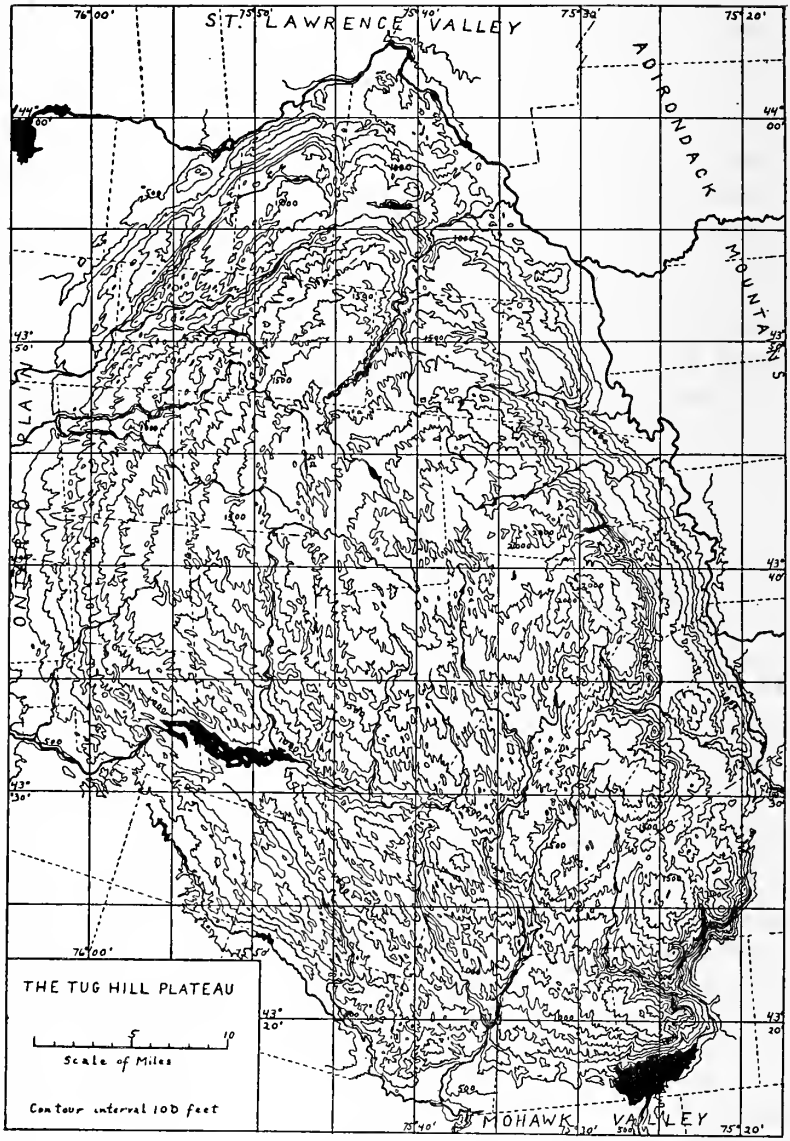

Figure 2 Contour map of the Tug Hill plateau. Constructed from topographic maps of the United States Geological Survey. See figure 3 for drainage and place names.

writer is also indebteded to Mrs Agnes Chase, K. K. Mackenzie, Dr K. M. Wiegand and Prof. M. L. Fernald for the identification of specimens of critical species; to W. H. McCarthy of Lowville for information regarding the Glenfield and Western railroad and the virgin forest in Osceola township; to various Tug Hill people for their hospitality; and to Dr H. D. House for his interest and advice during the latter part of the work.

THE ENVIRONMENT OF THE VEGETATION

Physiography

Topography and drainage. As indicated on the contour map (figure 2) the plateau is a large, remarkably regular, gently rounded hill, with the summit nearly flat and the sides sloping away in all directions, for the most part so gradually as to be almost imperceptible to one in the field. There are exceptions to this regularity, however, for the eastern edge of the plateau drops away rather abruptly by an escarpment some 400 or 500 feet in height to broad, flat-topped terraces which step down 400 or 500 feet more to the Black river, and extend along it from Boonville to Carthage (see Miller '24, figure 34, p. 107). This series of terraces has a width of three or four miles at the south and broadens northward where the upper escarpment is less pronounced, so that from the longitude of Carthage westward the slope from the highest level of the terrace country to the summit of the plateau is very gentle, while the terrace region itself is much broader than on the eastern side of the plateau and is considerably dissected by a number of deep, glacial cross-channels (Fairchild, '12, p. 16) running mostly in a northeast-southwest direction. The plateau, likewise, drops off rather abruptly toward the southeast into the Lansing Kill valley and the valley of the upper Mohawk. The topography of northern Oneida county is also irregular. This is presumably due to a considerable amount of morainal material which has been deposited by glacial action over that territory. The same type of land surface extends into eastern Oswego county. In general, however, the surface of the higher part of the plateau is broken only by low and much-rounded hills so that the appearance in the open country is of an extensive, gently rolling plain.

Topographic types differing decidedly from those found elsewhere in the region are the flood plain of the Black river from Lyons Falls north to Carthage, and the sand delta of the Black river northwest of Carthage, part of which lies on the south side of the river and hence comes within the limits of the area under consideration

(figure 8). This sand delta was laid down in the glacial Lake Iroquois at what was then the mouth of the Black river, and the conditions remained constant long enough to permit a deposition of sand to the thickness of 50 to 75 feet (Cushing and others, '10, p. 144) on the north side of the river over an area of 25 to 40 square miles.

Another pronounced topographic feature of the region is the numerous gorges and ravines which have cut back into the otherwise nearly level summit of the plateau, and whose formation has been influenced by the steepness of the plateau or terrace slopes and by the character of the country rock, which, as will be noted more fully later, is of shales and thin-bedded sandstones on the higher part of the plateau and of limestone in the terraces of the Black River valley. In the latter region numerous gorges, one to two miles in length, occur all along the west side from north of Boonville to Carthage. The most noticeable are those of Sugar river, Mill creek, and Roaring brook, south of Lowville, the Mill Creek gorge at Lowville, and the one through which Deer river flows just below Copenhagen (figure 9). The gorges which cut back into the shales and sandstones are usually much longer than the limestone gorges, some of them having a length of six or eight miles. Most conspicuous are Whetstone gulf and numerous other very deep gorges along the eastern escarpment, Lorraine gulf (figure 10), Big gulf, and the gorges of the east branch of Fish creek north of Taberg, of the Salmon river east of Orwell, and of Deer river above Copenhagen.

The plateau is drained by many streams, even to the broad summit which, however, is so nearly level that it has a very large area in swamp and in marsh meadow. The map of the Tug Hill plateau (figure 3) shows the direction and type of drainage. In general, the drainage is not affected by differences in dip and hardness of the bed rock. Excepting the southeastern part of the region which drains into the Mohawk river, the surface water flows by one route or another into Lake Ontario.

The direction of some of the streams has been influenced by other factors than simple stream erosion. The courses of Sandy creek and its branches have been conditioned by cross valleys formed by the action of glacial streams (Fairchild, '12, p. 16 and plate 4); and the Black river has been diverted from its original course by the formation of the sand delta at the bend of the river northwest of Carthage. One other diversion from what would seem to be the normal course is found in the streams which drain southward from

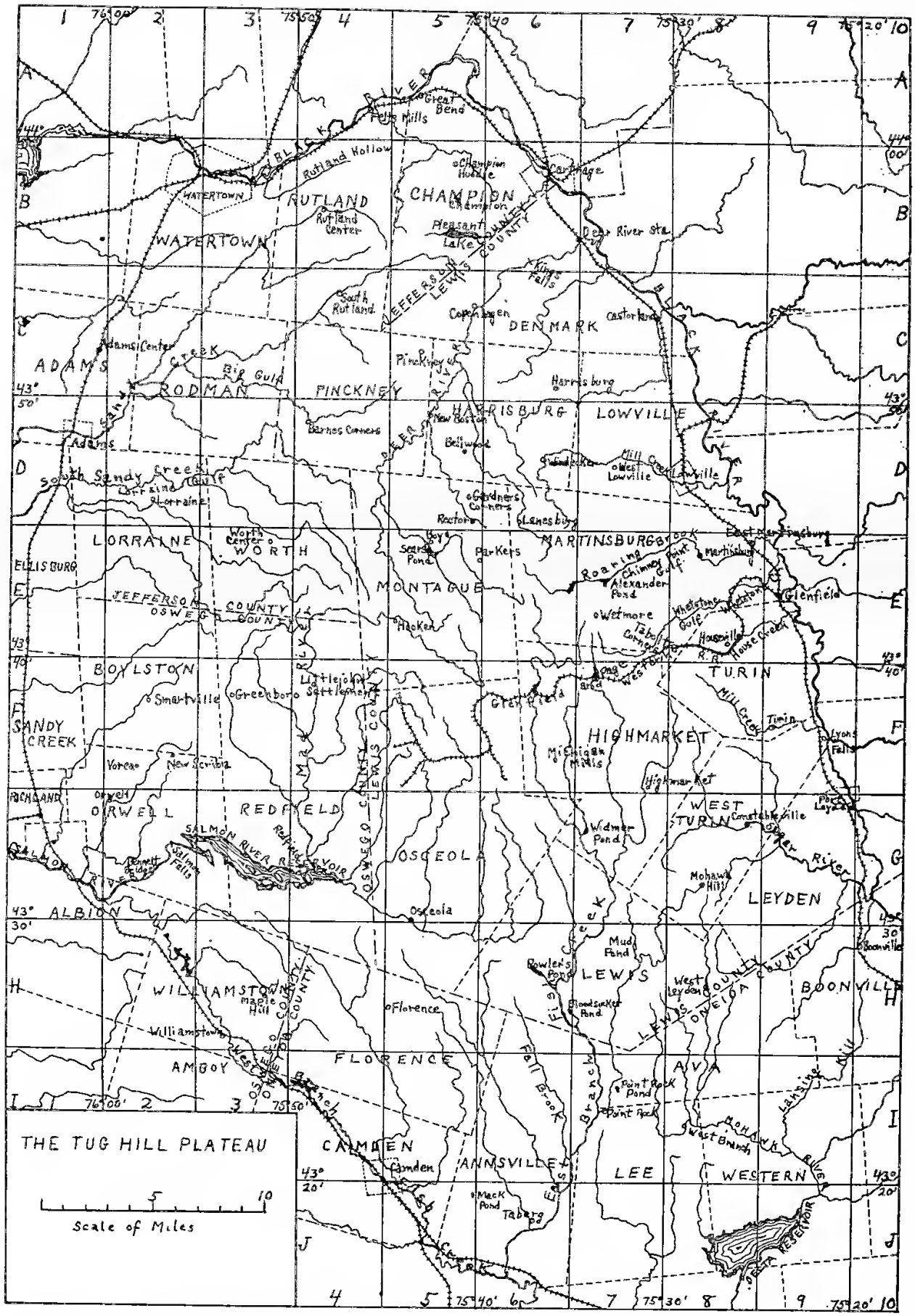

Figure 3 Political and drainage map of the Tug Hill plateau. Constructed from topographic maps of the United States Geological Survey.

the central part of the plateau, entering the Salmon river which flows westward. The natural direction of drainage would seem to be south over what is now a very low divide. Possibly the headwaters of streams originally flowing south were captured by the cutting back of the Salmon River valley.

Geology and soils. Four general types of rock outcrop in the region (figure 4). Along the Black river from below Boonville to Carthage, and continuing eastward over the greater part of the Adirondacks (see Miller, '17), is an area of Precambrian igneous and metamorphic rocks. Its greatest width on the west side of the river

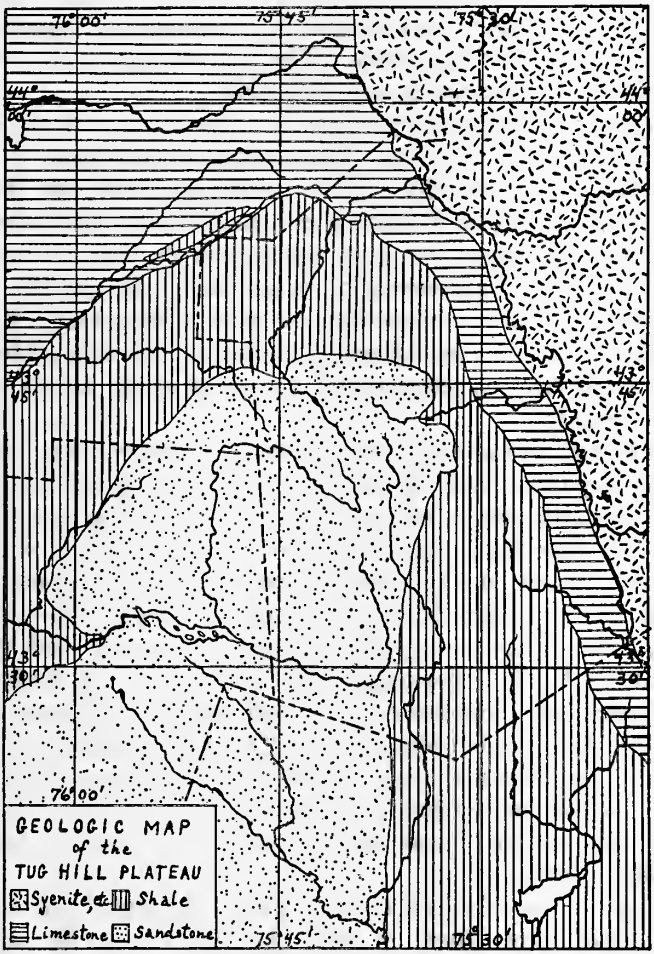

Figure 4 Geologic map of the Tug Hill plateau. Geology taken from the 1901 Geologic Map of New York.

is seldom over a mile yet the outcrops are numerous and the soil is for the most part thin.

West of this outcrop of Precambrian rocks and corresponding almost exactly with the terrace area described in the preceding section is a limestone region which varies from two to four miles in width from Boonville north to Lowville. The limestone continues northward and westward, widening out until it covers an area about ten miles in breadth, then passing around to the west side of the plateau near Adams.

The bed rock of the plateau proper is composed chiefly of shales, more heavily bedded and less calcareous toward the top. The soil overlying these rocks is, in most places, thin except in the morainal area of northern Oneida county. The highest part of the plateau is capped by a thin-bedded quartz sandstone.

These stratified rocks lying above the Precambrian of the Black River valley are, excepting the highest sandstones (Silurian), all of Ordovician age; and all dip slightly toward the south and west so that the lines of contact between the formations are much lower on the southern and western sides of the plateau than on the east and north (see Miller, '24, figure 4, p. 19, and figure 34, p. 107). The entire geologic section is shown on the map accompanying Miller's ('10) Geology of the Port Leyden Quadrangle. See this publication also for pictures of Whetstone gulf and some of the gorges of the limestone country.

The soil with its content of nutrient salts, air and water constitutes the most important part of the immediate environment of plants. On the Tug Hill plateau the soils include more or less pure quartz sands which have been deposited at lower altitudes by the action of water, clays, loams, and silty deposits on the flood plains, and muck and peat in swamps and bogs. The soils of Jefferson, Oneida, and Oswego counties have been reported upon in detail by field investigators of the U. S. Department of Agriculture and the New York State College of Agriculture (Carr and others, '13; Maxon and others, '15; Mooney and others, '19). One might attempt to correlate from their maps the type of soil in any given area and the vegetation. No soil survey has been made of Lewis county, but the soils of that part of the plateau are similar to types found in the other three counties.

The soils of the uplands are mostly glacial till, and the underlying rock has had some effect on their composition for the material appears, in general, to have been transported but a short distance.

Loams of varying grades of fineness derived chiefly from somewhat arenaceous shales and from sandstones constitute the greater part of the soils. At lower altitudes, especially in Oneida county, are loams which have been derived, in part, from the lower, more calcareous shales. On the northern and eastern borders of the region the influence of limestone is indicated by the fertility of the soils and by the character of the native vegetation. In every case there are rather conspicuous differences in the vegetation growing on different kinds of soil, especially when the amount of organic matter present is small. Organic matter, so vitally important to the growth of most plants, appears in the soil only after the advent of plants and animals. Its significance will be considered further in connection with the discussion of other biologic factors.

Occupying a smaller area but with a wide distribution in the region, especially at low altitudes, are the soils which have been deposited by the action of water. These may be gravelly to silty alluvium or they may be deposits of sand or gravel associated with glacial stream action. Boulders which sometimes have been transported for considerable distances often occur in the glacial till or even in the water-deposited soils.

Summary of physiographic factors. The surface of the earth has a direct influence on the vegetation. The physiographic factors (Nichols, '23, p. 21) which are apparently of greatest importance on the Tug Hill plateau, as well as in other regions, are the topography and the soils. Topography affects the vegetation principally through differences in slope, which are of especial importance in determining the water content of the soil, and direction of slope as it modifies exposure to light and wind. The effect of these differences is obvious when one compares the vegetation on the nearly level, swampy summit of the plateau with the more mesophytic or even xerophytic types on the slopes. The chemical and physical composition of the soil, its content of water and air, and its temperature are all important factors, and often a single one of them or a combination may be sufficient to condition the general composition of the vegetation. The chemical composition of the Tug Hill soils may be one of the important factors influencing the plateau's distinctive flora which contrasts in some ways so markedly with the flora of the Adirondacks and with that of the northern Allegheny plateau. The soils in the Adirondacks are derived largely from somewhat acidic granites, syenites and gneisses; those of the Tug Hill plateau from sandstones on the summit, grading into more argillaceous and calcareous rocks at lower altitudes; while

those of the northern Allegheny plateau are often modified by limestones and calcareous shales. Physiographic changes also affect the vegetation, those of greatest importance in a region such as this being the dynamic factors of erosion and deposition.

Climate

Definite data concerning the temperature, precipitation and winds of the high, central part of the Tug Hill plateau are not available, but records which may be of some use in determining the general climate have been kept at several stations on the borders of the region, including Adams Center and Watertown on the western and northwestern sides, respectively: Adams Center with an elevation of 540 feet, and Watertown, 737 feet. On the east side of the plateau some records are available from Lowville which has an elevation of 900 feet (Wilson, '12; Mordoff, '25).

Air movements. The prevailing winds of the region come from the west and are, perhaps, more constant and of higher velocity than in the Adirondacks or the Allegheny plateau. This is due to the proximity of Lake Ontario, down which the winds blow without obstruction; and to the topography of the western and central parts of the plateau, which is so regular and so gradually graded from the lake to the summit of the plateau that here, also, the prevailing winds are practically unobstructed. In 1922 and 1923, during part or all of the months of June, July, August and September there was, during the daytime at least, an almost constant westerly wind of sufficient velocity to be particularly noticeable to one in the open. The effect of the prevailing wind can be seen along the eastern edge of the plateau, and for a few miles back from the upper escarpment, in the isolated elm trees, which are so bent that practically all of their branches are on the east side. It is probable that local winds are more prevalent in the Black River valley, and it is certain that in the southern part of the region in Oneida and Oswego counties the influence of the prevailing westerlies is not so noticeable as in the central and northern parts.

Precipitation. The amount of precipitation is apparently somewhat greater than in the adjoining regions. The prevailing winds fresh from Lake Ontario have a tendency to precipitate their moisture as the higher altitudes are reached, though in winter there is a greater amount of snowfall, even at low altitudes along the western side of the region, than on the lake plain just to the south or in the St Lawrence valley north of Watertown. Observation, without instrumental

data to confirm it, indicates that in summer there is not so pronounced a difference in precipitation between the plateau and the regions just mentioned. Vegetation in the summer of 1923 showed a growth and luxuriance on Tug Hill that was lacking in the St Lawrence valley, during a period when the amount of rain was very slight in each; but the heavy dews and frequent fogs of the plateau and the general soil moisture conditions were probably effective in causing this luxuriance. The total amount of precipitation is approximately 35 to 40 inches a year, near the average for the State as a whole.

Temperature and the growing season. The proximity of Lake Ontario probably helps to prevent so many fluctuations of temperature as occur in the Allegheny plateau, but the somewhat higher latitude and the decided increase in altitude over a slightly dissected area of so great an extent operate to make the temperature conditions, in general, less mild than in the central, lowland part of the State. The growth of farm crops illustrates vividly the difference in the two regions. Lower temperature have affected the vegetation to such an extent that the characteristic forest trees are in kind and abundance more like those of the Adirondack forest than the lowland forest to the south or even that of the northern Allegheny plateau, where the extreme altitudes are slightly greater but where the plateau is deeply dissected.

Wilson ('12) assumes, as do most physiologists (?) that the growing season, the time between the last killing frost in spring and the first one in the fall, influences the vegetation more than do the maximum or minimum temperatures reached during the year; and the assumption in all probability holds for the Tug Hill plateau. The average length of the season for Lowville is 134 days (Wilson, '12, p. 542), averaged over a period of 20 years; for Adams Center it is 146 days (9 years); and for Watertown it is 152 days (16 years). These stations are all at low altitudes and are but slightly, if at all, representative of conditions on the highest part of the plateau. Probably the growing season at Number Four in eastern Lewis county represents more nearly the conditions on Tug Hill. Number Four is situated on the long, gentle slope which extends from the Black River valley into the Adirondacks and is directly east of the central part of the plateau, but the location of the latter doubtless influences the prevailing winds, with a consequent effect on the amount of precipitation and on the temperature. The altitude is 1571 feet and the growing season is 112 days, averaged over a period of 15 years, whereas the average length of the growing season for

Syracuse, Baldwinsville and Fayetteville, all of which are in Onondaga county and are situated either on the Ontario plain or at the edge of the Allegheny plateau and at an altitude under 600 feet, is 166 days (Wilson, '12, p. 536). Records were for 9, 18 and 10 years, respectively. Farther south in the Allegheny plateau records show in a number of places a shorter growing season than that at Adams Center and Watertown, but the average is apparently higher for most of the Allegheny plateau than for Tug Hill. The growing season at some points in the Adirondacks is considerably shorter than that at Number Four. Thus the Tug Hill plateau holds an intermediate position in length of growing season between that of the Allegheny plateau and that of the Adirondacks.

Light and humidity. Several other climatic factors of importance in the development of the vegetation should be mentioned though no instrumental data are available. The amount of sunshine probably does not differ greatly from that in other parts of the State, but the total duration of sunshine for the Tug Hill plateau during the growing season is effective in maturing plants in a shorter time than at lower altitudes.

The humidity of the atmosphere is probably greater here than in the Allegheny plateau region or in the central part of the State, due principally to the blowing up from the west of moisture-laden winds, and also to the large amount of water exposed on the plateau in the numerous streams, marsh meadows and swamps. Much of the windborne moisture, however, is undoubtedly dropped before the winds reach the eastern side of the plateau.

Summary of climatic factors. That climate, in general, is of wider significance in determining the kind of vegetation a region will support than are the variations in the earth's surface has been generally held by plant geographers and ecologists and has furnished the basis for a recent detailed work on the vegetation of the United States by Livingston and Shreve ('21). According to Nichols ('23, p. 20) the climatic factors which are of greatest importance are moisture, temperature and light. In the Tug Hill area the combination of factors is such that the forest type of vegetation is the most mesophytic which the climate of the region will support, different degrees of mesophytism occurring as a result of differences in physiographic and local climatic factors. Local climatic differences result mainly from variations in topography and relation to large bodies of water. Some of the characteristics of the vegetation of Tug Hill may be due to the slight amount of dissection of the

plateau and to its proximity to Lake Ontario. Differences in slope, and consequently in the angle at which the sun's rays strike the surface, also are influential in effecting local variations in the vegetation; and the reason why some more southern forms migrate into the region along shallow valleys may be due to complex air movements, which tend to ameliorate conditions. Past changes in climate have been important in determining the present distribution of a few plants, at least, for the occurrence in this region of *Saxifraga aizoides* and a variety of *Primula mistassinica* can be accounted for only by considering these species adaptable enough to survive in a place where the vegetation was at one time of an extremely boreal type. Other atmospheric influences are probably more important, in most cases, in the bearing they have on temperature and moisture than in any direct effect on the vegetation.

Occupation of the region by plants

Source of the vegetation. In order for any bare area to be occupied by plants there must necessarily be a migration from the surrounding regions in which they occur. As the Tug Hill plateau was once buried under a continental ice sheet the vegetation which at present covers the region must have entered it subsequent to the last retreat of the ice. At that time the vegetation which had been pressed southward by the advance of the ice would tend to move northward again by ordinary reproductive methods as the climate became more and more favorable to plant growth.

One factor which might modify this regular advance of plant species is that plants more suited to the cooler, early postglacial climate would tend to remain in the region wherever climatic conditions were less ameliorated by the retreat of the ice sheet than they were in general. Especially favorable situations would be the south sides of east-west valleys, other modifying conditions being equal; in most gorges, where conditions are such as to allow the entrance and exit of winds favorable to rapid evaporation and hence to the cooling of the atmosphere; in bogs, where a complex of factors seems to make this habitat more favorable for the growth of some northern plants than elsewhere; and, finally, and probably most important of all, the high, central part of the plateau itself, isolated as an area of considerable altitude with a consequently lower temperature. From the foregoing it appears that, if there has been a gradual retreat of the ice front since its last advance to this latitude, there have been available for the Tug Hill flora, at one time or an-

other, all the species occurring north of the region at the present time over an area with an east and west extent nearly as great as that of the region of eastern North America in which forest is the typical climax vegetation, excepting, of course, any species which may have originated since glacial times. The only apparent reason for the absence of more boreal forms is that the local climatic conditions have become more and more unfavorable for their existence.

Biologic environmental factors. The penetration of any region by plants brings with it a complex of factors which tends to modify the environment of the vegetation even more, at least locally, than do climate or physiography. Some of the things influencing plant establishment, growth and reproduction are shade, humus, microscopic plants, animals and competition. One of the most important in the growth of herbs and shrubs in a forested region is the presence of shade in varying amounts. Shade may be caused by cliffs and steep slopes bordering ravines, but generally it is caused by trees, and the extent to which a heavy canopy modifies the amount of sunshine and heat penetrating it, thereby affecting the amount of evaporation and the soil moisture for plants of low stature, is very different from what it would be in the open.

Pioneer vegetation is considerably affected by the chemical and physical composition of mineral soil. Thus there is throughout the Tug Hill region a correlation between the more distinct soil types and the vegetation wherever it is in an early stage of development or where a later stage has been disturbed by agriculture, logging or fire.

With the advent of plants dead organic matter begins to accumulate. When there is free drainage, as on ordinary upland soil, there is usually quite complete decomposition of accumulating plant remains, though in some situations, due to poor aeration, it may be only partial. Undisturbed accumulation of well-decomposed organic matter favors uniformity in the vegetation because it favors uniform soil conditions: it is well aerated, is sufficiently retentive of moisture for the best advantage of the plants, and furnishes available nitrogen to them. The presence of a considerable amount of moisture also helps to keep the temperature more nearly uniform. Humus, then, favors the development of a more or less mesophytic forest in well-drained situations. On the Tug Hill plateau the drainage, due to the levelness of the region, is often poor and there is a considerable accumulation of muck, similar to the better-drained leaf mold of the climax forest but with moisture content great enough to support a swamp vegetation. Where the drainage is very poor decomposition

is not complete and peat is formed. Due partly to the very poor aeration of the soil only a few kinds of plants are able to flourish in such a situation (a bog).

In a warm climate decomposition of organic matter is generally rapid, consequently a cool climate favors the accumulation of peat and, on upland soils, of partially decomposed duff. The Tug Hill plateau contrasts with the central lowland region of the State in this respect, but there is not such an extensive development of bogs and duff mats as in the Adirondacks. It is possible that the generally very silicious soils of the latter favor the incomplete decomposition of humus, contrasting with the more complete decomposition on the somewhat calcareous soils of Tug Hill.

The influence of microscopic plants and animals on the development of the conspicuous vascular vegetation with which we are acquainted is probably greater than is usually realized. Certainly they are active, especially the bacteria, in the oxidation of dead organic matter and in assisting in chemical changes which make nutritive nitrogenous substances available to the plant. It is possible that their abundance is sufficient in some cases to make their own remains a considerable source of plant food. The importance of some forms as parasites may be great; and the giving off in the soil of carbon dioxide by these organisms and the addition to the soil of oxygen by green algae may have a decided influence on the development of the higher vegetation. The activities of higher animals such as earthworms, rodents and insects are also very important.

Still another biotic factor of great importance to plants is that of competition among the higher plants themselves. This shows itself first in the migration of forms into a region. In general it would be expected that the plants with the most efficient methods for reproduction, either by seed or spore dispersal or vegetatively, would have the best chances in any region not completely occupied by plants. At the same time if the plants could grow satisfactorily under a wide range of conditions the chances for their establishment and survival would be still greater. Plants do not necessarily interfere with each other, however, in their attempt to become established, for their requirements may be so different that the presence of one supplements that of another. In a forest, for instance, the requirements and adaptations of shade-tolerating shrubs are quite different from those of deciduous canopy trees; requirements of a ground cover of mosses would be still different, etc. Competition between the aerial parts of plants is apparently set up as a result of the need

for carbon dioxide and light, and the minimum amount of light necessary for the establishment of some trees is more than is available under others, so that even with other conditions favorable seedlings of the species would not survive. Competition also takes place underground between the roots of plants for water, oxygen, nutritive salts etc. Here again the requirements of different species and differences in the kind and depth of root systems may be such that the plants but supplement each other. But there is obviously a limit to the number of individual plants which any area will support.

OCCUPATION OF THE REGION BY MAN

Early settlements

The Tug Hill region was probably not the permanent home of very many of the Iroquois or Algonquins who had villages scattered over much of the State, but who in general settled in the lower country where the water routes could be used for travel by canoe. An important early canoe route was up the Mohawk river to Rome, just south of Tug Hill, across a short portage to Wood creek, down it to Oneida lake and on to Lake Ontario at Oswego. The Mohawk valley was and is the most important gap through the Appalachian highlands, and in early times the water routes were of great importance.

Some outlying parts of the plateau have been settled by white men since shortly after the Revolution. Settlement was made at Redfield, Oswego county, between 1795 and 1797 (Churchill, '95, p. 671), this being one of the first in the interior of the region. The first settlements in Jefferson county were in Ellisburg and Champion townships in 1797 (Emerson, '98, p. 76) and others were made soon after. In fact, nearly all of the Tug Hill townships in the four counties were settled within a few years of each other, mostly between 1790 and 1812. The later ones were in the towns of Boylston and Albion (Churchill, '95, p. 464, 465, 484) in Oswego county in 1812; and in Lewis county—Highmarket in 1814, Osceola in 1822 (not a permanent settlement) and Montague in 1846 (Hough, '60, p. 115, 201, 193). Settlement was almost simultaneous along two lines, the Rome and Sackets Harbor state road which was opened before the War of 1812 (Churchill, '95, p. 628), and the road from Rome to High Falls (Lyons Falls), built in 1798 (Hough, '60, p. 250). The hill country was not occupied until some time later, and only about 70 years have passed since settlement was made of the higher, central part of the plateau in Montague. Except for a

forested area with a breadth of 15 to 20 miles, mostly in Lewis county, nearly all of the region is now inhabited.

The original vegetation

Hough ('60), in his history of Lewis county, quoting from notes in the original surveys of the townships, gives some idea of the primitive vegetation—swamps in the valley near the Black river had a great deal of black ash, pine, beech, soft maple and cedar (p. 83), with alders in the more open places (p. 308). These swamps were cleared, for the most part, at an early date and later were covered with wild grass and reeds. Cedar swamps were especially abundant in the valley in a long line some distance back from the river (p. 308) and on the limestone terraces near the eastern base of Tug Hill (p. 312). Hough also mentions the forest on the plateau in the township of Harrisburg (p. 113). Near the north line of the town there was much basswood, maple, elm, beech, birch and butternut. These trees also occurred at the southern end of the town together with some hemlock and spruce. Swamps and beaver meadows with their margins of balsam, alders and tamarack were characteristic of the summit of the plateau (p. 311, 314). The forests in Lowville and Pinckney townships were similar, as were those of Champion, Rodman and Rutland in Jefferson county (Emerson, '98, p. 536, 772 etc.).

Agriculture

The practice of both agriculture and lumbering has been mostly without definite plan. Farming and logging were flourishing industries in the early days, but as soon as the organic and other essential substances in the soil were used up in the production of crops, with practically no return and no clear idea of keeping the soil permanently in good condition, agriculture became a less profitable occupation. More and more farm land has been turned over to pasturage, and now dairying is the principal business over nearly the whole plateau, with hay and grain produced chiefly for home consumption. The trend was early in this direction, according to county histories written 30 to 75 years ago. Present climatic and soil conditions are apparently not satisfactory for the production of a great variety of crops, with the exception of timothy, clover, oats and potatoes. A little corn is grown but the season is too short for it to mature. In the limestone terrace country of the Black River valley conditions are, of course, more favorable, and corn, alfalfa and wheat can be grown profitably.

A factor which affects farming on the plateau is the distance of much of the territory from railroads; and until recently the poor roads made travel still more difficult. It is hardly profitable to bring in fertilizer or lime to improve the generally acid soils because of these distances. This same factor discourages the production of crops for market, and, perhaps as a result, there has been the general tendency toward dairying, the milk being taken to the numerous cheese factories which occur throughout the region.

Lumbering

The value of the timber was recognized at an early date and much of it was cleared off as rapidly as possible. In the history of the township of Annsville in Oneida county (Jones, '51, p. 70) mention is made of the large amount of hemlock, pine, spruce, curled and pinned maple, cherry, ash and basswood that was cut and shipped on the Erie canal. The industry became so important that a logging railroad was constructed from Williamstown through Maple Hill into Redfield township (Churchill, '95, p. 678) and this helped in the early removal of the timber on that part of the plateau.

Forest management in recent years has been possibly even more inefficient than when the land was first cleared. Most of the central forested part of the plateau has been cut over for pulpwood, especially the spruce, and there has been in the logging very little regard for the future of the forest. When logging for pulp was first started much was taken out on the small streams at time of high water, with the aid of water stored in numerous ponds. A considerable amount was also hauled out by the roads. Since that time a railroad has been built up from the valley at Glenfield to the top of the plateau at Page, and this has been extended westward through the heart of the forest nearly to the Oswego county line.

The outlook for farm and forest

Many farms have been abandoned in the past 20 or 30 years, and pastures, swamps and clearings are going back to a forested condition. Although at the present time the plateau is more characteristically an agricultural region and dairying is profitable, it seems to be better adapted to the production of forest. Such is certainly the case on the steep escarpments and valley slopes and on the more poorly drained and stony soils which occupy so great an area. Another point in favor of the reforestation of the whole plateau is that it is an important watershed, and if it were forested the waters of such

streams as the Salmon, Deer and Mohawk rivers, and Fish and Sandy creeks would be kept pure, would fluctuate less and so be less likely to flood, and if utilized for power would be more efficient. If managed properly the forests of the region are large enough to be an important source of lumber and pulpwood, at least locally, though of course they could hardly—and would not be expected to—compete with those of the Adirondacks.

THE TUG HILL FLORA

Life zones

The Tug Hill plateau stands out almost as distinctly as an isolated floristic or faunal area as it does as a physiographic province. In a classification of life zones based for the most part on temperature, varying with differences in latitude and altitude, Merriam ('98) maps the central part of the plateau as Boreal (Canadian) and the surrounding lowland country as Transition. The Canadian zone he characterizes (p. 19) as comprising the southern part of the transcontinental coniferous forest of Canada which extends a short distance into the United States in the northeast, and into Michigan, Minnesota and the northwest. It occurs in the Adirondacks and the Catskills in New York. His only other reference to the vegetation of the zone is that wild berries, such as cranberries, blackberries, currants and huckleberries, are abundant, and that the beech is of general occurrence. A larger number of mammals and birds are mentioned; and the writer's observation of a number of these species in the region helps to corroborate Merriam's correctness in placing Tug Hill in this zone. Two of his mammals, the porcupine and the varying hare, are quite abundant. Characteristic birds which occur through the summer and apparently breed are the white-throated sparrow and the olive-backed thrush, and some, such as the winter wren, golden-crowned kinglet, hermit thrush, blue-headed vireo and red-breasted nuthatch, not listed by Merriam but usually considered as breeding in this zone.

A more recent and at the same time more satisfactory classification of the floristic zones of New York State has been made by Bray ('15, p. 66–80). His zones are identified by letters and characterized by dominant and secondary species, Zone A being of southern distribution, while Zone F comprises the arctic flora occurring only on the summits of the highest mountains. Zone D, called the Canadian-Transition Zone (p. 74–76), apparently corresponds very nearly to the Canadian Zone of Merriam, as mapped, while the true Canadian

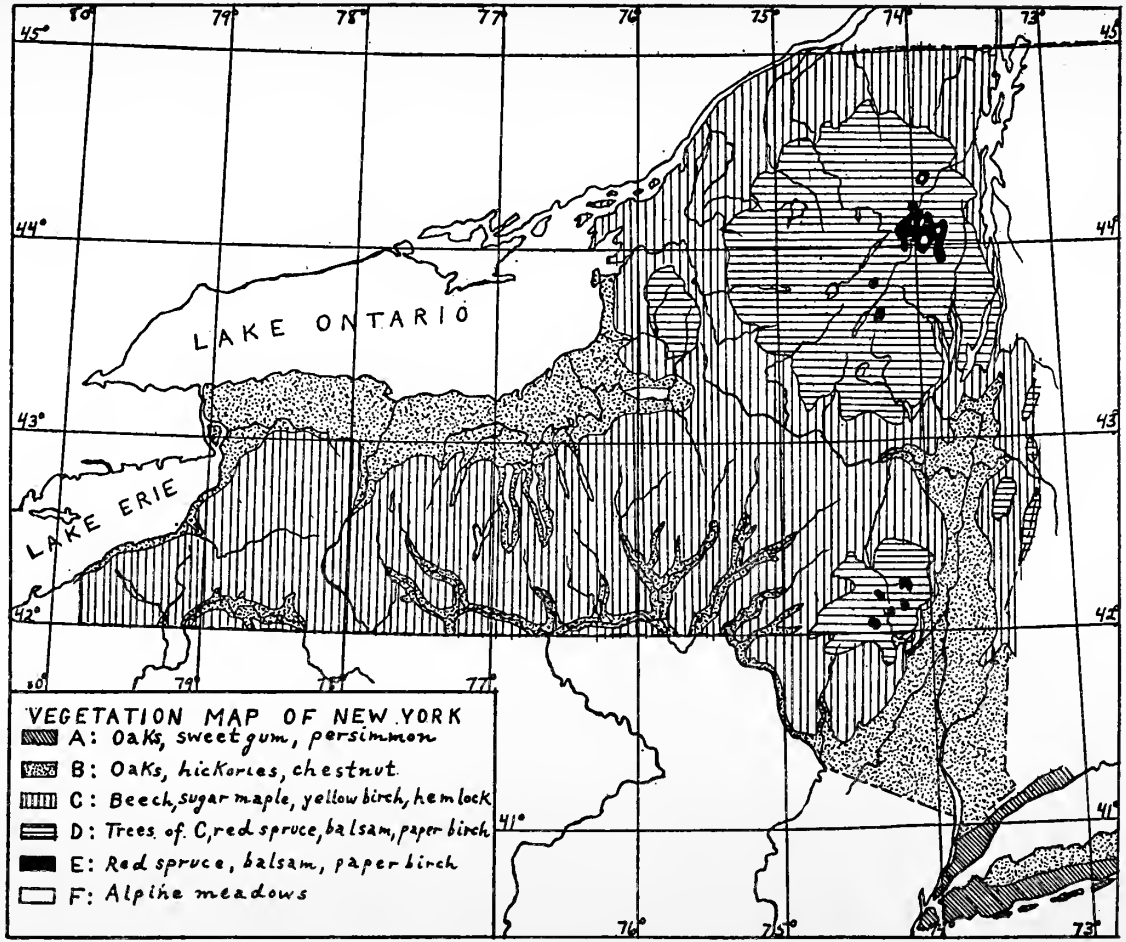

Figure 5 Map of New York State showing the floristic zones. Modified by H. D. House from

of Bray which is a zone of coniferous trees is limited by him (p. 77) to the higher summits of the Catskills and the higher part of the Adirondack plateau. Zone D is characterized by the presence of the following species: maple, beech, yellow birch, hemlock, white pine (as in Zone C which will be mentioned later), with red and black spruce, balsam, paper birch and mountain ash coming in at higher altitudes. Tulip tree, chestnut, oaks (most species), hickories and elms are absent. Some of the shrubby and herbaceous species are (quoting further from Bray) shield fern, hobble-bush, true wood sorrel, shining club moss, ground hemlock, red-berried elder, bush honeysuckle, wild sarsaparilla, fetid currant, large-leaved goldenrod, mountain aster, bunchberry, yellow Clintonia, twin-flower, two-leaved Solomon's seal, stiff club moss, goldthread and one-flowered Pyrola. These species, with but few exceptions, are the characteristic ones in the ordinary, well-drained upland forest on the Tug Hill plateau. Paper birch, twin-flower and one-flowered Pyrola are the only ones on the list which have not been generally noted by the writer (the latter not seen at all). Tug Hill, however, has not been mapped by Bray as belonging to Zone D. The map (figure 5) showing the summit of the plateau in this zone has been modified from his map.

Zone C covers all of the region not included in D. The following tree species (Bray, '15, p. 73), all of which have been observed by the writer, are the dominants: white pine, hemlock, hop hornbeam, blue beech, yellow birch, beech, witch-hazel, Juneberry, wild black cherry, sugar maple, red maple, striped maple, mountain maple, basswood and white ash. Nearly all of his list of herbaceous species occur regularly and abundantly.

One other scheme for the classification of the vegetation of the United States is described by Livingston and Shreve ('21). Their map places Tug Hill in the area of Deciduous Forest, but the plateau summit seems to the writer to belong, rather, to their Northeastern Evergreen-Deciduous Transition Forest which is mapped as covering the larger part of the Adirondack region. They list as dominant species in this forest sugar maple, beech, birch, basswood, hemlock, white pine, balsam fir and jack pine (p. 41). All but the last are characteristic of Tug Hill and make up the greater part of the forest.

The higher part of the Tug Hill plateau belongs, then, in Merriam's Canadian, and, more exactly, in Bray's Canadian-Transition Zone; and its vegetation seems to correspond rather closely to that of the Northeastern Evergreen-Deciduous Transition Forest of Livingston and Shreve. This vegetation covers practically all of the plateau

above 1500 feet and some of it below that altitude, especially on the western and southern sides. Below this altitude the Transition Zone of Merriam, or the Allegheny-Transition Forest Zone of Bray, takes the place of the Canadian. The definition of these zones in the field, however, is in very few cases distinct. Along the steep eastern face of the plateau the difference is clearest; elsewhere the intergradation is gradual and scarcely perceptible. There seems to be a tendency for the Zone C vegetation to follow up some of the shallow valleys into the plateau, and at the same time there is more or less of a downward extension of Zone D along the borders of ravines and gorges. The dryness of the soil and possibly its chemical composition may be factors in the latter case. A flora resembling that of Zone D occurs isolated in swamps and bogs on the limestone terraces of the Black River valley and elsewhere.

A transect across Tug Hill from south to north or from west to east helps one in visualizing the vegetation as a whole and in correlating its parts with differences in altitude.

Beginning a south-north transect at Taberg, one finds there several southern species not to be seen at all, or but rarely so, elsewhere in the region. These include *Muhlenbergia sylvatica, M. Schreberi, Elymus riparius, Corallorrhiza maculata, Phytolacca, Platanus* and *Epifagus.* Others, slightly more widespread, are *Thelypteris marginalis, Quercus borealis,* var. *maxima, Carpinus, Podophyllum, Benzoin, Hamamelis, Rubus alleghe*niensis and *Epigaea.* Still another group includes species such as *Thelypteris Dryopteris* and *Streptopus amplexifolius,* more common at higher altitudes. Northward, toward and about Point Rock at altitudes between 1000 and 1100 feet, other northern species appear: *Equisetum sylvaticum,* var., *Lycopodium* spp., *Picea rubra* and *Clintonia.* Here remain, of the species found at Taberg, only *Carpinus, Hamamelis* and *Epigaea.* About Point Rock *Vaccinium corymbosum,* a southern species not detected on the summit of the plateau, is quite common. The first *Abies* appears just northeast of Point Rock.

North and east of Point Rock pond with the gradual increase in altitude *Spiraea latifolia* becomes a conspicuous roadside and wet land shrub; *Lycopodium* species and *Cornus canadensis* are common along the roadsides; and *Picea rubra* and *Abies* become more and more abundant, until the highest part of the plateau is reached. At Parkers, the rich, well-drained climax forest has as its most conspicuous species *Thelypteris spinulosa,* var. *intermedia, Lycopodium lucidulum, Picea rubra, Abies, Clintonia, Maianthemum, Medeola,*

Trillium undulatum, Fagus, Coptis, Ribes prostratum, Pyrus americana, Dalibarda, Oxalis montana, Acer pennsylvanicum, A. spicatum, A. Saccharum, A. rubrum, Aralia nudicaulis, Cornus canadensis, Trientalis, Mitchella and *Viburnum alnifolium.*

On the northern slope of the plateau balsam and alder swamps are conspicuous down to an altitude of 1400 feet, but the flora is generally less boreal at an altitude of 1200 feet than on the southern slope of the plateau, due in part, probably, to the more calcareous soil. In the gorge of Deer river below Copenhagen a number of more boreal species occur, but here the flora is considerably modified by the calcareous rocks and by moisture. Tree species not so abundant on the higher part of the plateau which are especially noticeable here are *Tsuga, Thuja, Juglans cinerea, Ostrya* and *Tilia americana.* Conspicuous herbaceous plants are *Thelypteris marginalis, Cystopteris bulbifera, Clintonia, Maianthemum, Streptopus roseus, Medeola, Hepatica acutiloba, Actaea rubra, A. alba, Mitella diphylla, Geranium Robertianum* and *Galium Aparine.* Shrubs—excepting *Viburnum acerifolium*—resemble those of the summit of the plateau.

From Copenhagen to Felts Mills the vegetation is still less boreal. *Quercus borealis,* var. *maxima* occurs along Deer river below the gorge, and on the limestone and sand land farther north *Quercus alba* and *Q. macrocarpa* appear. At Felts Mills *Carya cordiformis,* with other more or less austral species, makes up the vegetation at an altitude of about 600 feet.

In crossing the Tug Hill plateau from west to east one sees the vegetation vary in a manner quite like that just described. The western part of the plateau in Oswego county resembles the southern part in Oneida county. *Picea rubra* appears at an altitude of about 1100 feet, and near Smartville, at an altitude of about 1200 feet, the climax forest is similar to that on the summit of the plateau.

On the eastern side at Whetstone gulf, the gorge of Mill creek (Turin) or the gorge of House creek, the characteristic vegetation of the plateau extends down to 1500 feet, and along the margins of the gorges probably lower. On the other hand, plants more common in the lower country follow up the gorges. Species which become more abundant as one goes down the gorge of Mill creek are *Adiantum, Thelypteris marginalis, Uvularia grandiflora, Asarum, Rubus odoratus, Geranium Robertianum, Hydrophyllum virginianum* and *Viburnum acerifolium.* On the limestone terraces the plants are those of Bray's Zone C.

Seasonal aspects of the vegetation

In general, the growing season on the summit of the plateau opens from two to three weeks later than at Syracuse, so that in the latter part of May and in early June there is a conspicuous remnant of the spring flora.

Some of the species conspicuous in the spring are *Carex* spp., *Arisaema, Uvularia grandiflora, Erythronium, Clintonia, Maianthemum, Streptopus* spp., *Polygonatum pubescens, Trillium erectum, T. undulatum, Sisyrinchium* spp., *Salix* spp., *Claytonia caroliniana, Caltha, Coptis, Actaea rubra, A. alba, Caulophyllum, Dicentra Cucullaria, D. canadensis, Tiarella, Viola* spp., *Panax trifolium, Viburnum alnifolium* and *Sambucus racemosa.*

Summer, as a distinct season, is less pronounced than in regions where the growing season is longer. The first killing frosts come very early in the fall and there is consequently a shortening of the season at both ends, so that the flowering periods of some of the spring and fall species overlap and practically eliminate summer. Some, however, are more characteristic of late spring or early fall, and have a flowering period of considerable length. Among these are a number of shrubs, especially species of *Cornus* and *Viburnum.* Other plants are *Lilium canadense, Medeola,* various orchids, *Thalictrum polygamum, Anemone canadensis, Clematis virginiana, Spiraea latifolia, Potentilla* spp., *Geum* spp., *Rubus* spp., *Dalibarda, Oxalis montana, Impatiens* spp., *Hypericum* spp., *Epilobium* spp., *Oenothera* spp., *Circaea alpina, Cornus canadensis, Lysimachia terrestris, Trientalis, Apocynum* spp., *Monarda didyma, Sambucus canadensis, Lobelia cardinalis* and *L. inflata.*

Several species of *Solidago* and *Aster* are conspicuous in autumn. With them are other Composites (species of *Eupatorium, Rudbeckia, Bidens, Hieracium*), *Gentiana linearis,* several mints, and *Chelone glabra.*

The presence of so much cleared and waste land influences the general appearance of the vegetation at flowering time. Meadows are especially showy during the summer when they are made bright, first with buttercup (*Ranunculus acris*), later with daisies (*Chrysanthemum Leucanthemum,* var.), devil's paint-brush (*Hieracium aurantiacum*), and other less conspicuous plants.

In addition to the direct effect of the length of the growing season on the time of flowering, the shortness of the season, the severity of the winters, and the general instability of weather conditions all seem to affect the setting and maturing of fruit. Among the forest trees,

most of which flower quite early, there was in two seasons, with few exceptions (beech, one year), quite a noticeable lack of mature fruit. The absence of mature fruit was also noted in the early spring herbaceous vegetation.

Relationships of the flora

The vegetation as a whole resembles that of the Adirondacks but seems to be of a slightly less boreal type and less characteristic of acid soils. Some evidences of the latter are the relative rarity of *Gaultheria,* the smaller amount of *Vaccinium* spp., (except *V. canadense*), the rarity of *Linnaea* and of *Betula papyrifera.* The small amount of raw humus or duff on the Tug Hill forest floor may have some influence on the abundance of these species.

While the flora resembles that of the Adirondacks, its affinities seem to be more with the flora of the Allegheny plateau (Southwestern plateau on figure 1), the Tug Hill plateau being geologically an isolated part of the latter region with its altitude, soils and geographical position such as to make the vegetation approach, in apparent nature, that of the Adirondacks. The source of the flora is indicated in an earlier section on "Source of the vegetation."

The following table may help to bring out the somewhat closer relation of the Tug Hill and Allegheny plateau floras than of the floras of Tug Hill and the Adirondacks. It includes practically all of the Tug Hill species which do not have a general range in New York State. The data are based on specimens and other records in the Herbarium of the New York State Museum. The Adirondack ranges exclude records from the borders of the region at Lake Bonaparte in Lewis county, in Fulton county and along Lakes George and Champlain; the Allegheny plateau ranges, of course, do not include the Catskill region; nor are Tug Hill plants listed which are recorded only from the Lake Iroquois basin in and around Felts Mills and Great Bend. The general ranges are expressed in relation to New York State.

Comparisons of the ranges of selected Tug Hill plants

SPECIES	GENERAL RANGE	TUG HILL	ADIRONDACK	ALLEGHENY
Cryptogramma Stelleri	northern	occ.	rare	rare
Asplenium viride	northern	rare	——	——
Picea rubra	middle	common	common	——
Abies balsamea	northern	common	common	rare
Panicum boreale	northern	occ.	common	rare
Muhlenbergia sylvatica	southern	rare	rare	occ.
M. Schreberi	southern	rare	——	occ.
M. uniflora	middle	rare	common	——
Sphenopholis pallens	southern	rare	rare	occ.
Deschampsia caespitosa, var. glauca	northern	occ.	——	occ.
Cyperus strigosus	southern	rare	——	occ.
Scirpus hudsonianus	northern	common	occ.	rare
S. atrocinctus	northern	common	common	rare
Carex Crawfordii	northern	rare	common	rare
C. angustior	middle	common	common	rare
C. bromoides	southern	rare	——	common
C. rosea	southern	rare	rare	occ.
C. cephaloidea	middle	rare	——	occ.
C. torta	southern	occ.	——	occ.
C. Haydeni	middle	rare	rare	——
C. aurea	northern	rare	rare	occ.
C. virescens, var. Swanii	southern	rare	——	occ.
C. deflexa	northern	rare	occ.	——
C. Peckii	northern	rare	rare	rare
C. novae-angliae	northern	rare	common	rare
C. paupercula	northern	occ.	occ.	rare
C. prasina	southern	rare	——	occ.
C. eburnea	northern	rare	——	occ.
C. laxiculmis	southern	rare	——	occ.
C. ormostachya	middle	rare	rare	rare
C. albursina	southern	rare	——	occ.
C. granularis, var. Haleana	middle	rare	——	occ.
C. castanea	northern	occ.	occ.	rare
C. oligosperma	northern	rare	occ.	——
C. intumescens, var. Fernaldii	northern	common	occ.?	rare?
C. Michauxiana	northern	rare	occ.	rare
C. Tuckermani	middle	rare	——	occ.
Acorus Calamus	southern	occ.	rare	occ.
Spirodela polyrhiza	southern	rare	rare	occ.
Lemna minor	southern	rare	——	occ.
Juncus filiformis	northern	rare	common	——
J. articulatus	middle	rare	——	occ.
Luzula campestris, var. frigida	northern	rare	——	——
Uvularia grandiflora	southern	occ.	rare	occ.
Allium tricoccum	middle	occ.	——	common
Lilium canadense	southern	occ.	——	common
Streptopus amplexifolius	northern	occ.	occ.	rare
Trillium grandiflorum	southern	rare	——	common
Sisyrinchium gramineum	southern	rare	——	rare
Cypripedium parviflorum, var. pubescens	southern	rare	rare	occ.
C. reginae	middle	rare	rare	occ.
Orchis spectabilis	southern	rare	——	occ.
Habenaria obtusata	northern	rare	occ.	rare

Comparisons of the ranges of selected Tug Hill plants (*continued*)

SPECIES	GENERAL RANGE	TUG HILL	ADIRONDACK	ALLEGHENY
Habenaria lacera	middle	rare	——	occ.
Spiranthes plantaginea	southern	rare	——	occ.
Listera auriculata	northern	rare	——	——
L. convallarioides	northern	occ.	rare	——
Corallorrhiza striata	western	rare	——	——
Betula populifolia	middle	rare	rare	rare
Ulmus fulva	southern	rare	rare	occ.
Celtis occidentalis	southern	rare	——	occ.
Urtica procera	southern	rare	——	rare
Asarum canadense	southern	occ.	rare	common
A. canadense, var. acuminatum	western	rare	——	occ.
Polygonum virginianum	southern	rare	——	common
Phytolacca americana	southern	rare	——	occ.
Arenaria lateriflora	middle	rare	rare	occ.
Cerastium arvense	middle	rare	——	rare
Thalictrum dioicum	southern	rare	rare	common
Anemone cylindrica	middle	rare	rare	occ.
A. canadensis	middle	common	——	occ.
Podophyllum peltatum	southern	rare	——	common
Benzoin aestivale	southern	rare	——	occ.
Sanguinaria canadensis	southern	rare	——	occ.
Roripa hispida	middle	rare	——	occ.
Barbarea vulgaris, var. longisiliquosa	middle	occ.	——	rare?
Dentaria laciniata	southern	rare	——	occ.
Cardamine pratensis, var. palustris	northern	rare	——	occ.
Arabis hirsuta	middle	rare	——	occ.
Penthorum sedoides	southern	rare	——	occ.
Saxifraga pennsylvanica	southern	common	rare	common
S. aizoides	northern	rare	——	rare
Parnassia caroliniana	southern	rare	——	occ.
Ribes americanum	southern	rare	——	occ.
Platanus occidentalis	southern	rare	——	occ.
Spiraea alba	western	rare	——	occ.
S. latifolia	middle	common	common	rare
S. tomentosa	middle	rare	common	rare
Pyrus americana	northern	common	common	occ.
Amelanchier Bartramiana	northern	occ.	occ.	——
Rubus occidentalis	southern	rare	rare	occ.
R. setosus	northern	common	common	——
Geranium Robertianum	middle	occ.	rare	occ.
Zanthoxylum americanum	southern	rare	——	occ.
Floerkea proserpinacoides	southern	rare	——	occ.
Hypericum Ascyron	middle	rare	——	occ.
Viola sororia	southern	rare	——	common
V. blanda	southern	rare	——	common
V. adunca	middle	rare	rare	——
Shepherdia canadensis	northern	rare	——	occ.
Panax trifolium	southern	occ.	rare	occ.
Cryptotaenia canadensis	southern	rare	——	occ.
Conioselinum chinense	northern	rare	——	occ.
Angelica atropurpurea	middle	rare	——	rare

Comparisons of the ranges of selected Tug Hill plants
(*concluded*)

SPECIES	GENERAL RANGE	TUG HILL	ADIRONDACK	ALLEGHENY
Kalmia angustifolia	middle	rare	common	rare
Vaccinium corymbosum	southern	rare	——	occ.
Primula mistassinica, var. noveboracensis	middle	rare	——	rare
Gentiana linearis	middle	common	common	——
Phlox divaricata	southern	rare	——	occ.
Polemonium Van-Bruntiae	middle	rare	——	occ.
Hydrophyllum virginianum	southern	common	rare	occ.
H. canadense	southern	rare	——	occ.
Verbena urticaefolia	southern	rare	——	occ.
V. hastata	southern	occ.	rare	common
Stachys tenuifolia, var. aspera.	southern	rare	——	occ.
Monarda didyma	southern	occ.	——	common
M. fistulosa, var. mollis	southern	rare	——	occ.
Mentha spicata	southern	occ.	——	occ.
M. piperita	southern	occ.	——	occ.
Collinsonia canadensis	southern	rare	——	occ.
Solanum Dulcamara	middle	occ.	——	occ.
S. nigrum	southern	rare	——	occ.
Mimulus moschatus	northern	rare	——	——
Veronica serpyllifolia, var. humifusa	northern	rare	rare	——
Utricularia cornuta	middle	rare	common	rare
Galium Aparine	middle	rare	——	occ.
Lonicera villosa, var. tonsa	middle	common	occ.	——
Linnaea borealis, var. americana	northern	rare	common?	occ.?
Triosteum perfoliatum, var. aurantiacum	southern	rare	——	occ.
Campanula aparinoides	southern	rare	occ.	rare
Solidago macrophylla	northern	rare	occ.	——
Aster novae-angliae	southern	rare	——	occ.
A. prenanthoides	southern	occ.	——	common
Erigeron pulchellus	southern	rare	——	occ.
E. philadelphicus	middle	occ.	——	occ.
Antennaria Parlinii	middle	rare	——	occ.
Senecio obovatus	southern	rare	——	rare
Prenanthes alba	southern	rare	rare	occ.
Hieracium canadense	northern	rare	rare	occ.

It is interesting in the above list of 140 species to note their distribution relative to the Tug Hill plateau:

Common to all three regions..... 46 species
Tug Hill plateau only..... 5 species
Common to Tug Hill and the Adirondacks..... 14 species
Common to Tug Hill and the Allegheny plateau. 74 species

Of those common to the Adirondacks and Tug Hill five species appear to be less common on Tug Hill and two species more common. Of

those common to Tug Hill and the Allegheny plateau 59 species are less common on Tug Hill and only two are more common. Thus the Tug Hill flora appears to be much more closely allied to the flora of the Allegheny plateau than to that of the Adirondacks, but the rarity of individuals in so many species compared with their abundance in the Allegheny plateau indicates the nearness of the limit of their ranges, probably set in the Tug Hill region as much by the high altitude and associated climatic conditions as anything else.

Some of the more noteworthy of the species considered in this discussion are, first, the five occurring (so far as the three regions are concerned) only on Tug Hill.

Asplenium viride.....Tug Hill plateau only
Luzula campestris, var. *frigida*.Tug Hill plateau only
Listera auriculata .. ..Tug Hill plateau only
Corallorrhiza striata .....elsewhere only in Monroe county, western New York
Mimulus moschatus.....probably introduced; elsewhere only on Long Island and in Saratoga county

Of the species occurring on Tug Hill and the Allegheny plateau but not in the Adirondacks perhaps the most interesting are the following:

Carex torta
other *Carex* spp. (data incomplete)
Allium tricoccum
Lilium canadense
Trillium grandiflorum
Habenaria lacera
Polygonum virginianum
Anemone canadensis
Benzoin aestivale
Sanguinaria canadensis
Cardamine pratensis, var. *palustris*
Spiraea alba
Floerkea proserpinacoides
Viola sororia
Viola blanda
Vaccinium corymbosum
Polemonium Van-Bruntiae
Monarda didyma
Triosteum perfoliatum, var. *aurantiacum*
Aster prenanthoides
Erigeron philadelphicus
Senecio obovatus (mostly in the Hudson valley and eastward)

In this group occur also the boreal *Saxifraga aizoides* and the variety of a boreal species, *Primula mistassinica,* var. *noveboracensis,* isolated in New York State on moist, calcareous shale cliffs in cool gorges.

Two grasses form an interesting connecting link between the above group of plants and those restricted to Tug Hill and the Adirondacks. They occur on the summit of the plateau in marsh meadows of apparently similar nature. *Deschampsia caespitosa,* var. *glauca* has not

been found in the Adirondacks but occurs mostly on the Allegheny plateau and in the lowland regions of the State. *Muhlenbergia uniflora* does not occur on the Allegheny plateau but is restricted almost entirely to the Adirondacks and Long Island.

The last group, the species occurring on Tug Hill and in the Adirondacks but not on the Allegheny plateau, contains the following species of special interest:

Picea rubra
Listera convallarioides
Amelanchier Bartramiana
Rubus setosus
Gentiana linearis
Lonicera villosa, var. *tonsa*
Solidago macrophylla

THE PLANT ASSOCIATIONS AND THEIR SUCCESSION

In the following brief survey of the relations to each other of the species which make up the vegetation of the Tug Hill plateau, only that part of the plateau above the limestone region is considered, except in making comparisons and contrasts. Concepts of a unit of vegetation and of plant succession to be used in a survey of the vegetation of a particular region have been developed by various ecologists to a point where the ideas generally held are somewhat similar. Various classifications have been outlined. In this paper the treatment of the associations is a modification of the scheme outlined by Nichols in a recent paper ('23, p. 154–77). This plan has been successfully used by him in a study of the vegetation of northern Cape Breton Island ('18).

The climax forest

The climax vegetation (the most mesophytic vegetation a region will support) of New York State is, for the most part, deciduous forest, the principal exceptions being the Adirondacks and Catskills above 3500 feet, approximately. There is, however, a considerable variation in the species which are associated to form the climax forest in different parts of the State, as was noted in the discussion of the vegetation zones.

The climax forest of the higher part of the Tug Hill plateau (and of gorge slopes at lower altitudes ?) is composed largely of the following species, listed, so far as possible, in the order of their abundance:

TREES

Betula lutea
Fagus grandifolia
Acer saccharum
Picea rubra
Acer rubrum
Pyrus americana
Tsuga canadensis
Abies balsamea
Prunus serotina
Tilia americana
Fraxinus americana

SHRUBS

Viburnum alnifolium
Ribes prostratum
Acer spicatum
A. pennsylvanicum
Cornus alternifolia
Taxus canadensis

HERBS

Thelypteris spinulosa, var. *intermedia*
Oxalis montana
Aralia nudicaulis
Clintonia borealis
Cornus canadensis
Lycopodium lucidulum
Maianthemum canadense
Trillium undulatum
Coptis trifolia
Medeola virginiana
Trientalis borealis
Mitchella repens
Dalibarda repens
Trillium erectum
Erythronium americanum
Tiarella cordifolia
Viola canadensis
Actaea rubra
Rubus pubescens
Thelypteris Phegopteris
Hydrophyllum virginianum
Pyrola elliptica
Streptopus roseus
Dentaria diphylla
Viola incognita
Galium triflorum
Claytonia caroliniana
Dicentra canadensis
Thelypteris Dryopteris
Poa saltuensis
Panax trifolium
Uvularia grandiflora
Allium tricoccum
Viola eriocarpa, var. *leiocarpa*
Athyrium acrostichoides
Lycopodium obscurum
Asarum canadense
Botrychium virginianum
Chiogenes hispidula
Poa alsodes
Polygonatum pubescens
Milium effusum
Caulophyllum thalictroides
Thelypteris Goldiana
Actaea alba
Polystichum acrostichoides
Smilacina racemosa
Carex plantaginea
Mitella diphylla
Aralia racemosa

Bryophytes are uncommon in the climax forest except on stones and logs.

All the plants listed above by no means occur together, but usually most of the trees and shrubs and most of the first third of the species in the herb list, with a considerable assortment of the remainder scattered among them, may be found growing in any

particular area of forest. The principal trees of the forest are yellow birch (*Betula lutea*), beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*), any one of the three species containing, perhaps, from 10 to 40 per cent of the trees in various situations throughout the climax forest. Red spruce (*Picea rubra*) was certainly—and white pine (*Pinus Strobus*) possibly—more common in the virgin forest. Hobble-bush (*Viburnum alnifolium*) is the most conspicuous and probably the most abundant shrub, but the others listed are well distributed throughout. Commonest of the herbaceous plants are the fern, *Thelypteris spinulosa,* var. *intermedia,* and wood sorrel (*Oxalis montana*), both of which occur almost everywhere in the forest, but many of the other species are also abundant.

Certain variations in the herbaceous vegetation are associated with differences in the soil and in the woody vegetation. For instance, in forest containing a greater percentage of coniferous trees *Oxalis montana, Aralia nudicaulis, Lycopodium lucidulum, Trillium undulatum, Cypripedium acaule* and *Chiogenes hispidula* (?) are more than ordinarily abundant; *Viola rotundifolia* occurs where the soil is somewhat lighter in texture than the average; while in the lower, richer sections of the forest the tendency is toward the greater abundance of still other species (see "The vegetation of gorges", and "The vegetation of streams and their margins").

At this point it may be well to consider some of the questions which have probably arisen: questions regarding the distribution of the climax forest, the nature of the virgin forest, etc. Does any true climax forest actually occur on Tug Hill at the present time?

In 1927 an area of virgin forest reported to contain between 20,000 and 30,000 acres was still in existence in the central part of the township of Osceola, Lewis county. From observations made by the writer on two trips across it, it appeared to be a nearly perfect type of the climax forest, as just outlined—a beautiful stand of yellow birch, beech, sugar maple, red spruce and hemlock (*Tsuga canadensis*), with a dense ground cover of wood sorrel, wild sarsaparilla (*Aralia nudicaulis*), shining club moss (*Lycopodium lucidulum*) and other species. The forest was in general quite open and, except where the crown was more open than usual, hobble-bush and other shrubs were less common than in the cut-over forests. This was especially noticeable wherever the conifers were abundant, the ground cover there being composed almost entirely of the herbs mentioned above. Many of the trees—except the red spruce—had a diameter of three feet or more; the red spruce probably averaged

two feet and was equally tall and straight with the others. All of the tree species were reproducing freely everywhere except in the denser sections of the forest, but the young trees were mostly of shrub size, and small and medium-sized ones were noticeably absent.

A large portion of the forested part of the plateau has been logged over for spruce for pulpwood, and some hardwoods have been taken out for lumber, together with white pine—if that species ever was common. The forest does not appear to have been disturbed enough, however, to make it differ greatly from the virgin, climax forest, judging from the observations just noted, descriptions of the original vegetation in county histories, and the reports of the older inhabitants. The climax forest probably occurred originally on all the well-drained ridges and slopes throughout the higher part of the plateau, and now apparently is in the same situations where logging or clearing has not destroyed the ground cover of humus which is so important in equalizing the water content and temperature of the soil and in furnishing nutrient material for plant growth.

General development of the vegetation

Besides the climax forest, toward which the vegetation in less favorable situations tends to develop, the vegetation may be considered as a complex the variations of which are due to differences in physiographic factors. In the Tug Hill region, where the climate is presumably not so favorable as farther south for the development of a vegetation approaching mesophytism, the type of vegetation is apparently influenced more readily by minor differences in the physiographic factors than in the more favored regions. Thus a slightly impeded drainage at any point in the climax forest may bring about an association of plants which is not a typical climax. Such forms as *Sphagnum* and *Osmunda cinnamomea* appear in these places and, although the tree species may not differ, the difference in the secondary species which cover the forest floor is often considerable. Similarly, anything which destroys a considerable amount of humus brings about a more xerophytic vegetation than that of the climax, and it may be that the mere logging over of the forest for spruce is sufficient to break up the nice balance which is present in the climax forest and which makes it such a relatively stable unit of vegetation.

In the development of the climax from the other types the approach is usually from either of two directions: from the vegetation in excessively dry or that in excessively wet situations. The ability of the vegetation to change is based on the possibility of changes in

the environment. These are brought about by physical forces such as erosion and deposition, and more especially by the changes effected or conditions modified by the vegetation itself. (For the importance of humus in this connection see the discussion of biologic environmental factors.)

A large part of the vegetation here considered is of a secondary nature, the original forests and meadows having been modified by logging, clearing and fire, and being therefore of a more xerophytic type than formerly. Extremely wet situations have in some instances been modified by drainage, making the soil favorable for the development of a mesophytic vegetation. In the few cases of this kind that occur, however, the land has been used chiefly for agricultural purposes and there is no opportunity for the native vegetation to develop. A hydrophytic vegetation may also have been favored in the few cases where streams have been dammed. The primary xerophytic and mesophytic vegetation—including that which has been so little altered by man that it seems not to have been materially disturbed in its regular development—will be considered first.

Primary xerophytic and mesophytic associations

These associations comprise all the plants growing in situations varying from excessively dry to those where moisture is sufficient for growth but the soil is not saturated. The summit of the Tug Hill plateau includes very little primary vegetation that can properly be called xerophytic. There are practically no rock outcrops or talus slopes except in the gorges and ravines which border the plateau, and no sand plains except in the Black River valley at the north and in Oneida county. Probably conditions over much of the higher part of the plateau after the last retreat of the ice front were such that the climax vegetation quickly became established in a habitat mesophytic from the very first, except for the lack of organic material in the soil.

Wherever either erratics or bed rock are exposed vegetation tends to establish itself upon them, and its succession in the Tug Hill region is apparently similar to that described by ecologists elsewhere. Crustose lichens ordinarily appear first, followed by foliose and fruticose forms and xerophytic mosses. The organic matter left by the death and decay of successive types of plants gradually becomes sufficient to retain enough moisture to support more and more mesophytic and larger and larger plants until eventually a climax vegetation or one approaching a climax may be attained.

The vegetation of gorges. In the numerous gorges and ravines bordering the plateau the exposure of bed rock is extensive, but in most places little vegetation has become established except in the situations where seepage helps to bring about more or less hydrophytic conditions. Rapid erosion, due to the steepness of the slopes and the softness of the rocks, together with the extreme dryness of the situations are the principal factors in preventing the more rapid and successful establishment of plants in such places. Of the few higher plants which grow on gorge cliffs the more conspicuous are *Cystopteris fragilis, Aquilegia canadensis, Rubus odoratus, Diervilla Lonicera, Campanula rotundifolia* and *Erigeron philadelphicus.* A species of *Parthenocissus* is sometimes found along the exposed bases of the cliffs and open talus slopes.

Some of the gorges are narrow and ravinelike but others have rather broad bottoms, either open (often with deposits of shingle) or wooded. On the open bottoms a few of the more common species are *Carex torta, Veratrum viride, Salix cordata, Anemone canadensis, Apocynum cannabinum, Mentha piperita* and *Tussilago Farfara.* Perhaps these could as well be considered as belonging in a flood plain succession as here, but true flood plains with actual hydrophytic conditions are almost wholly lacking in the region except along the Black river northward from Lyons Falls. On the wooded bottoms the forest is near the climax but is of a somewhat hydrophytic type. The herbaceous plants, in particular, indicate an abundance of moisture. Species that are often conspicuous are *Cystopteris bulbifera, Pteretis nodulosa, Poa alsodes,* and *Viola eriocarpa* var. *leiocarpa,* and some plants, such as *Trillium grandiflorum* and *Triosteum perfoliatum,* var. *aurantiacum,* characteristic of rich, somewhat calcareous woods and much more abundant on the Allegheny plateau than on Tug Hill.

The talus slopes in the gorges are often covered with forest approaching the climax, otherwise, due to their instability, they are nearly bare of vegetation. In the limestone gorges along the western side of the Black River valley talus slopes are often covered with arbor vitae (*Thuja occidentalis*). Arbor vitae is also abundant on the shale slopes in Chimney Point gulf.

For a short distance back from the edge of many of the deep gorges the vegetation is decidedly xerophytic. This character may in some cases have been intensified by lumbering, but the dryness, the possible leached-out condition of the soil and the rapidity of erosion are probably enough to prevent the development of a true climax. The forest is usually more typically coniferous than on ordinary, well-

drained uplands. Red spruce is one of the commonest trees, and white pine and hemlock occur more abundantly than elsewhere. Many of the climax forest species are present in these situations, but there are usually conspicuous additions. Some of the species are:

TREES

Thuja occidentalis
Populus tremuloides
P. grandidentata
Ostrya virginiana

SHRUBS

Taxus canadensis
Juniperus communis, var. *depressa*
Amelanchier laevis
Vaccinium spp.
Lonicera canadensis
Viburnum acerifolium
Sambucus racemosa

HERBS

Pteridium latiusculum
Botrychium virginianum
Lycopodium clavatum
L. obscurum
L. flabelliforme
L. tristachyum
Clintonia borealis
Maianthemum canadense
Medeola virginiana
Trillium undulatum
Cypripedium acaule
Coptis trifolia
Mitella diphylla
Oxalis montana
Viola incognita
Cornus canadensis
Pyrola elliptica
Monotropa uniflora
Epigaea repens
Gaultheria procumbens
Mitchella repens

Secondary xerophytic and mesophytic associations

The most conspicuous part of the Tug Hill vegetation, outside of the large forested area, is of a secondary nature. Most of the modification has been due to agriculture, and especially to the partial or total abandonment of land which for a time has been under cultivation. Even in cultivated fields there is a tendency for the native or introduced vegetation to reestablish itself, the pioneers apparently being weeds, but when cultivation is continued this succession is destroyed year after year so that it gets no further than a very primitive stage. Succession, in general, seems to be similar to that among the primary associations but its details as well as those of the associations themselves are rather obscure, the whole aspect of the vegetation often being one of disorder.

The vegetation of meadows. Native and introduced weeds are conspicuous in meadows. *Chrysanthemum Leucanthemum*, var. *pinnatifidum* and *Hieracium aurantiacum* are perhaps the most abundant. *Ranunculus acris* is common in the wetter places, and *Panicum implicatum, Rumex Acetosella, Potentilla canadensis* and *Lobelia inflata*

are abundant in the drier meadows. In general, both meadows and pastures show, with age, a tendency toward increasing "sourness" of soil, plants like *Rumex Acetosella* and mosses, especially *Polytrichum,* coming in in abundance. In most cases succession progresses no further than the establishment of a number of these perennials, mowing preventing the entrance of shrubs and most of the herbs. Abandonment or pasturing might permit succession to proceed as outlined in the next section.

The vegetation of roadsides and pastures. Roadsides generally have a characteristic secondary vegetation, but it is so similar to that of the numerous dry pastures that it will not be considered separately. A large percentage of the total cleared acreage of the plateau is in pasture land which may vary in its moisture conditions from extremely wet and swampy, or even boggy, to dry and more or less sandy. Most of the pastured land has been in use for such a long time that there is little evidence of the way in which so many native species have become established. Probably many of the native ferns and other herbs live through the process of clearing; others may be able to establish themselves because the large amount of pasture per animal prevents close grazing. The most abundant native grasses are *Panicum implicatum, Agrostis alba, Deschampsia caespitosa,* var. *glauca* and *Danthonia spicata. Anthoxanthum odoratum* is also fairly common. Associated with grasses are various sedges, perhaps the most conspicuous being *Carex scoparia.* Additional conspicuous species of pastures and dry roadsides are:

Pteridium latiusculum
Athyrium angustum
Thelypteris noveboracensis
Dennstaedtia punctilobula
Osmunda regalis, var. *spectabilis*
O. Claytoniana
O. cinnamomea
Botrychium obliquum
Lycopodium clavatum
L. obscurum
L. flabelliforme
L. tristachyum
Agrostis hyemalis
Carex brunnescens, var. *sphaerostachya*
C. gracillima
C. deflexa (rare)
C. communis
C. novae-angliae (rare)
C. pallescens
C. debilis, var. *Rudgei*
Oakesia sessilifolia
Cypripedium acaule (bushy pastures)
Spiranthes cernua
Rumex Acetosella
Spiraea latifolia
Pyrus melanocarpa
Fragaria virginiana
Epilobium angustifolium
Aralia hispida (bushy pastures)
Carum Carvi
Vaccinium canadense
Gentiana linearis
Diervilla Lonicera
Lonicera villosa, var. *tonsa*
Solidago humilis
S. rugosa

S. graminifolia
Aster umbellatus
Antennaria spp.
Anaphalis margaritacea
Achillea Millefolium
Chrysanthemum Leucanthemum, var. *pinnatifidum*
Hieracium spp.

Mosses, especially *Polytrichum* spp., and lichens are abundant on sandy hummocks and elsewhere. *Clintonia borealis, Cornus canadensis* and other plants characteristic of the climax forest often occur in dry pastures. Many of the species are almost equally typical of wet meadows and swamps, the composition of the soil itself and the manner and rate of decomposition of organic matter apparently operating to favor the same sort of vegetation, to some extent irrespective of the moisture conditions.

Some shrubs may persist after clearing, and of this group *Corylus cornuta* is perhaps the most abundant. Most of the shrubs in the above list, however, seem to reinvade the areas and therefore are constituents of shrub stages in the process of natural reforestation. The principal pioneer trees are red spruce and balsam fir (*Abies balsamea*), and these are so abundant that in many cases they are dominant after cleared land has been largely reoccupied by forest. Associated with them occasionally are red maple (*Acer rubrum*) and tamarack (*Larix laricina*).

The vegetation of burns and clearings. The influence of fire on the vegetation is inconspicuous in the Tug Hill region. Due to the small amount of but partially decomposed organic matter in the upper part of the soil (compared with the amount generally found in the Adirondack region) fires seem neither to start easily nor to travel readily. Wherever they have occurred at all a pioneer vegetation of mosses and lichens, which do not require a large amount of humus or an abundant and steady supply of water, tends to appear. Succession following the establishment of these plants is probably very similar to—but perhaps slower than—that on cleared land. In some of the burned-over marsh meadows and swamps the liverwort, *Marchantia polymorpha,* is one of the first and most conspicuous pioneers.

Lumbering often has a decided influence on the vegetation, especially when enough of the upper story of the forest is removed to alter materially the amount of light reaching the tree seedlings, shrubs and herbaceous plants. There may be, as a result, not only a difference in the amount of light but also a change in the water content of the soil and a modification of the amount and rate of decomposition of humus. There is, of course, an introduction of

weeds of various species along wood roads, and wherever there has been much logging several species are found in the forest, which indicate the secondary nature of part, at least, of its vegetation. *Pteridium latiusculum, Rumex Acetosella,* and *Rubus idaeus* var. *strigosus,* occur commonly in such situations. Where clearing has progressed so far that the forest cover is almost completely destroyed bracken (*Pteridium*) becomes very conspicuous, and *Lycopodium clavatum, Rubus canadensis, Aralia hispida* and *Cornus canadensis* are characteristic associates. The trees most important in the reoccupation of such areas by forest are aspen (*Populus tremuloides*), wild red cherry (*Prunus pennsylvanica*), and perhaps red spruce and red maple.

The vegetation of sand plains. Sand plains of any appreciable extent occur only at the extreme north, along the Black river, and at a few places in Oneida county, near Taberg and near Point Rock. In all the localities the primitive vegetation has apparently been very much modified. The present vegetation differs somewhat from that on ordinary cleared land.

On sand land near Point Rock pond aspen and gray birch (*Betula populifolia*) are common trees, with much bracken associated. *Potentilla canadensis* is, in places, a conspicuous plant on more or less open sand. Gray birch is also common in a similar situation at Mack pond, northwest of Taberg, and with it are *Spiraea tomentosa* and other species, the presence of all probably being due to the clearing of the land.

Primary hydrophytic associations

The vegetation of slow streams and of ponds with free drainage. Lakes, ponds and streams in which the current is slow enough to permit the growth of plants are uncommon on the higher part of the plateau. Most of the ponds are artificial and the vegetation might rather be considered as secondary, but in most places it has been undisturbed for so long that it may very possibly represent what normally would be present in natural ponds.

Usually the succession from an association of plants existing in open water to swamp and finally the climax includes several fairly well defined stages. The first plants ordinarily noticed in open water are entirely submerged, although these presumably are preceded by free-floating or submerged and attached algae. The wholly submerged flowering plants are not conspicuous on Tug Hill, the only species noted on the summit of the plateau being *Potamogeton alpinus* in a slow-flowing stream near Parkers, and *P. zosterifolius*

and *P. pusillus* at Mud pond. Other pondweeds (*Potamogeton* spp.), *Najas flexilis* and *Elodea canadensis* are found in Pleasant lake in the limestone country to the north.

Succeeding the submerged vegetation in situations where the water is shallow enough are aquatics with floating leaves. The submerged plants in death contribute their remains to the general sediment of the pond and thus, in time, help to build up the substratum enough to permit a higher type of vegetation to take possession. Species which belong in this class are *Potamogeton epihydrus, P. amplifolius, Polygonum natans, Nymphozanthus variegatus* and *Nymphaea odorata,* all but *N. variegatus* being apparently rare.

In still shallower places than those occupied by plants with floating leaves occur forms with their bases submerged but with the upper part of the plant aerial. At lower altitudes in the State where there are large areas of marsh *Typha* is characteristic, but on Tug Hill it is inconspicuous. When found it is almost always in a somewhat open swamp, not associated with a body of water. Bordering the ponds and streams there is often a marsh or bog meadow which is building outward so vigorously that it forms steep banks of rather closely matted rhizomes and roots, or even a thin mat extending out over shallow water. As a consequence there is very little of the partially submerged vegetation except in a few special localities. The best development noted was at Alexander pond. Here the association is really secondary, the pond being an artificial one which has been partially drained. The slope is gentle, both above and below the water line, and the conspicuous species are *Equisetum limosum, Eleocharis palustris* and *Carex rostrata.* These occur over a comparatively large area in the pond, the *Eleocharis* also extending up along the margins of the slow-flowing inlet stream. *Equisetum limosum* was noted, too, in a slow-flowing stream near Whetstone gulf in a situation similar to the one just described. Other partially emerged aquatics, seen occasionally, are *Sagittaria latifolia, Glyceria borealis* and *Dulichium arundinaceum. Peltandra virginica* occurs at Mud pond, and associated with it is the free-floating *Spirodela polyrhiza.*

At Pleasant lake, in the limestone country, a bordering marsh is somewhat better developed than in localities on the summit of the plateau. Here are *Equisetum limosum, Typha, Dulichium arundinaceum* and *Scirpus acutus*; and even shrubs, such as species of *Salix,* extend into the water. Most conspicuous of all is *Myrica Gale,* occurring in a rather extensive zone along one section of shore a few feet out from the water's edge.

The vegetation of well-drained swamps. The plant associations of lake and seepage swamps are the most noticeable of all those in which the vegetation has been practically untouched by man—excepting, possibly, the climax forest. On the higher, rolling part of the plateau most of the swamps have apparently resulted from the filling of shallow lakes, but there may also be some seepage caused by impervious soil layers lying so as to bring the underground water to the surface. By far the greater percentage of swamp is of the well-drained type, in contrast to the Adirondack region where nearly everywhere there is a considerably larger relative amount of bog.

Subsequent to the filling of ponds sufficiently to support a partially emerged vegetation, added accumulation of vegetable remains and mineral sediments provides a habitat which will support plants tolerating some contact with the free atmosphere but, at the same time, ones which necessarily are subjected to an excessive amount of soil moisture, at least at certain seasons, due to the closeness of the water table to the surface. Practically all of the Tug Hill vegetation has developed beyond the point where open ponds are still present, except in the case of a few bogs. In the typical swamp situations there is evidence that a large area was once covered by shallow lakes or ponds, their former presence being indicated by the level marsh-meadow or alder-swamp covered flats, almost always bordering slow, meandering streams.

The succession of associations following the stage of partially emerged marsh vegetation is first to a marsh meadow made up of grasses, sedges and other low herbaceous flowering plants. Some of these are more characteristic of the water's edge and may be partially submerged, but the type is in its broader aspects quite uniform. Shrubs, in time, encroach on marsh meadows, usually in the drier, firmer situations but sometimes more or less promiscuously. Trees enter the shrub-covered areas either after they are completely covered, or, in some cases, very soon after the entrance of the first shrubs, and swamp forest results. All the while the accumulation of organic material has been building the substratum higher and higher above the water table, making the soil better aerated, so that finally the situation is one which is able to support a climax forest.

Marsh meadow is one of the commonest plant associations on Tug Hill. Nearly every stream, along some part of its upper course on the higher part of the plateau, has such meadows ranging in area from a fraction of an acre to several acres (figure 11). As the

ponds of the summit of the plateau are either artificial or poorly drained, marsh meadows are not characteristically developed along their borders. There is every gradation between typical marsh meadow and typical bog meadow.

Some of the more conspicuous marsh meadow species are:

Panicum boreale
Phalaris arundinacea
Calamagrostis canadensis
Deschampsia caespitosa, var. *glauca*
Glyceria canadensis
G. nervata
Dulichium arundinaceum
Scirpus hudsonianus
S. atrocinctus
Eriophorum viridi-carinatum
Carex angustior
C. interior (rare)
C. polygama (rare)
C. flava
Habenaria dilatata
H. clavellata
H. psycodes
H. fimbriata
Ranunculus abortivus (rare)
Thalictrum polygamum
Anemone canadensis
Potentilla palustris
Sanguisorba canadensis
Hypericum ellipticum
H. mutilum
H. virginicum
Viola cucullata
V. pallens
Epilobium densum
Oenothera perennis
Sium suave
Lysimachia terrestris
Gentiana linearis
Lycopus americanus
Chelone glabra
Veronica scutellata
Galium palustre
Campanula uliginosa
Lobelia cardinalis
Eupatorium maculatum
E. perfoliatum
Solidago humilis
S. canadensis
S. graminifolia
Aster Tradescanti
A. umbellatus
Senecio aureus
Cirsium muticum

Several of these species are more characteristic of the swamp shrub and swamp forest stages, but a considerable percentage of the list may be found in almost any marsh meadow.

Some species not listed above are common in the wetter marsh meadows. They include *Thelypteris palustris* (which occurs also in meadows approaching the bog type), *Onoclea sensibilis, Osmunda regalis*, var. *spectabilis, O. cinnamomea* and *Iris versicolor.* Other species are more abundant in situations, such as wet roadsides (see "Secondary hydrophytic associations"), which have been modified by man, though they may also occur in marsh meadows. Of this class, *Scirpus rubrotinctus, S. atrovirens, S. atrocinctus, Carex strictior, Juncus effusus, Veratrum viride, Saxifraga pennsylvanica* and *Geum rivale* are the most common. Some of the plants of meadows intermediate between the marsh and bog types are *Erio-*

phorum virginicum, Rynchospora alba, Carex castanea, C. oligosperma (rare), *C. Michauxiana* (rare), *Smilacina trifolia* and *Drosera rotundifolia.*

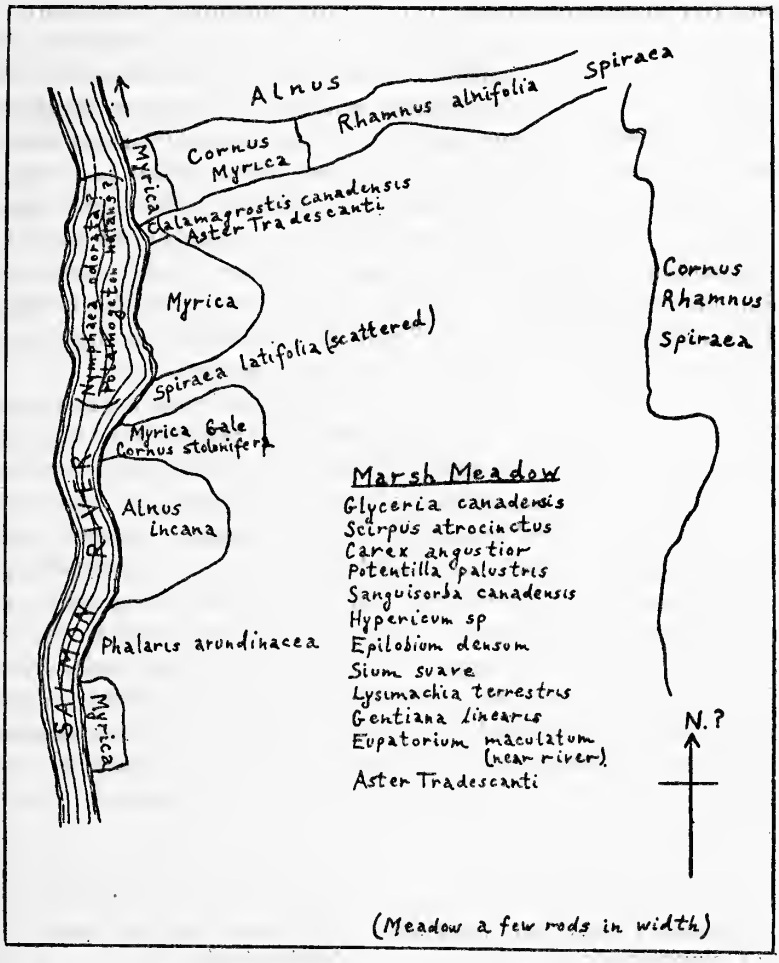

Figure 6 Map of the Salmon River meadows. A typical marsh meadow with shrubs taking possession from all sides.

The swamp shrub association follows marsh meadow, the shrubs usually invading along the margins (figure 6; figure 12 shows a marsh meadow in which scattered shrubs are becoming established nearly everywhere). The composition of swamp shrub is quite variable. One of the commonest species is alder (*Alnus incana*) which in many places forms an almost pure stand over large areas with,

of course, a herbaceous undergrowth. In other situations various willows (*Salix* spp.) form a large part of the shrub association, but willows occur more often in secondary associations and are comparatively inconspicuous elsewhere. Other important marsh shrubs, generally growing in places where *Alnus* is less abundant, are *Myrica Gale, Spiraea latifolia, Rosa palustris, Rhamnus alnifolia, Cornus stolonifera, Lonicera villosa,* var. *tonsa, Viburnum dentatum, Sambucus canadensis* and, coming in more noticeably in the somewhat boggy meadows, *Pyrus melanocarpa, Nemopanthus mucronata, Ledum groenlandicum, Andromeda glaucophylla, Vaccinium canadense, Viburnum cassinoides* and other more typical bog shrubs. *Ilex verticillata* is a plant which is apparently more closely associated with the swamp forest association than with the pure shrub stage. The herbaceous species are similar to those found in the more open swamp forest, as well as to those of marsh meadows.

One of the first trees to enter the shrub association is red maple. This is accompanied, or very soon followed, by balsam fir, red spruce, elm (*Ulmus americana*)—though the latter is probably more common in secondary swamp associations—hemlock, tamarack (?), and occasionally arbor vitae and basswood (*Tilia americana*). Balsam often grows in extensive, nearly pure stands, and arbor vitae nearly always has the same habit (figure 13). Associated with these trees are most of the shrubs listed as belonging to the swamp shrub association. Others which sometimes occur are *Taxus canadensis, Ribes triste,* var. *albinervium, Pyrus americana, Amelanchier Bartramiana, Rhus Toxicodendron* and *Lonicera canadensis.* The herbaceous vegetation is similar in the swamp shrub and forest associations. The herbs characteristic of mixed swamp forests are as follows:

Thelypteris palustris
Onoclea sensibilis
Pteretis nodulosa
Osmunda regalis, var. *spectabilis*
O. cinnamomea
Equisetum sylvaticum, var.
Cinna latifolia
Glyceria melicaria
Carex canescens, var. *disjuncta* (rare)
C. trisperma
C. tenella
Arisaema triphyllum, var. *Stewardsonii*
Calla palustris
Veratrum viride
Lilium canadense
Smilacina stellata (rare)
Streptopus amplexifolius
Smilax herbacea
Habenaria dilatata
Listera convallarioides
Stellaria borealis
Ranunculus septentrionalis
Caltha palustris
Coptis trifolia
Cardamine pennsylvanica
Saxifraga pennsylvanica
Chrysosplenium americanum
Geum rivale

Rubus pubescens	*Eupatorium maculatum*
Viola cucullata	*Aster puniceus*
Chiogenes hispidula	*A. umbellatus*
Scutellaria epilobiifolia	*A. acuminatus*

In a few swamps other species are occasionally common, and those of the climax forest, especially *Clintonia borealis, Coptis trifolia, Dalibarda repens* and *Cornus canadensis,* may appear very early. Several species not included in the preceding list are often found in arbor vitae swamps. These are generally rare elsewhere. They include *Habenaria obtusata, Listera cordata, Corallorrhiza trifida, Mitella nuda, Viola renifolia* var. *Brainerdii,* and *Linnaea borealis* var. *americana.* A considerable number of additional rare species grow in the more extensive arbor vitae swamps in the Black River valley limestone country.

Following the appearance of such climax forest herbs as those mentioned above, or associated with them, are a number of other woody and herbaceous species such as *Thelypteris spinulosa,* var. *intermedia, Betula lutea, Ribes prostratum, Oxalis montana, Acer pennsylvanicum, A. spicatum, Aralia nudicaulis* and *Viburnum alnifolium.* The entrance and dominance of beech and sugar maple mark the approach of the climax forest. The bryophytes play an important part in this hydrophytic succession, being very abundant throughout except in the climax forest itself, where for the most part they are noticeably lacking.

The vegetation of poorly drained ponds. There is often a marked contrast between the plants of lakes and ponds which have free drainage and those in which it is impeded. Sometimes the vegetation itself may be active in closing up free drainage outlets, at other times ponds have been undrained from the first. The vegetation is generally very scanty. In three such Tug Hill ponds *Nymphozanthus variegatus* is the only conspicuous species. Two of these, Mack pond and Point Rock pond, occupy kettle holes in sand land and probably were never drained. The other pond (figure 7), a small one along the Glenfield and Western railroad west of Page, is entirely surrounded by bog but may have drained at one time through a stream which has since been cut off by the vegetation. At Mud pond where the drainage has permitted the formation of a bog at the lower end and along the slow-flowing outlet there is a conspicuous development of *Nymphaea odorata* in the latter.

Partially emerged plants are inconspicuous at most of the poorly drained ponds visited. Along the margin of Mack pond, however,

there is a large stand of *Chamaedaphne calyculata* in a few inches of water. *Decodon verticillatus* also borders the pond, this being

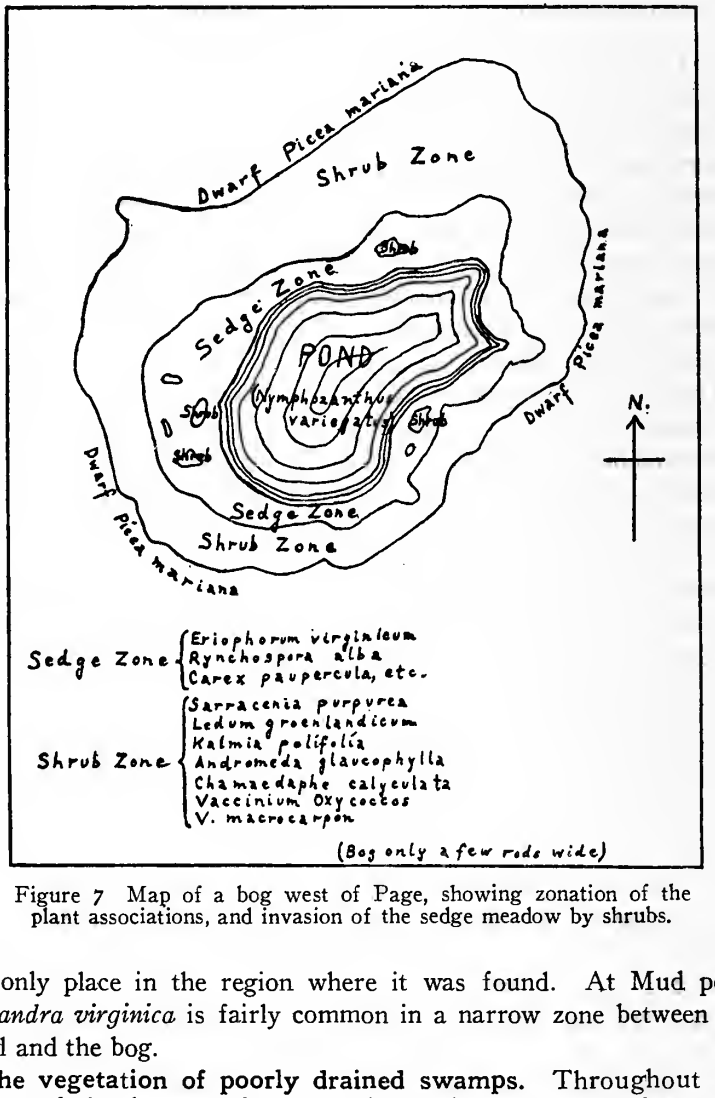

Figure 7 Map of a bog west of Page, showing zonation of the plant associations, and invasion of the sedge meadow by shrubs.

the only place in the region where it was found. At Mud pond *Peltandra virginica* is fairly common in a narrow zone between the pond and the bog.

The vegetation of poorly drained swamps. Throughout the course of development from marsh meadow to swamp forest the factors which make possible the changes in the vegetation are those associated with the soil. These factors have to do with the supply of water and its effect on the aeration and on the degree of decomposition of humus. The nature of the humus, in turn, affects the

aeration. In the earlier stages of the succession the latter is poor, due to the nearness of the water table to the surface, and it is probable that only a slight variation in the direction of poorer aeration is necessary to set up bog conditions which in many cases may not be overcome until the forest stage is reached. Accompanying the building up of the substratum, and partially causing it, is a constant accumulation of humus. Intergradations of every degree between the two typical lines of succession probably occur more commonly here, where the cool temperature and the general climatic conditions favor a development of bog, largely because of their slowing up the rate of oxidation of dead organic matter, than in warmer regions.

The plants about poorly drained ponds are often quite different from those growing around or following the disappearance of ordinary well-drained ones. Bordering such a pond there is often a bog meadow composed of grasses, sedges and other herbs, but with the sedges much more abundant than in marsh meadows. The turf is usually firm, though where a bog borders a pond the mat of stems and roots may be built out so far that it is in part floating. Shrubs apparently encroach much earlier than they do in marsh meadows. Most of the characteristic species belong to the heath family, Ericaceae, though there are a number of exceptions. The shrub stage is followed, as in the typical swamp succession, by forest which at first is composed of different species than is the swamp forest. Later it may become more like the latter and eventually it approaches the climax. *Sphagnum* moss is the most abundant of all plants from the sedge stage to the bog forest. Bogs are not so characteristic of Tug Hill as of the Adirondacks, but at least partial bog conditions are common on the higher part of the plateau.

The bog succession, which is first distinguished from the ordinary swamp succession in the marsh stage, usually has in its meadows some of the following species: *Eriophorum spissum* (rare), *E. virginicum, Rynchospora alba, Carex angustior, C. trisperma, C. paupercula,* and *Habenaria blephariglottis, Pogonia ophioglossoides* and *Calopogon pulchellus,* the last three rare. Other herbaceous plants which may occur in bog meadows or are found as an understory in the later stages are *Calla palustris, Smilacina trifolia, Sarracenia purpurea, Drosera rotundifolia* and *Gaultheria procumbens.*

In many bogs there is a more definite zonation into these various stages than in the normal hydrophytic succession (figure 7). There are some, however, which are of a more mixed nature, comprising scattered trees, shrubs and herbs (figure 14); but bog conditions

here are not quite so pronounced and the vegetation seems to have developed from some state in the swamp succession as advanced as the beginning of the swamp forest (evidenced by the presence of fairly large individuals of red maple and a rather thin mat of *Sphagnum*). Herbaceous species occurring perhaps more commonly than in the early stages of the more typical bogs are *Smilacina trifolia, Cypripedium acaule* and *Chiogenes hispidula.*

The beginning of the next stage is indicated by the encroachment over the sedge meadow of shrub species. This usually progresses inward regularly from the border of the meadow, but in some cases isolated individuals get a foothold out in the sedge mat away from the rest of their own kind (see figure 7). Sometimes this stage follows so closely after the other or is so rapid in its occupation that it almost entirely covers the sedges (figure 15). In some cases, at least, *Vaccinium Oxycoccos* appears to be the pioneer invader of the sedge mat. Other closely associated species are, first, *Ledum groenlandicum, Kalmia polifolia, Andromeda glaucophylla, Chamaedaphne calyculata* and *Vaccinium macrocarpon,* soon followed by *Pyrus melanocarpa, Amelanchier Bartramiana, Nemopanthus mucronata, Vaccinium canadense* and *Viburnum cassinoides.* Other species not occurring in all bogs but abundant in some are *Myrica Gale, Kalmia angustifolia, Gaylussacia baccata, Vaccinium corymbosum,* and occasionally a little *Alnus incana.* The latter and *Myrica Gale,* however, seem to indicate a vegetation more closely related to the shrub stage of the normal hydrophytic succession.

Black spruce (*Picea mariana*) is the most characteristic tree of the bog forest. Generally associated with it are tamarack, red spruce, balsam and red maple; and with the advent of these species, accompanied by *Clintonia borealis, Cypripedium acaule, Coptis trifolia, Dalibarda repens, Cornus canadensis* and *Chiogenes hispidula,* there is an approach to the swamp forest. The climax may presumably be reached when the substratum is built up enough to permit better drainage and rapid and complete decomposition of leaf mold. but this takes so long that the swamp forest remains relatively stable for a long time. With the development of a swamp forest from the bog forest most of the bog shrub species (except *Pyrus melanocarpa, Amelanchier Bartramiana* and *Viburnum cassinoides*) disappear, especially the heath shrubs such as *Ledum, Kalmia* spp., *Chamaedaphne, Vaccinium Oxycoccos* and *V. macrocarpon,* but *Sphagnum* continues nearly to the climax.

The vegetation of streams and their margins. The primary hydrophytic associations so far considered have been those connected in some way with the development of the substratum and the vegetation thereon from a submerged habitat in slow-flowing streams and in ponds to an aerial one. Other hydrophytic associations are found on flood plains, and along more rapidly flowing streams and the gorges which in the Tug Hill region often accompany them.

A single species of plant was observed in the streams of the higher part of the plateau—the moss, *Fontinalis antipyretica,* var. *gigantea.* This is abundant on the large slabs of sandstone which fill the stream beds. In slower brooks or in those without rocky beds *Stellaria borealis, Cardamine pennsylvanica* and *Callitriche palustris* are abundant in places.

The plants bordering a brook in the forest show the influence of the presence of the stream on atmospheric humidity and soil moisture in often being of different species from those farther away from the stream. Bryophytes are usually abundant in such situations, as are *Athyrium acrostichoides, Thelypteris Phegopteris, T. Dryopteris, Pteretis nodulosa* and various flowering plants. In marsh meadows shrubs are sometimes common along the stream banks, and some grasses and other herbs are often more abundant there than elsewhere. Some species of the latter class are *Phalaris arundinacea, Calamagrostis canadensis, Chelone glabra* and *Lobelia cardinalis.*

Another situation which supports a somewhat hydrophytic vegetation is the dripping cliffs which are common in some of the gorges, especially the larger ones: the east branch of Fish creek above Taberg, Salmon river below Salmon falls, Lorraine gulf and Deer river south of Copenhagen. Some of the most interesting plants of the region, including isolated species with boreal affinities, are found on these wet, calcareous shale cliffs. Some of the conspicuous species in the Fish Creek gorge are:

Cystopteris bulbifera
C. fragilis
Saxifraga virginiensis
S. aizoides
Parnassia caroliniana
Potentilla fruticosa
Rubus odoratus
Amphicarpa monoica
Aralia racemosa
Primula mistassinica, var. *noveboracensis*
Campanula rotundifolia
Lobelia Kalmii
Aster prenanthoides
Erigeron philadelphicus

Most of these plants also grow in the other large gorges, and many are found in similar situations in the limestone gorges along the west side of the Black River valley. Plant succession has almost never

progressed far on gorge slopes and cliffs, being successfully prevented by the frequency of slides and the effectiveness of ordinary erosion.

On moist, shady, sloping gorge banks there is often a better development of vegetation—occasionally a forest with some of the following species conspicuous as undergrowth.

Adiantum pedatum	*Taxus canadensis*
Thelypteris Phegopteris	*Mitella diphylla*
T. Dryopteris	*Ribes lacustre*
T. marginalis	*Rubus odoratus*
T. Goldiana	*R. pubescens*
Cystopteris bulbifera	*Acer spicatum*

Secondary hydrophytic associations

Secondary hydrophytic associations may be formed by the damming of streams to form artificial ponds. This has happened on Tug Hill in a number of places. If otherwise undisturbed the succeeding changes may be somewhat similar to those of the normal hydrophytic succession, with a few of the former swamp forest species mixed with the earlier stages. Willows, perhaps, play a larger part in the shrub stage of this succession than in the primary shrub association.

Secondary successions may also establish themselves as a result of the clearing and pasturing of shrubby or forested swamps or the pasturing of marsh meadows, both often occurring. Such land may later be abandoned and, except for the presence of some introduced species, may return in no great length of time to a condition approximating the original state. The utilization of such meadows and swamps, however, for pasture or hay production for any considerable length of time may alter the vegetation to such an extent that if there is any change it is more often of a retrogressive nature. Cleared and pastured swamp land has a characteristic appearance. Some of the plants often present are various grasses, species of *Scirpus* (*S. rubrotinctus, S. atrovirens* and *S. atrocinctus*), *Acorus Calamus, Juncus* spp. (*J. tenuis, J. filiformis* and *J. effusus*), *Salix* spp., *Alnus incana, Oenothera perennis* and *Veronica americana.*

The vegetation of the marsh meadows is, perhaps, less disturbed by man's activity than is that of the swamps. Roadside vegetation, too, seems to be less modified, even though it is often pastured. Roads, including old farm or wood roads, often have growing abundantly on their marshy or muddy margins and in their ditches species which are uncommon elsewhere or which are characteristic of marsh meadows. Some of these species are:

Onoclea sensibilis
Osmunda spp.
Equisetum arvense
E. sylvaticum, var.
Eleocharis obtusa
Carex crinita, var. *gynandra*
Veratrum viride
Iris versicolor
Habenaria dilatata
Salix spp.
Polygonum sagittatum
Caltha palustris
Saxifraga pennsylvanica
Spiraea latifolia
Geum rivale
Callitriche palustris
Ludvigia palustris
Zizia aurea
Steironema ciliatum
Myosotis scorpioides
Verbena hastata
Gratiola neglecta
Galium asprellum
Gnaphalium uliginosum
Senecio aureus

SUMMARY

The Tug Hill plateau stands out as a distinct physiographic province, and because little attention had been paid it by botanists a preliminary survey of the vegetation was undertaken. The results of this survey may be summarized as follows:

1 The summit of the plateau is characterized (a) by a nearly level topography and rather poor drainage, causing a greater amount of swamp than is present in most parts of the State, and (b) by a soil derived largely from sandy shales and sandstones, apparently intermediate in acidity between the Adirondack soils and those of the limestone and calcareous shale country of the northern Allegheny plateau.

2 The climate is similar to that of the rest of the State, but due to the altitude the growing season is comparatively short.

3 The vegetation, modified by environmental factors, has been derived, since the last recession of the continental ice sheet, from the species now occurring between the southern end of the Tug Hill plateau and the northern limit of vegetation. This is borne out, in part, by the study of the species-composition of the flora.

4 An important biologic environmental factor, conditioned by climate and physiography, is the amount and rate of decomposition of humus. On Tug Hill decomposition is, in general, more rapid and complete than in the Adirondacks.

5 The flora is intermediate in composition and character between that of the Adirondacks and that of the northern Allegheny plateau. It is apparently more closely allied to the latter, though the altitude helps to bring about a vegetation the physiognomy of which is similar to that of the Adirondack vegetation. Soil conditions may play an important part in this relation with the Allegheny plateau flora.

6 Plant succession is, in general, similar to that elsewhere in the forested region of northeastern United States. Due to the modifications brought about by human activity a large part of the vegetation is of a secondary nature and is somewhat xerophytic. Successional relations are obscure in many instances because of these modifications.

7 The normal swamp succession, as contrasted with the bog succession, is more conspicuous than in the Adirondack region. This may be due, in part, to the influence of the chemical and physical composition of the soils on aeration.

8 Further botanical work on the Tug Hill plateau might well be aimed toward making such a painstaking study of the native flora and vegetation and of the environmental factors that future agricultural practice and forest management might be used upon it. To do this the species-composition of the vegetation as a whole, and of specific plant associations, should be carefully determined and an accurate delimitation made of the latter; careful instrumental records should be taken of environmental factors through a number of seasons and in a large number of representative localities; and correlations made between the latter and the vegetation.

LIST OF THE VASCULAR PLANTS OF THE TUG HILL PLATEAU

The species in the following list were, for the most part, collected by the writer during the summers of 1922, 1923 and 1927. Incorporated in the list, also, are the records of other specimens in the Herbarium of the New York State Museum when of species rated as rare or when not collected by the writer. Records of additional species in Paine's Oneida county and Hough's Lewis county catalogs (Paine, '65; Hough, '46) are included with references to each by the author's name and the page, and in the case of some of these records which appear doubtful that fact has been noted. So many of the records in Bendrat's Flora of Mohawk Hill (Bendrat, '13) are questionable that none have been entered in the present list. Localities are cited for the rare species only, and the writer's collection number in parentheses indicates when the station is represented by a specimen in the Herbarium of the New York State Museum. The map (figure 3) contains the names of all the localities in the list just preceding the catalog of species. Stations can be located by means of the index numbers, and their approximate altitude can be determined by consulting the contour map (figure 2).

Most of the writer's collecting was done on the summit of the plateau, so the list of plants is not at all complete for the region as

a whole. Many species of the limestone country, the Black River flood plain and the sand land at the north are obviously lacking.

Identifications are based largely on Gray's Manual (Robinson and Fernald, '08) descriptions and on comparisons with specimens in the Herbarium of Syracuse University and the Herbarium of the New York State Museum. Some of the principal additional works to which reference has been made are Britton and Brown's ('13) Flora, Hitchcock's ('20) Genera of Grasses, and Brainerd's ('21) Violets of North America. Critical species of Gramineae were identified by Mrs Agnes Chase; critical species of *Carex,* by K. K. Mackenzie; *Amelanchier,* by Dr K. M. Wiegand; and *Rubus* and some other specimens, by Prof. M. L. Fernald.

The nomenclature is that of the seventh edition of Gray's Manual, with the emendations of Robinson and Fernald ('09) and with more recent changes and additions the authority for which is given in the catalog, all, in so far as possible, in keeping with the International Code of Nomenclature.

Localities Mentioned in the Following Catalog

(See map, Figure 3, for marginal index)

Alexander pond .....E 7
Barnes Corners .....D 4
Bellwood .....D 5
Bennett Bridge .....G 2
Black river .....G 10–A 1
Bloodsucker pond.....H 6
Boyd .....E 5
Castorland .....C 7
Champion .....B 5
Champion Huddle .....B 5
Chimney Point gulf.....E 7
Constableville .....G 8
Copenhagen .....C 5
Deer river .....E 5–B 7
Deer River Station.....B 6
East Martinsburg .....E 8
Fall brook.....I 6
Felts Mills .....A 4
Fish creek (East branch)..
E 6–J 6
Florence .....H 5
Gardners Corners .....D 5
Glenfield and Western railroad .....F 5–E 9
Great Bend .....A 5
Greenboro .....F 3
Harrisburg .....C 6
Highmarket .....F 7
Hooker .....E 5
House creek .....E 8–E 9
Houseville .....E 8
Kings falls .....B 6
Lanesburg .....D 6
Littlejohn Settlement.....F 4
Lorraine .....D 2
Lorraine gulf.....D 2
Lowville .....D 8
Lyons Falls .....F 9
Mack pond .....J 5
Mad (Salmon) river...E 5–F 4
Martinsburg .....E 8
Michigan Mills.....F 6
Mill creek (Turin)....F 8–F 9
Mohawk Hill .....G 8
Mud pond .....H 7
New Boston .....D 5
New Scriba .....F 2
Orwell .....G 2
Osceola .....G 5
Page .....F 7
Parkers .....E 5
Pinckney .....C 5

Pleasant lake.....B 5
Point Rock .....I 7
Point Rock pond (Point of Rock lake) .....I 7
Powler's pond .....H 6
Rector .....D 5
Redfield .....G 4
Roaring brook .....E 6–E 9
Rutland Center .....B 4
Rutland Hollow .....B 4
Salmon falls.....G 2
Salmon river .....G 6–G 1
Salmon River reservoir. G 4–G 2
Sears pond .....E 5
South Rutland .....C 4
Sugar river.....F 8–G10
Taberg .....J 6
Tabolt Corners .....E 8
Turin .....F 9
Vorea .....F 2
West Branch .....I 8
West Leyden .....H 8
West Lowville .....D 7
Wetmore .....E 7
Whetstone creek.....E 7–E 9
Whetstone gulf.....E 8
Widmer pond.....G 7
Windecker .....D 6
Worth Center.....E 3

POLYPODIACEAE

POLYPODIUM VIRGINIANUM L. (*P. vulgare* of Gray's Manual, ed. 7. See Rhodora 24: 141. 1922) Polypody
Rock outcrops, especially along gorges; occasional

ADIANTUM PEDATUM L. Maidenhair
Low woods, wooded gorge banks etc., especially at lower altitudes; occasional

PTERIDIUM LATIUSCULUM (Desv.) Maxon (*Pteris aquilina* of Gray's Manual, ed. 7. See Rhodora 21: 179. 1919) Common brake; Bracken
Roadsides, pastures, clearings etc.; common

CRYPTOGRAMMA STELLERI (Gmel.) Prantl Rock brake
Shady ledges in the limestone gorges of the Black River valley; occasional

WOODWARDIA VIRGINICA (L.) Sm. Chain fern
Bogs in sand land in the southern part of the region; rare
Point Rock pond (2416); near Mack pond, House 11253

ASPLENIUM VIRIDE Huds. Green spleenwort
Moist shale cliff in Whetstone gulf (2613)

A. TRICHOMANES L. Maidenhair spleenwort
"Fish creek precipices." Paine, p. 177

ATHYRIUM ANGUSTIFOLIUM (Michx.) Milde (*Asplenium angustifolium* of Gray's Manual, ed. 7. See Rhodora 21: 178. 1919) Narrow-leaved spleenwort
Rich, low woods northwest of Widmer pond (2382); Osceola, House 16634

A. ACROSTICHOIDES (Sw.) Diels (*Asplenium acrostichoides* of Gray's Manual, ed. 7. See Rhodora 21: 178. 1919) Silvery spleenwort
Borders of rich, climax forest, shady brooksides in the forest, arbor vitae swamps etc.; occasional

A. ANGUSTUM (Willd.) Presl (*Asplenium Filix-femina,* in part, of Gray's Manual, ed. 7. See Rhodora 19: 190. 1917) Lady fern

Roadsides, pastures, alder swamps, borders of the climax forest etc.; common. The several varieties and forms were not distinguished in the Tug Hill plateau region

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott Christmas fern

Climax forest, borders of open woods etc.; occasional

THELYPTERIS PHEGOPTERIS (L.) Slosson (*Phegopteris polypodioides* of Gray's Manual, ed. 7. See Rhodora 21: 179. 1919) Long beech fern

Gorge banks, shady brooksides in the climax forest etc.; common

T. DRYOPTERIS (L.) Slosson (*Phegopteris Dryopteris* of Gray's Manual, ed. 7. See Rhodora 21: 179. 1919) Oak fern

Shady brooksides and dense climax forest, arbor vitae swamps etc.; occasional

T. PALUSTRIS Schott (*Aspidium Thelypteris* of Gray's Manual, ed. 7. See Rhodora 21: 178. 1919) Marsh fern

Open marshy swamps; occasional

T. NOVEBORACENSIS (L.) Nieuwl. (*Aspidium noveboracense* of Gray's Manual, ed. 7. See Rhodora 21: 178. 1919) New York fern

Dry shady banks, pastures etc.; occasional

T. MARGINALIS (L.) Nieuwl. (*Aspidium marginale* of Gray's Manual, ed. 7. See Rhodora 21:1178. 1919) Evergreen wood fern

Shady gorge banks etc. at lower altitudes, especially in the limestone country; occasional

T. GOLDIANA (Hook.) Nieuwl. (*Aspidium Goldianum* of Gray's Manual, ed. 7. See Rhodora 21: 177. 1919) Goldie's fern

Rich climax forest, wooded gorge slopes etc.; occasional

T. CRISTATA (L.) Nieuwl. (*Aspidium cristatum* of Gray's Manual, ed. 7. See Rhodora 21: 177. 1919) Crested shield fern

Swampy, or somewhat boggy, woods; rare

Parkers (38); northeast of Osceola; Turin

T. SPINULOSA (O. F. Muell.) Nieuwl., var. INTERMEDIA (Muhl.) Weatherby (*Aspidium spinulosum,* var. *intermedium* of Gray's Manual, ed. 7. See Rhodora 21: 178. 1919)

Climax forest, low woods, alder swamps etc.; common (either this, or the typical form which was not observed).

CYSTOPTERIS BULBIFERA (L.) Bernh.

Rock outcrops along streams and in gorges, especially in the limestone country; occasional

C. FRAGILIS (L.) Bernh. Brittle fern

Rock outcrops in gorges, especially in the limestone country; occasional

DENNSTAEDTIA PUNCTILOBULA (Michx.) Moore (*Dicksonia punctilobula* of Gray's Manual, ed. 7. See Rhodora 21: 178. 1919) Hay-scented fern

Dry barren pastures, roadsides, dry woods etc.; common

ONOCLEA SENSIBILIS L. Sensitive fern

Wet roadsides, pastures, swamps, low woods etc.; common

PTERETIS NODULOSA (Michx.) Nieuwl. (*Onoclea Struthiopteris* of Gray's Manual, ed. 7. See Rhodora 21: 178. 1919) Ostrich fern

Low wet woods and wooded gorge bottoms; occasional

OSMUNDACEAE

OSMUNDA REGALIS L., var. SPECTABILIS (Willd.) Gray (See Rhodora 21: 179. 1919) Royal fern

Pastures and swamps; common

O. CLAYTONIANA L. Interrupted fern

Pastures, roadsides etc.; common

O. CINNAMOMEA L. Cinnamon fern

Swamps, bogs, wet woods, and wet or dry pastures; common

OPHIOGLOSSACEAE

OPHIOGLOSSUM VULGATUM L. Adder's tongue

Marsh meadows, pastures etc.; rare

Parkers (1693, 2465); Fall brook, Haberer 6/25/03

BOTRYCHIUM SIMPLEX E. Hitchcock Little grape fern

"near Fall brook, west of Fish creek." Paine, p. 180 (Specimen collected by Paine labelled simply "Fish creek")

B. TENEBROSUM A. A. Eaton (Given as a synonym of *B. simplex* in Gray's Manual, ed. 7; possibly a reduced form of *B. matricariaefolium*)

Dry grassy pasture northwest of Rector (55)

B. ANGUSTISEGMENTUM (Pease & Moore) Fernald (*B. lanceolatum*, var. *angustisegmentum* of Gray's Manual, ed. 7. See Rhodora 17: 87. 1915) Lance-leaved grape fern

Pasture northwest of Parkers (2464)

B. MATRICARIAEFOLIUM A. Br. (*B. ramosum* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 36)

Sterile field west of Hooker (2490); dry open woods southwest of Orwell (2169)

B. OBLIQUUM, Muhl. Grape fern

Dry grassy pastures, coniferous woods, marsh meadows and roadsides; common

The dissected-leaf form (*B. obliquum*, var. *dissectum* (Spreng.) Clute of Gray's Manual, ed. 7) occurs occasionally in marsh meadows etc. (See Rhodora 23: 151. 1921 for a discussion of the nomenclature of these forms)

B. VIRGINIANUM (L.) Sw. Rattlesnake fern
Dry coniferous woods, climax forest etc.; occasional

EQUISETACEAE

EQUISETUM ARVENSE L. Common horsetail
Low swampy woods, moist gorge slopes, roadsides etc.; occasional

E. SYLVATICUM L., var. PAUCIRAMOSUM Milde, forma MULTIRAMOSUM Fernald (See Rhodora 20: 131. 1918) Wood horsetail
Open or partially wooded swamps, pastures, ditches etc.; common

E. LIMOSUM L. (*E. fluviatile* of Gray's Manual, ed. 7. See Rhodora 23: 45. 1921) Pipes
Wet roadsides, pond margins, arbor vitae swamps etc.; occasional

E. HYEMALE L., var. AFFINE (Engelm.) A. A. Eaton Scouring rush
Shaded or open banks etc.; rare
Bennett Bridge (2181); south of Copenhagen; southwest of Castorland; north of Lyons Falls; Pleasant lake

E. SCIRPOIDES Michx.
Arbor vitae swamp southwest of Castorland (2666); shady shale bank of Salmon river below Bennett Bridge (2180)

LYCOPODIACEAE

LYCOPODIUM LUCIDULUM Michx. Shining club moss
Rich climax forest; common

L. INUNDATUM L. Bog club moss
Moist mossy roadsides, sandy bogs etc.; rare
South of Greenboro (2771); New Scriba (2774); Osceola, House 9143; Mack pond, House 11256

L. ANNOTINUM L., var. ACRIFOLIUM Fernald (See Rhodora 17: 124. 1915)
Dry woods and roadsides; occasional
Typical form recorded on sight from three localities but specimens collected are all of this variety

L. CLAVATUM L. Common club moss
Dry woods, roadsides, climax forest (?) etc.; common

L. CLAVATUM, var. MEGASTACHYON Fernald & Bissell (Var. *monostachyon*, in part, of Gray's Manual, ed. 7. See Rhodora 12: 53. 1910)
Sand land east of Felts Mills (906)

L. OBSCURUM L. Tree club moss
Rich, somewhat dry, woods, fields, climax forest etc.; common

L. OBSCURUM, var. DENDROIDEUM (Michx.) D. C. Eaton
Dry woods, pastures etc.; occasional

L. FLABELLIFORME (Fernald) Blanchard (*L. complanatum,* var. *flabelliforme* of Gray's Manual, ed. 7. See Rhodora 13: 168. 1911) Ground pine
Roadsides, dry woods, pastures, climax forest (?) etc.; common

L. TRISTACHYUM, Pursh
Dry woods and pastures, roadsides, dry soil bordering gorges etc.; occasional

L. TRISTACHYUM, VAR. HABERERI (House) Vict. (See Marie-Victorin, Les Lycopodinées du Québec, p. 51)
Parkers (69)

TAXACEAE

TAXUS CANADENSIS Marsh. Ground hemlock; Yew
Low shady or swampy woods, arbor vitae swamps, gorge banks, climax forest etc.; occasional

PINACEAE

PINUS STROBUS L. White pine
Dry woods bordering gorges, swamps etc.; occasional

P. RESINOSA Ait. Red pine
Sand land south of Felts Mills (916)

LARIX LARICINA (DuRoi) Koch Tamarack; Larch
Swamps, bogs, pastures etc.; common

PICEA RUBRA (DuRoi) Dietr. Red spruce
Climax forest, pastures, gorge banks, swamps etc.; common

P. MARIANA (Mill.) BSP. Black or bog spruce
Bogs; occasional

ABIES BALSAMEA (L.) Mill. Balsam fir
Climax forest, swamps, pastures etc.; common

TSUGA CANADENSIS (L.) Carr. Hemlock
Swampy woods, climax forest, gorge banks etc.; common—but inconspicuous on the summit of the plateau except in virgin forest

THUJA OCCIDENTALIS L. Arbor vitae; White cedar
Swamps and gorge banks; occasional. Common in the limestone region

JUNIPERUS COMMUNIS L., var. DEPRESSA Pursh Juniper
Dry pastures and gorge margins etc.; occasional

TYPHACEAE

TYPHA LATIFOLIA L. Common cat-tail
Marshy places in wooded swamps, marshy lake shores etc.; occasional

SPARGANIACEAE

SPARGANIUM AMERICANUM Nutt. Bur-reed
Marshy margin of arbor vitae swamp northwest of Turin (2597)

S. CHLOROCARPUM Rydb. (*S. diversifolium* of Gray's Manual, ed. 7. See Rhodora 24: 29. 1922) Bur-reed
Margin of brook, Parkers (2647)

S. CHLOROCARPUM var. ACAULE (Beeby) Fernald
Osceola, House 16649

NAJADACEAE

POTAMOGETON NATANS L. Pondweed
Pleasant lake (880)

P. EPIHYDRUS Raf. Pondweed
Mud pond (2784)

P. ALPINUS Balbis Pondweed
Slow-flowing brook, Parkers (75)

P. AMPLIFOLIUS Tuckerm Pondweed
Slow-flowing streams; rare
Whetstone creek above Whetstone gulf (2615); above Sears pond (2646)

P. GRAMINEUS L., var. GRAMINIFOLIUS Fries (*P. heterophyllus,* in part, at least, of Gray's Manual, ed. 7. See Rhodora 23: 189. 1921) Pondweed
Marshy pond south of Great Bend (2731)

P. ZOSTERIFOLIUS Schumacher Pondweed
Shallow water of ponds; rare
Mud pond (2786); Pleasant lake (2738)

P. PUSILLUS L. Pondweed
Mud pond (2785)

P. FOLIOSUS Raf. Pondweed.
Pleasant lake (2741)

NAJAS FLEXILIS (Willd.) Rostk. & Schmidt Naiad
Pleasant lake (2739)

JUNCAGINACEAE

SCHEUCHZERIA PALUSTRIS L. var. AMERICANA Fernald (See Rhodora 25: 178. 1923)
"Point of Rock lake," Paine, p. 134 (as *S. palustris*)

ALISMACEAE

SAGITTARIA LATIFOLIA Willd. Broad-leaved arrowhead
Wet soil along brooks; rare
Sears Pond (2644); Parkers

S. CUNEATA Sheldon (*S. arifolia* of Gray's Manual, ed. 7. See Rhodora 23: 192. (1921) Arrowhead
Marshy pond south of Great Bend (2729)

ALISMA PLANTAGO-AQUATICA L. Water plantain
Marshy pond south of Great Bend (2728)

HYDROCHARITACEAE

ELODEA CANADENSIS Michx. (*E. canadensis,* in part, of Gray's Manual, ed. 7. See Rhodora 22: 17–29. 1920) Water weed
Pleasant lake (2740)

GRAMINEAE

DIGITARIA ISCHAEMUM Schreb. (*D. humifusa* of Gray's Manual, ed. 7. See Rhodora 18: 231. 1916) Finger grass
Sandy roadside south of Felts Mills (919)

PANICUM CAPILLARE L. Old-witch grass
Roadside northeast of New Boston (865)

P. VIRGATUM L. Switch grass
Sandy field, Point Rock pond

P. BOREALE Nash
Marsh meadows, dry pastures etc.; occasional

P. IMPLICATUM Scribn.
Pastures, meadows, marsh meadows etc.; occasional

P. TENNESSEENSE Ashe
Marly sidehill seepage southwest of Castorland (2661)

P. CLANDESTINUM L. Deer-tongue grass
Rocky bed of Salmon river above Bennett Bridge (2194); dry brushy field north of Osceola (2439); Greenboro

ECHINOCHLOA CRUSGALLI (L.) Beauv. Barnyard grass
Gardens and roadsides; occasional

E. CRUSGALLI, forma LONGISETA (Trin.) Farwell (See Rhodora 23: 55. 1921)
Roadside, Parkers (82). Collected with typical form

SETARIA LUTESCENS (Weigel) Hubbard (*S. glauca* of Gray's Manual, ed. 7. See Rhodora 18: 232. 1916) Yellow foxtail; Pigeon grass
Roadside, West Lowville hill (1686)

S. VIRIDIS (L.) Beauv. Green foxtail
Garden, Rector (88)

LEERSIA ORYZOIDES (L.) Sw. Rice cut-grass
Marshy places; rare
Southwest of Copenhagen (869); Mack pond, House 11258

PHALARIS ARUNDINACEA L. Reed canary grass
Swales and marsh meadows, usually bordering brooks; occasional

ANTHOXANTHUM ODORATUM L. Sweet vernal grass
Pastures, roadsides and meadows; common

MILLIUM EFFUSUM L. Millet grass
Climax forest or rich, wooded stream bottoms; occasional

ORYZOPSIS ASPERIFOLIA Michx. Mountain rice
Heavy dry soil in open woods south of Copenhagen (2358)

MUHLENBERGIA SYLVATICA Torr.
Rocky bank of Fish creek southwest of Taberg (1821)

M. RACEMOSA (Michx.) BSP.
Marsh meadow south of Parkers (1702)

M. SCHREBERI J. F. Gmel. Drop-seed; Nimble will
Dry opening in woods southwest of Taberg (1815)

M. UNIFLORA (Muhl.) Fernald (*Sporobolus uniflorus* of Gray's Manual, ed. 7. See Rhodora 29: 10. 1927)
Marsh meadows; rare
South of Parkers (819, 1692); northwest of Rector (2624)

BRACHYELYTRUM ERECTUM (Schreb.) Beauv.
Dry woods and banks; occasional

PHLEUM PRATENSE L. Timothy
Pastures, roadsides etc.; common

ALOPECURUS PRATENSIS L. Meadow foxtail
Roadsides; rare
East of Rector (439); Parkers

A. AEQUALIS Sobol. (*A. geniculatus,* var. *aristulatus* of Gray's Manual, ed. 7. See Rhodora 19: 165. 1917 for its recognition as a distinct species; and House, Annotated List of the Ferns and Flowering Plants of New York State, p. 94, for synonymy) Floating foxtail
Swampy woods south of Great Bend (2713)

AGROSTIS ALBA L. Red top
Roadsides, fields, open swamps etc.; common

A. ALBA, var. MARITIMA (Lam.) G. F. W. Mey
Moist rocks along Fish creek southwest of Taberg (1822)

A. TENUIS Sibth. (*A. alba,* var. *vulgaris* of Gray's Manual, ed. 7. See Rhodora 26: 2. 1924)
Pasture, Rector (1706)

A. TENUIS, forma ARTISTATA (Parnell) Wiegand (See Rhodora 26: 2. 1924)
Dry grassy roadside northeast of Hooker (2756)

A. HYEMALIS (Walt.) BSP. Hair grass
Dry roadsides, meadows etc.; occasional

CALAMAGROTIS CANADENSIS (Michx.) Nutt. (See Rhodora 24: 142. 1922) Blue-joint grass
Wet roadsides, marsh meadows etc.; occasional

CINNA LATIFOLIA (Trev.) Griseb.
Swamps and rich low woods; occasional

NOTHOLCUS MOLLIS (L.) Hitchc. (Belongs to the genus *Holcus* of Gray's Manual, ed. 7; replaced by *Ginannia* Bub., Rhodora 18: 233. 1916)
Meadow northwest of Rector (2637)
Reported by Hitchcock in The Genera of Grasses of the United States, p. 118, and by Hitchcock in Abrams, An Illustrated Flora of the Pacific States, Vol. 1, p. 163 as having been introduced into California.
The Tug Hill meadow has the appearance of being rather old and the colony of the grass is well established.

SPHENOPHOLIS PALLENS (Spreng.) Scribn.
Shady shale gorge banks at lower altitudes and open arbor vitae swamps; rare
Lorraine gulf northwest of Lorraine (2506); Whetstone gulf (2607); Houseville (2602); West Lowville

DESCHAMPSIA CAESPITOSA (L.) Beauv., var. GLAUCA (Hartm.) Lindm. (See Rhodora 28: 154. 1926) Tufted hair grass
Marsh meadows etc.; occasional

DANTHONIA SPICATA (L.) Beauv. Wild oat grass
Dry banks, roadsides and pastures; common

D. COMPRESSA Aust.
Dry roadsides in the southwestern part of the region; rare.
Southwest of Hooker (2758); southeast of Greenboro; New Scriba

MELICA STRIATA (Michx.) Hitchc. Purple oat
Woods, wooded gorge banks and margins, especially in the limestone country; occasional—but rare on the summit of the plateau

DACTYLIS GLOMERATA L. Orchard grass
Roadsides etc., especially at lower altitudes; occasional

POA ANNUA L. Low spear grass
Roadside, West Lowville hill (1687); wet woods west of Rector (583)

P. COMPRESSA L. Canada blue grass; Wire grass
Roadside, West Lowville hill (1685)

P. PALUSTRIS L. (*P. triflora* of Gray's Manual, ed. 7. See Rhodora 18: 235. 1916) Fowl meadow grass
Marsh meadows etc.; occasional

P. PRATENSIS L. June grass; Kentucky blue grass
Climax forest, wood roads, roadsides etc.; occasional

P. TRIVIALIS L. Rough-stalked meadow grass
Low wet woods west of Harrisburg (597)

P. SALTUENSIS Fernald & Wiegand (See Rhodora 20: 122. 1918)
Shady gorge banks, rich climax forest etc.; occasional

P. ALSODES Gray
Rich climax forest etc.; occasional
More often at lower altitudes and in richer, moister places (often on stream bottoms) than the preceding species

GLYCERIA MELICARIA (Michx.) Hubbard (*G. Torreyana* of Gray's Manual, ed. 7. See Rhodora 14: 186. 1912)
Wet woods, alder and arbor vitae swamps etc.; occasional

G. CANADENSIS (Michx.) Trin. Rattlesnake grass
Wet meadows and roadsides, marsh meadows etc.; occasional

G. NERVATA (Willd.) Trin. Fowl meadow grass
Marsh meadows and low wet woods; common

G. GRANDIS Wats. Reed meadow grass
Wet meadows; occasional

G. FERNALDII (Hitchc.) St John (*G. pallida,* var. *Fernaldii* of Gray's Manual, ed. 7. See Rhodora 19: 76. 1917)
Mucky soil in clearing northwest of Rector (2634)

G. BOREALIS (Nash) Batchelder
Marshy pond margins; rare
Whetstone creek (2616); Sears pond (2638); south of Great Bend (2714); Pleasant lake

FESTUCA OVINA L., var. DURIUSCULA (L.) Koch ? Sheep's fescue
Rocky pasture southwest of Orwell (2161); sandy field northeast of Point Rock (2412)

F. ELATIOR L. Meadow fescue
Roadside near Gardners Corners (591)

F. NUTANS Spreng.
Shady shale bank in Whetstone gulf (2609); limestone woods, Felts Mills

BROMUS CILIATUS L. Wood chess
Wooded or grassy roadsides etc.; occasional

B. CILIATUS, var. DENUDATUS (Wieg.) Fernald (See Rhodora 28: 20. 1926)
Grassy banks, roadsides etc.; rare
Sears pond (2645); northwest of West Leyden (2791)

B. PURGANS L., forma GLABRIFLORUS Wiegand (See Rhodora 24: 92. 1922)
Rich limestone woods, Felts Mills (2704)

B. INERMIS Leyss. (See House, Annotated List of the Ferns and Flowering Plants of New York State, p. 124)
Roadside near head of Whetstone gulf (2614)

NARDUS STRICTA L. (See House, Annotated List of the Ferns and Flowering Plants of New York State, p. 126)
Roadsides and old pastures; rare
Northwest of Point Rock (2431); Highmarket (2443)

AGROPYRON REPENS (L.) Beauv. Quack grass; Couch grass
Gardens, meadows etc.; rare
Rector (78)

ELYMUS RIPARIUS Wiegand (See Rhodora 20:84. 1918) Wild rye
Rocky bank of Fish creek southwest of Taberg (1818)

ASPERELLA HYSTRIX (L.) Humb. (*Hystrix patula* of Gray's Manual, ed. 7. See Rhodora 14: 187. 1912) Bottle-brush grass
Dry limestone woods, Felts Mills (909)

CYPERACEAE

CYPERUS STRIGOSUS L.
Field near Black river southeast of Lowville (801)

C. FILICULMIS Vahl, var. MACILENTUS Fernald
Sandy roadside, Felts Mills (2709)

DULICHIUM ARUNDINACEUM (L.) Britton
Marsh meadows, wet roadsides etc.; occasional

ELEOCHARIS OBTUSA (Willd.) Schultes Spike rush
Wet roadsides, open mucky depressions in pastures, open borders of swamps etc.; rare
Northwest of Rector (2632); northwest of Turin (2594); south of Copenhagen; south of Greenboro

E. PALUSTRIS (L.) R. & S. Spike rush
In water at Alexander pond (510)

E. ACICULARIS (L.) R. & S. Spike rush
Margin of pool in woods south of Great Bend (2720)

E. CAPITATA (L.) R. Br. (*E. tenuis* of Gray's Manual, ed. 7. See Rhodora 20: 24. 1918) Spike rush
Open swampy places along brooks, open alder swamps etc.; occasional

SCIRPUS HUDSONIANUS (Michx.) Fernald Alpine cotton grass
Marsh meadows; common

S. VALIDUS Vahl Great bulrush
Swale northwest of Martinsburg (658); shallow pond south of Great Bend (2734)

S. ACUTUS Muhl. (*S. occidentalis* of Gray's Manual, ed. 7. See Rhodora 22: 55. 1920)
Shallow water, Pleasant lake (2743)

S. RUBROTINCTUS Fernald
Wet meadows and roadsides; occasional

S. ATROVIRENS Muhl.
Moist pastures and roadsides; occasional

S. CYPERINUS (L.) Kunth, var. PELIUS Fernald Wool grass
Wet pastures and roadsides; occasional

S. ATROCINCTUS Fernald
Moist pastures, open swamps, bogs, and wet roadsides; common

ERIOPHORUM SPISSUM Fernald (*E. callitrix* of Gray's Manual, ed. 7. See Rhodora 27: 208. 1925) Hare's tail
Bogs; rare
Mud pond (2398); Point Rock pond (2421); east of Parkers (2481)

E. TENELLUM Nutt. Cotton grass
Bog meadow, Parkers (100)

E. VIRIDI-CARINATUM (Engelm.) Fernald Cotton grass
Marsh meadows etc.; occasional

E. VIRGINICUM L. Cotton grass
Bog and marsh meadows; occasional

RYNCHOSPORA ALBA (L.) Vahl Beak rush
Bogs and marsh meadows; occasional

MARISCUS MARISCOIDES (Muhl.) Kuntze (*Cladium mariscoides* of Gray's Manual, ed. 7. See Rhodora 25: 53. 1923) Twig rush
Shore of Pleasant lake (2746)

CAREX SCOPARIA Schkuhr
Dry pastures etc.; occasional

C. PROJECTA Mackenzie (*C. tribuloides,* var. *reducta* of Gray's Manual, ed. 7. See Bul. Torr. Bot. Club 35: 264. 1908)
Wet roadsides and low wet woods; occasional

C. CRAWFORDII Fernald
Dry pastures etc.; rare
Parkers (89); northwest of Rector (2631)

C. ANGUSTIOR Mackenzie (*C. stellulata,* var. *angustata* of Gray's Manual, ed. 7. See Rydberg, Flora of the Rocky Mountains and Adjacent Plains, p. 124)
Marsh meadows, bogs, wet roadsides etc.; common

C. INTERIOR Bailey (*C. scirpoides* of Gray's Manual, ed. 7. See Rhodora 23: 96. 1921)
Marsh meadows; rare
Parkers (2469, 2474)

C. CANESCENS L., var. DISJUNCTA Fernald
Marsh meadows and swampy woods; rare
Parkers (560, 2454)

C. BRUNNESCENS Poir., var. SPHAEROSTACHYA (Tuckerm.) Kükenthal (See Rhodora 28: 163. 1926)
Dry pastures and open grassy woods; common

C. BROMOIDES Schkuhr
Low mucky woods; rare
West of Harrisburg (596); Rector (585); Houseville, House 9293

C. DEWEYANA Schwein.
Rich open woods west of Parkers (2458)

C. TRISPERMA Dewey
In *Sphagnum* in wet woods, bogs etc.; occasional

C. TENELLA Schkuhr
Rich mucky woods and swamps; occasional

C. ROSEA Schkuhr (*C. rosea,* var. *radiata* and *C. rosea,* var. *minor,* each in part, of Gray's Manual, ed. 7. See Bul. Torr. Bot. Club 43: 425. 1916)
Open woods, Copenhagen, House 10095

C. CEPHALOIDEA Dewey
Open woods, Copenhagen, House 10096; limestone rocks along the Sugar river, Haberer 3534

C. VULPINOIDEA Michx.
Low wet woods, wet pastures etc.; occasional

C. DIANDRA Schrank
Bog at Mud pond (2399)

C. STIPATA Muhl.
Swamps etc.; rare
Parkers (478)

C. CRINITA Lam.
Moist meadows, bogs, brooksides, arbor vitae swamps etc.; occasional

C. CRINITA, var. GYNANDRA (Schwein.) Schwein. & Torr.
Wet roadside ditches etc.; rare
Southeast of Sears pond (2488); Houseville, House 9291; Parkers

C. TORTA Boott
Swamps, open rocky stream bottoms etc.; occasional

C. STRICTIOR Dewey (*C. stricta,* in part, of Gray's Manual, ed. 7. See Bul. Torr. Bot. Club 42: 415. 1915)
Wet roadsides, brook banks etc.; occasional

C. HAYDENI Dewey (*C. stricta,* var. *decora* of Gray's Manual, ed. 7. See Bul. Torr. Bot. Club 42: 410. 1915)
Dry pasture near edge of swamp, Rector (97)

C. AUREA Nutt.
Low field in limestone country, Copenhagen (604); dry crevices in shale along margin of Salmon river above Bennett Bridge (2188); exposed crevices of igneous rock east of Turin (2251)

C. LEPTALEA Wahlenb.
Wooded swamps, pastures etc.; rare
Parkers (794, 2463)

C. POLYGAMA Schkuhr
Marsh meadow east of Page (2444)

C. VIRESCENS Muhl., var. SWANII Fernald
Dry wooded gulf bottom northwest of Lorraine (2503); heavy pasture soil, Pleasant lake (2747); under hemlocks at edge of arbor vitae swamp southwest of Castorland (2663)

C. GRACILLIMA Schwein.
Moist pastures, roadsides etc.; occasional

C. DEFLEXA Hornem.
Dry pasture east of Parkers (2483)

C. PECKII E. C. Howe (*C. albicans* of Gray's Manual, ed. 7—according to Mackenzie)
Copenhagen, House 9286

C. COMMUNIS Bailey
Rich to dry open woods, roadsides etc.; occasional

C. NOVAE-ANGLIAE Schwein.
Dry pasture, Parkers (2470)

C. PALLESCENS L.
Moist meadows, dry roadsides etc.; common

C. PAUPERCULA Michx. (including var. *irrigua* of Gray's Manual, ed. 7. See Rhodora 23: 96. 1921)
Bog meadows; occasional

C. LIMOSA L.
Open bogs; rare
Southwest of Orwell (2160); Point Rock pond (2417)

C. PRASINA Wahlenb.
Brookside near Fish creek south of Point Rock (431)

C. EBURNEA Boott
Dry shady shale bank along Deer river south of Copenhagen (2352); cliffs, Fall brook, Haberer 1035

C. PEDUNCULATA Muhl.
Dry rocky woods southwest of Orwell (2166); shady slope in Chimney Point gulf (2222)

C. PLANTAGINEA Lam.
Climax forest; occasional

C. LAXICULMIS Schwein.
Fall brook, Haberer 3888

C. ORMOSTACHYA Wiegand (See Rhodora 24: 196. 1922)
Dry rocky woods southwest of Orwell (2167)

C. HETEROSPERMA Wahl. (*C. anceps* Muhl.—according to Mackenzie. *C. anceps* is *C. laxiflora,* var. *patulifolia of* Gray's Manual, ed. 7. See Rhodora 24: 198. 1922)
Dry woods along margin of Lorraine gulf northwest of Lorraine (2509)

C. ALBURSINA Sheldon (*C. laxiflora,* var. *latifolia* of Gray's Manual, ed. 7. See Rhodora 24: 193. 1922)
Open wooded slope west of Turin (2267); Osceola, House 16620

C. LEPTONERVIA (Fernald) Fernald (*C. laxiflora,* var. *leptonervia* of Gray's Manual, ed. 7. See Rhodora 16: 214. 1914)
Low woods, margins of swamps, wooded roadsides etc.; occasional

C. HITCHCOCKIANA Dewey
Rich limestone woods, Felts Mills (2705)

C. GRANULARIS Muhl., var. HALEANA (Olney) Porter
Open valley in limestone country, Copenhagen (605); marly sidehill seepage southwest of Castorland (2659)

C. FLAVA L.
Marsh meadows and open balsam and alder swamps; common

C. CRYPTOLEPIS Mackenzie
Osceola, House 16621

C. CASTANEA Wahlenb.
Marsh meadows; occasional

C. ARCTATA Boott
Rich woods, wooded roadsides etc.; rare
Parkers (2449, 2479); southwest of Orwell (2165)

C. DEBILIS Michx., var. RUDGEI Bailey
Dry roadsides and fields; occasional

C. SCABRATA Schwein.
Swales and mucky hollows in the forest; rare
Parkers (821); northwest of Rector (2630); Copenhagen, House 6/18/24

C. OLIGOSPERMA Michx.
Very wet marsh meadow east of Parkers (2651)

C. RIPARIA W. Curtis, var. LACUSTRIS (Willd.) Kükenthal (See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 131)
Open or somewhat wooded swamps, brooksides in wet meadows etc.; occasional

C. PSEUDO-CYPERUS L.
Low swampy woods south of Great Bend (2715)

C. COMOSA Boott
Bog on outlet of Mud pond (941); low swampy woods south of Great Bend (2716); open margin of arbor vitae swamp northwest of Turin (2596)

C. HYSTERICINA Muhl.
Open valley in limestone country, Copenhagen (606); marly sidehill seepage southwest of Castorland (2660)

C. LURIDA Wahlenb.
Damp roadside, Rector (94)

C. RETRORSA Schwein.
Mud flat at Sears pond (860); wet roadside, Parkers; Redfield, Peck, July

C. LUPULINA Muhl.
Wet woods; rare
Parkers (93); south of Great Bend (2718); Redfield, Peck, July

C. INTUMESCENS Rudge, var. FERNALDII Bailey
Rich open climax forest, roadsides, marsh meadows etc.; common

C. FOLLICULATA L.
Marsh meadow, Parkers (92); shrubby boggy swamp at Mud pond (2778)

C. MICHAUXIANA Boeckl.
Marsh meadows; rare
Parkers (565); east of Parkers (2650)

C. VESICARIA L., var. MONILE (Tuckerm.) Fernald
Margin of Sears pond (2639)

C. ROSTRATA Stokes
Brooksides and low wet ground; occasional

C. TUCKERMANI Dewey
Redfield, Peck, July

ARACEAE

ARISAEMA TRIPHYLLUM (L.) Schott Indian turnip; Jack-in-the-pulpit
Rich low woods; occasional

A. TRIPHYLLUM, var. STEWARDSONII (Britton) T. G. Stevens (See Rhodora 23: 136. 1921)
Wet woods, arbor vitae swamps etc.; occasional
Possibly somewhat more common on the summit of the plateau than the preceding

PELTANDRA VIRGINICA (L.) Kunth Arrow arum
Swampy margin of Mud pond (2397)

CALLA PALUSTRIS L. Water arum; Wild calla
Bogs, standing water in wooded or open swamps etc.; occasional

ACORUS CALAMUS L. Sweet flag
Swales along pasture and meadow brooks, roadsides etc.; occasional

LEMNACEAE

SPIRODELA POLYRHIZA (L.) Schleid. Greater duckweed
In water, marshy margin of Mud pond (2396); Pleasant lake

LEMNA TRISULCA L.
Marshy pond south of Great Bend (2732)

L. MINOR L. Lesser duckweed
Pools in woods north of Salmon River reservoir; southwest of Bennett Bridge

JUNCACEAE

JUNCUS BUFONIUS L. Toad rush
Wet meadows and damp places along roadsides and in pastures; occasional

J. TENUIS Willd. Path rush
Moist meadows, somewhat dry pastures etc.; occasional

J. DUDLEYI Wiegand
Wet field in limestone valley, Copenhagen (607)

J. FILIFORMIS L.
Wet meadow, Parkers (570)

J. EFFUSUS L., var. DECIPIENS Buchenau (See Rhodora 12: 87. 1910)
Common or soft rush
The only specimen of *J. effusus* collected, is very near this variety. Wet pasture, Rector (108)
Some form or forms of the species are common in wet pastures, open swamps, arbor vitae swamps, bogs (?) etc.

J. EFFUSUS var. PYLAEI (Larharpe) Fernald & Wiegand
Osceola, House 16639

J. BREVICAUDATUS (Engelm.) Fernald
Marshy brookside, Parkers (808)

J. CANADENSIS J. Gay
Bog on outlet of Mud pond (942)

J. ARTICULATUS L.
Wet meadow bordering arbor vitae swamp southwest of Castorland (2665)

LUZULA SALTUENSIS Fernald Wood rush
Rich bottomland woods, Bennett Bridge (2183)

L. CAMPESTRIS (L.) DC., var. MULTIFLORA (Ehrh.) Čelak
Wooded roadside, Salmon falls

L. CAMPESTRIS, var. FRIGIDA Buchenau
Heavy soil in low meadows (there in rather dense, extensive patches); rare
Rector (110); Parkers (2321); northeast of Mohawk Hill (2274); east of Gardners Corners

LILIACEAE

VERATRUM VIRIDE Ait. American white hellebore; Indian poke
Swamps, roadsides, wet clearings in the forest etc.; common

UVULARIA GRANDIFLORA Sm. Bellwort
Climax forest etc.; occasional

OAKESIA SESSILIFOLIA (L.) Wats. Bellwort
Clearings, wood roads etc.; common

ALLIUM TRICOCCUM Ait. Wild leek
Climax forest etc., in rich, often heavy, soil; occasional

LILIUM CANADENSE L. Wild yellow or meadow lily
Wet roadsides, wooded swamps etc.; occasional

ERYTHRONIUM AMERICANUM Ker Yellow adder's-tongue; Dog's-tooth violet
Roadsides, climax forest etc.; common

ASPARAGUS OFFICINALIS L. Asparagus
Roadside, Copenhagen (598)

CLINTONIA BOREALIS (Ait.) Raf. Yellow clintonia
Climax forest, swamps, roadsides, clearings etc.; common

SMILACINA RACEMOSA (L.) Desf. False spikenard
Climax forest and wooded gorge banks; occasional

S. STELLATA (L.) Desf.
Swampy woods; rare
Northwest of Rector (114); southeast of Parkers (2316); north of Salmon River reservoir

S. TRIFOLIA (L.) Desf.
Bog meadows and open bogs with scattered trees and shrubs; occasional

MAIANTHEMUM CANADENSE Desf. Wild lily of the valley
Climax forest, coniferous forest, pastures etc.; common

STREPTOPUS AMPLEXIFOLIUS (L.) DC. Twisted-stalk
Low woods and wet gorge slopes; occasional

S. ROSEUS Michx. Purple twisted-stalk
Climax forest etc.; occasional

POLYGONATUM PUBESCENS (Willd.) Pursh (*P. biflorum* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 147) Small solomon's seal
Climax forest etc.; occasional

MEDEOLA VIRGINIANA L. Indian cucumber-root
Climax forest, dry woods etc.; common

TRILLIUM ERECTUM L. Red trillium
Climax forest, moist or dry woods; common

T. GRANDIFLORUM (Michx.) Salisb. White trillium
Wooded gorge bottoms and rich woods at low altitudes; rare
Northwest of Lorraine (2502); south of Copenhagen (2365); southwest of Orwell; Bennett Bridge; Felts Mills

T. UNDULATUM Willd. Painted trillium
Dry climax forest etc.; common

SMILAX HERBACEA L. Carrion-flower
Roadsides, somewhat wet woods, pastures etc.; occasional

S. HISPIDA Muhl.
Swampy woods south of Great Bend (2723)

IRIDACEAE

IRIS VERSICOLOR L. Blue flag
Marsh meadows, wet pastures etc.; common

SISYRINCHIUM ANGUSTIFOLIUM Mill. Blue-eyed grass
Roadsides and meadows, open bottomlands etc.; common

S. GRAMINEUM Curtis Blue-eyed grass
Dry meadow, Greenboro (2765, 2766)

ORCHIDACEAE

CYPRIPEDIUM PARVIFLORUM Salisb., var. PUBESCENS (Willd.) Knight
Larger yellow lady's-slipper
Swampy woods, alder or arbor vitae swamps; rare
Southwest of Orwell (2175); Parkers (2302); northwest of Turin (2278)

C. REGINAE Walt. (*C. hirsutum* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 153) Showy lady's-slipper
Arbor vitae swamps; rare
Northwest of Turin (2599); Houseville

C. ACAULE Ait. Moccasin flower
Climax forest (?), coniferous forest, gorge margins, bogs etc.; common

ORCHIS ROTUNDIFOLIA Banks (or Pursh?—See Rhodora 28: 169. 1926)
Turin, Hough 7/11/81

O. SPECTABILIS L. Showy orchis
Dry rocky open woods southwest of Orwell (2168); Bennett Bridge

HABENARIA VIRDIS (L.) R. Br., var. BRACTEATA (Muhl.) Gray (See Rhodora 28: 174. 1926)
Rich woods southeast of Worth Center (2495)

H. HYPERBOREA (L.) R. Br.
Wet woods, Parkers (123)
The following specimens and records which were at first referred to *H. dilatata,* var. *media* (Rydb.) Ames may belong with this species: among alders of rather open swamp, Parkers (2304); arbor vitae swamp northwest of Turin (2276); wooded swamp, Turin (2234); northeast of Gardners Corners

H. DILATATA (Pursh) Gray
Bogs, marsh meadows, and wooded swamps; common

H. CLAVELLATA (Michx.) Spreng.
Marsh meadows and open swamps; occasional

H. OBTUSATA (Pursh) Richards.
Rich mucky woods and mossy arbor vitae swamps; rare
Parkers (2457); northwest of Turin (2280); east of Parkers; Lowville, Hough, no date

H. BLEPHARIGLOTTIS (Willd.) Torr. White fringed orchis
Open bog at Mud pond (2788)

H. LACERA (Michx.) R. Br. Ragged fringed orchis
Dry roadsides; rare
West of Whetstone gulf (2618); northeast of Lanesburg

H. PSYCODES (L.) Sw. Purple fringed orchis
Wet roadsides, wooded and open swamps, and marsh meadows; common

xH. ANDREWSII White
Arbor vitae swamp, Turin (2591)

H. FIMBRIATA (Ait.) R. Br. Large purple fringed orchis
Marshy meadows etc.; occasional
Probably some plants referred in the field to *H. psycodes* belong here

POGONIA OPHIOGLOSSOIDES (L.) Ker Rose pogonia
Bogs and marsh meadows; rare
Point Rock pond (2423); Rector (2627); Mud pond (2780)

CALOPOGON PULCHELLUS (Sw.) R. Br. Grass pink
Bogs; rare
Point Rock pond (2424); Mud pond (2779)

SPIRANTHES PLANTAGINEA (Raf.) Torr. (*S. lucida* of Gray's Manual, ed. 7. See Rhodora 23: 83. 1921) Ladies' tresses
Wet meadow, Greenboro (2763); marly sidehill seepage southwest of Castorland (2658); open valley in limestone country, Copenhagen (608)

S. CERNUA (L.) Richard. Ladies' tresses
Dry roadsides, pastures etc.; common

S. ROMANZOFFIANA Cham. Ladies' tresses
Somewhat wooded clearing under bracken, Parkers (788); dry roadside, Rector

EPIPACTIS REPENS (L.) Crantz, var. OPHIOIDES (Fernald) A. A. Eaton
"South side of Point of Rock lake." Paine, p. 136 (as *Goodyera repens* R. Br.). May have been the next species

E. TESSELATA (Lodd). A. A. Eaton Rattlesnake plantain
Evergreen forest along Fish creek west of Mud pond (2392)

LISTERA CORDATA (L.) R. Br. Twayblade
Arbor vitae swamp east of Parkers (2299, 2472)

L. AURICULATA Wiegand Twayblade
Rich mucky woods, Parkers (2453)

L. CONVALLARIOIDES (Sw.) Torr. Twayblade
Swampy woods, arbor vitae swamps etc.; occasional

CORALLORRHIZA TRIFIDA Chatelain Early coral root
Swampy, or dry, evergreen woods; rare
Parkers (2313); Chimney Point gulf (2224)

C. MACULATA Raf. Large coral root
Dry woods southwest of Taberg

C. STRIATA Lindl. Coral root
Mucky arbor vitae swamp, Houseville (2284)

MICROSTYLIS UNIFOLIA (Michx.) BSP. Adder's mouth
Dry woods and roadsides and grassy meadows; rare
Rector (125); New Scriba (2773)

LIPARIS LOESELII (L.) Richard Fen orchis
Somewhat open, boggy, arbor vitae and tamarack swamp, Houseville (2604)

CALYPSO BULBOSA (L.) Oakes
Lowville, Hough, no date

SALICACEAE

SALIX LUCIDA Muhl. Shining willow
Swamps, wet roadsides and bogs; occasional

S. FRAGILIS L. Crack willow
Roadside by bridge over Deer river below Copenhagen (637)

S. CORDATA Muhl.
Gorge slopes and rocky stream bottoms; occasional

S. PEDICELLARIS Pursh Bog willow
Marsh meadow near bog southwest of Orwell (2172). Specimen is probably (?) var. HYPOGLAUCA Fernald (See Rhodora 11: 161. 1909)

S. DISCOLOR Muhl. Pussy or glaucous willow
Roadsides and swamps; common

S. PETIOLARIS Sm.
Roadsides and open swamps; rare
West of Constableville (2273); Parkers (2330); Turin (2236)

S. SERICEA Marsh. Silky willow
Wet roadsides, open swamps, margins of ponds etc.; occasional

S. BEBBIANA Sargent (*S. rostrata* of Gray's Manual, ed. 7. See Rhodora 26: 122. 1924)
Roadsides, pastures etc.; occasional

POPULUS TREMULOIDES Michx. American aspen; Popple
Dry fields and woods, pastures, clearings etc.; common

P. GRANDIDENTATA Michx. Large-toothed aspen
Sterile soil bordering gorges, gorge banks, dry clearings etc.; occasional

P. TACAMAHACCA Mill., var. LANCEOLATA (Marsh.) Farwell (*P. balsamifera* of Gray's Manual, ed. 7. See Rhodora 21: 101. 1919) Balsam poplar; Tacamahac
Sand land, Felts Mills (904); rocky bed of Salmon river in the gorge above Bennett Bridge (2193); dry exposed bank along Deer river south of Copenhagen (2354); Pleasant lake (2749).
A cordate-leaved form, near var. MICHAUXII (Henry) Farwell (See Rhodora 21: 101. 1919), was collected at Parkers (663) near an old house and was probably cultivated

MYRICACEAE

MYRICA GALE L. Sweet gale
Brook bank in marsh meadow southeast of Parkers (451): leaves are rather densely puberulent above and below; younger than the following specimen

M. GALE, var. SUBGLABRA (Chev.) Fernald (See Rhodora 16: 167, 1914)
Brook bank, Parkers (128)
This variety or the typical form (probably the variety ?) occasional by brooks, margins of lakes, in marsh meadows and bogs

JUGLANDACEAE

JUGLANS CINEREA L. Butternut
Roadsides, open gorge bottoms etc.; rare
South of Alexander pond (516); Copenhagen; south of Copenhagen; Orwell

J. NIGRA L. Black walnut
"Woods. West Turin," Hough, p. 274

CARYA CORDIFORMIS (Wang.) K. Koch Bitternut or swamp hickory
Sand land east of Felts Mills (902)

BETULACEAE

CORYLUS CORNUTA Marsh. (*C. rostrata* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York. p. 174) Beaked hazelnut
Bushy roadsides, thickets etc.; common

OSTRYA VIRGINIANA (Mill.) K. Koch Hop hornbeam; Ironwood
Gorge slopes and margins in the northeastern part of the region; rare
Copenhagen (615); Chimney Point gulf (2229); Martinsburg; West Lowville; northeast of Bellwood

CARPINUS CAROLINIANA Walt. Blue or water beech
Roadside thickets, gorge banks etc., in the southern half of the region, at lower altitudes than the preceding; rare
West Branch (946); northeast of Taberg; Point Rock; gorge of Salmon river above Bennett Bridge

BETULA LUTEA Michx. f. Yellow birch
Climax forest, somewhat swampy woods, arbor vitae swamps etc.; common
The typical form and var. *macrolepis* Fernald (See Rhodora 24: 170. 1922) were not distinguished

B. POPULIFOLIA Marsh. White, gray or old field birch
Sandy soil, mostly in the southern part of the region; rare
Bloodsucker pond (2408); Point Rock pond (2414); north of Lyon Falls (2255); Mack pond, House 11259; Rector (130) —small tree with cordate-based leaves

B. PAPYRIFERA Marsh. (*B. alba*, var. *papyrifera* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 176) Paper, canoe or white birch
Dry gorge slopes and margins and sandy soil; rare
South of Copenhagen (2367, 2353); Point Rock pond (2422); northwest of Lorraine; Pleasant lake

ALNUS INCANA (L.) Moench Speckled alder
Brooksides and swamps, bogs etc.; common

FAGACEAE

FAGUS GRANDIFOLIA Ehrh. Beech
Climax forest; common

CASTANEA DENTATA (Marsh.) Borkh. Chestnut
"Woods. Leyden." Hough, p. 273 (as *C. vesca,* var. *americana* Michx.)

QUERCUS ALBA L. White oak
Sand land south of Felts Mills (917)

Q. MACROCARPA Michx. Bur oak
Dry woods south of Felts Mills (908)

Q. BOREALIS Michx. f., var. MAXIMA (Marsh.) Ashe (*Q. rubra* of Gray's Manual, ed. 7. See Rhodora 18: 48. 1916 and Rhodora 24: 173. 1922) Red oak
Gorge banks and bordering woods; rare
Copenhagen (632); northeast of Taberg; northwest of Lorraine. Specimen and records are probably all this variety.

URTICACEAE

ULMUS FULVA Michx. Slippery or red elm
Somewhat dry soil in limestone country; rare
Felts Mills; Lowville

U. AMERICANA L. American or white elm
Fields and swampy woods; occasional

U. RACEMOSA Thomas Cork or rock elm
Shallow soil over limestone, Felts Mills (896)

CELTIS OCCIDENTALIS L. Hackberry; Sugarberry
Lowville, Peck, July

HUMULUS LUPULUS L. Hop
Roadsides; rare
Parkers (849); east of Florence; Littlejohn Settlement

URTICA PROCERA Muhl. (*U. gracilis* of Gray's Manual, ed. 7. See Rhodora 28: 195. 1926) Nettle
Roadside east of Lowville (803); rich soil along wood road, Parkers (820)

LAPORTEA CANADENSIS (L.) Gaud. Wood nettle
Rich low woods; occasional

PILEA PUMILA (L.) Gray Richweed; Clearweed
Rich low woods south of Great Bend (2725)

LORANTHACEAE

ARCEUTHOBIUM PUSILLUM Peck Dwarf mistletoe
On black spruce in bogs; rare
Parkers (556); southeast of Parkers

ARISTOLOCHIACEAE

ASARUM CANADENSE L. Wild ginger
Rich climax forest, dry gorge slopes etc.; occasional

A. CANADENSE, var. ACUMINATUM Ashe
Wooded gorge slope northeast of New Boston (2372)

POLYGONACEAE

RUMEX PATIENTIA L. Patience dock
Rector (143)

R. BRITANNICA L. Great water dock
Wet meadow, Rector (141)

R. CRISPUS L. Yellow dock
Roadside, Rector (144); Redfield, Peck, July

R. OBTUSIFOLIUS L. Bitter or broad-leaved dock
Fields and roadsides; rare
Rector (142); Redfield, Peck, July

R. ACETOSELLA L. Field or sheep sorrel
Dry roadsides, pastures, meadows, woods, clearings etc.; common

POLYGONUM AVICULARE L. Knotweed
Yards and roadsides; occasional

P. AVICULARE, var. VEGETUM Ledeb.
Garden, Rector (134)

P. LAPATHIFOLIUM L.
Mud flat at Sears pond (856)

P. NATANS A. Eaton (*P. amphibium* of Gray's Manual, ed. 7. See Rhodora 27: 158. 1925)
Shallow, open pond south of Great Bend (2733); Powler's pond, Haberer 736; Sears pond; Pleasant lake

P. NATANS, forma HARTWRIGHTII (Gray) Stanford (*P. amphibium*, var. *Hartwrightii* of Gray's Manual, ed. 7. See Rhodora 27: 160. 1925)
Partly emersed, north side of Pleasant lake (2745)

P. PENNSYLVANICUM L., var. LAEVIGATUM Fernald (See Rhodora 19: 73. 1917)
Roadside southeast of South Rutland (928)
A specimen collected in a low field southeast of Lowville (802) may be the typical form of the species

P. HYDROPIPER L. Smartweed; Water pepper
Muddy places; occasional—this or var. *projectum* Stanford (?) (See Rhodora 29: 86. 1927). A specimen collected in a wet place in a pasture at Parkers (137) is apparently typical, judging from the size of the achenes, though the pedicels are somewhat exserted

P. PERSICARIA L. Lady's-thumb
Grain fields, ditches etc.; occasional

P. VIRGINIANUM L.
Roadside thicket, West Branch (945); open gorge slope, Salmon falls (2197)

P. SAGITTATUM L. Arrow-leaved tear-thumb
Wet brooksides in meadows, wet roadsides etc.; common

P. CONVOLVULUS L. Black bindweed
Meadows and roadsides; rare
Rector (136); south of Felts Mills (920)

P. CILINODE Michx.
Growing over bushes etc. in thickets and woods; occasional

POLYGONELLA ARTICULATA (L.) Meisn. Coast jointweed
Sand land, Felts Mills (901)

CHENOPODIACEAE

CHENOPODIUM BOTRYS L. Jerusalem oak; Feather geranium
Open rocky bottom of Whetstone gulf (2608)

C. CAPITATUM (L.) Asch. Strawberry blite
Lowville, Peck, no date

C. HYBRIDUM L. Maple-leaved goosefoot
Roadside in Rutland Hollow (926)

C. ALBUM L. Lamb's quarters; Pigweed
Gardens and yards; rare
Rector (145)

AMARANTHACEAE

AMARANTHUS RETROFLEXUS L. Pigweed; Red root
Garden, Rector (147)

A. GRAECIZANS L. Tumble weed
Garden, Rector (146)

PHYTOLACCACEAE

PHYTOLACCA AMERICANA L. (*P. decandra* of Gray's Manual, ed. 7. See Rhodora 17: 180. 1915) Pokeweed; Scoke
Southwest of Taberg

AIZOACEAE

MOLLUGO VERTICILLATA L. Carpet weed
Sand land, Felts Mills (905)

CARYOPHYLLACEAE

SPERGULA ARVENSIS L. Corn spurrey
Grain fields, along ditches etc.; occasional

SAGINA PROCUMBENS L. ? Pearlwort
"Wet grounds. West Leyden." Hough, p. 254 (as *Lagina procumbens* L.). Doubtful

ARENARIA LATERIFLORA L., var. TYPICA (Regel) St John (See Rhodora 19: 260. 1917) Sandwort
Dry wooded gorge slopes, rich woods in the limestone country, and dry embankment in an arbor vitae swamp; rare
South of Copenhagen (2363); northwest of Turin (2275); Felts Mills (2706); northeast of New Boston

A. SERPYLLIFOLIA L. Thyme-leaved sandwort
Rich, rather dry, limestone woods, Felts Mills (2702)

STELLARIA BOREALIS Bigel.
Swamps, brooksides in meadows etc.; occasional
Collections include forms which are apparently referable to var. ISOPHYLLA Fernald, var. FLORIBUNDA Fernald, and perhaps to the typical form (See Rhodora 16: 150, 151. 1914)

S. LONGIFOLIA Muhl.
Wet meadow northwest of Rector (154); open rocks along Fish creek west of Mud pond (2389)

S. GRAMINEA L.
Dry pastures, roadsides etc.; occasional

S. MEDIA (L.) Cyrill. Common chickweed
Yards and gardens; occasional

CERASTIUM ARVENSE L. Field mouse-ear chickweed
Meadows; rare
Widmer pond (2385); northwest of Parkers (2468)

C. VULGATUM L., var. HIRSUTUM Fries (See Rhodora 22: 178. 1920) Common mouse-ear chickweed
Dry pasture northwest of Rector (148); east of Turin

SILENE NOCTIFLORA L. Night-flowering catchfly
Fields and yards etc.; rare
Parkers (150); Whetstone gulf (2610)

S. VIRGINICA L. Fire pink
"Denmark. Woods." Hough, p. 254. Doubtful

S. LATIFOLIA (Mill.) Britten & Rendle Bladder campion
Fields and roadsides; rare
Rector (149); south of Felts Mills

SAPONARIA OFFICINALIS L. Bouncing bet; Soapwort
Roadside east of Lowville (800); Felts Mills

PORTULACACEAE

CLAYTONIA CAROLINIANA Michx. Spring beauty
Climax forest, wooded roadsides etc.; collected on the summit of the plateau at Parkers (2211), and reported as common and conspicuous in the spring

CERATOPHYLLACEAE

CERATOPHYLLUM DEMERSUM L. Hornwort
Pleasant lake (2744)

NYMPHAEACEAE

NYMPHOZANTHUS VARIEGATUS (Engelm.) Fernald (*Nymphaea advena,* var. *variegata* of Gray's Manual, ed. 7. See Rhodora 21: 187. 1919) Cow or yellow pond lily; Spatter-dock
Ponds and slow streams; occasional

NYMPHAEA ODORATA Ait. (*Castalia odorata* of Gray's Manual, ed. 7. See Rhodora 18: 164. 1916) Sweet-scented or white water lily
Ponds and slow streams; rare
Mud pond; Pleasant lake; Mad (Salmon) river (?)

RANUNCULACEAE

RANUNCULUS DELPHINIFOLIUS Torr. Yellow water crowfoot
Shallow pond hole in woods south of Great Bend (2717)

R. ABORTIVUS L. Small-flowered crowfoot
Marsh meadow, Parkers (453); woods west of Turin; southwest of Orwell

R. RECURVATUS Poir. Hooked crowfoot
Rich low woods; occasional

R. SEPTENTRIONALIS Poir. Swamp buttercup
Marshy meadows, swamps etc.; occasional

R. BULBOSUS L. Bulbous buttercup
Hard pasture soil in limestone country southeast of Turin (2245)

R. ACRIS L. Common buttercup
Fields, roadsides, marsh meadows etc.; common

THALICTRUM DIOICUM L. Early meadow rue
Wooded slope along Deer river below Copenhagen (631); southwest of Orwell

T. POLYGAMUM Muhl. Tall meadow rue
Brooksides, wet meadows, roadsides, alder and arbor vitae swamps etc.; common

HEPATICA ACUTILOBA DC. Hepatica
Rich woods on gorge slopes and elsewhere, at lower altitudes; rare
Copenhagen (616); Bennett Bridge; Salmon falls; northeast of Bloodsucker pond; Felts Mills; southwest of Orwell. Reported from but not seen by the writer on the summit of the plateau

ANEMONE CYLINDRICA Gray Thimbleweed
Barren field in limestone country east of Copenhagen (609); sand land, Felts Mills (903)

A. VIRGINIANA L. Tall anemone; Thimbleweed
Limestone slope, Pleasant lake (877)

A. CANADENSIS L. Anemone
Wet meadows, alder swamps, rocky stream bottoms etc.; common

A. QUINQUEFOLIA L. Wood anemone
Borders of woods and rich wooded stream bottoms; rare
Bennett Bridge (2184); gorge of the Salmon river above Bennett Bridge; Fish creek west of Mud pond (2390)

CLEMATIS VIRGINIANA L. Virgin's bower
Roadsides, alder swamps etc.; common

CALTHA PALUSTRIS L. Marsh marigold; Cowslip
Low wet woods, balsam swamps etc.; common

COPTIS TRIFOLIA (L.) Salisb. Goldthread
Climax forest, swamps, bogs, pastures under balsams etc.; common

AQUILEGIA CANADENSIS L. Wild columbine
Rocky gorge banks; occasional

A. VULGARIS L. Garden columbine
Roadside south of Point Rock (425)

ACTAEA RUBRA (Ait.) Willd. Red baneberry
Climax forest; common

A. ALBA (L.) Mill. White baneberry
Climax forest, gorge banks etc.; occasional

MENISPERMACEAE

MENISPERMUM CANADENSE L. Moonseed
"Thickets, Leyden" Hough, p. 250

BERBERIDACEAE

PODOPHYLLUM PELTATUM L. May apple; Mandrake
Roadside east of Rector (443); southwest of Bennett Bridge; open pasture along gorge of Fish creek northeast of Taberg

CAULOPHYLLUM THALICTROIDES (L.) Michx. Blue cohosh
Climax forest etc.; occasional

LAURACEAE

BENZOIN AESTIVALE (L.) Nees Spice bush
Wet woods and swamps; rare
North of Osceola (2436); Turin (2235); southwest of Taberg (1816); southwest of Orwell; south of Great Bend

PAPAVERACEAE

SANGUINARIA CANADENSIS L. Bloodroot
Bottomland woods south of Copenhagen; woods, Sears pond (2217); Champion Huddle

CHELIDONIUM MAJUS L. Celandine
West Lowville hill (551); roadside northeast of Taberg

FUMARIACEAE

DICENTRA CUCULLARIA (L.) Bernh. Dutchman's breeches
Rich wooded roadside, Parkers (487); woods east of Littlejohn Settlement

D. CANADENSIS (Goldie) Walp. Squirrel corn
Rich climax forest; occasional
The genus is reported to be conspicuous in the spring

CORYDALIS AUREA Willd. Golden corydalis
"Rocky roads. Denmark." Hough, p. 251

CRUCIFERAE

DRABA ARABISANS Michx.
Crest of limestone cliffs along the gorge of Deer river, Copenhagen (626)

LEPIDIUM DENSIFLORUM Schrad. (*L. apetalum* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 225) Peppergrass
Roadside southeast of Felts Mills (641); railroad tracks east of Page

CAPSELLA BURSA-PASTORIS (L.) Medic. Shepherd's purse
Dry roadsides and yards; rare
Parkers (164)

BRASSICA ARVENSIS (L.) Kuntze Charlock; Wild mustard
Roadsides and grain fields; rare
Rector (163); West Lowville hill (546)

B. CAMPESTRIS L. Rutabaga
Roadsides and grainfields; rare
New Boston (862); east of Rector

ERUCASTRUM GALLICUM (Willd.) Schulz (See Rhodora 13: 12. 1911 and Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 228)
Roadside north of New Boston (864)

SISYMBRIUM OFFICINALE (L.) Scop., var. LEIOCARPUM DC. Hedge mustard
Roadside, Felts Mills (907)

S. ALTISSIMUM L. Tumble mustard
Roadsides; rare
Northwest of Rector (170); south of Felts Mills (922)

ERYSIMUM CHEIRANTHOIDES L. Worm-seed mustard
Clearing, deserted lumber camp east of Hooker (830)

RORIPA HISPIDA (Desv.) Britton (*Radicula palustris,* var. *hispida* of Gray's Manual, ed. 7. See Rhodora 30: 133. 1928) Marsh cress
Shallow water of pond west of Rector (166); Castorland, Peck 8/12/09

ARMORACIA AQUATICA (Eaton) Wiegand (*Radicula aquatica* of Gray's Manual, ed. 7. See Rhodora 27: 186. 1925) ? Lake cress

"Lake Pleasant. Champion." Hough, p. 252 (as *Nasturtium natans* D. C.)

A. RUSTICANA Gaertn. (*Radicula Armoracia* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 231) Horseradish

Roadsides and ditches; occasional

BARBAREA VULGARIS R. Br. Winter cress; Yellow rocket

Moist open slope in Whetstone gulf (521)

B. VULGARIS, var. LONGISILIQUOSA Carion (*B. stricta* of Gray's Manual, ed. 7. See Rhodora 11: 139. 1909. Identity questioned: Weigand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 231)

Roadsides etc.; occasional

DENTARIA DIPHYLLA Michx. Crinkle root; Toothwort

Rich climax, or somewhat swampy, forest; occasional

D. HETEROPHYLLA Nuttall ?

"Denmark, banks of Deer river." Hough, p. 252. Probably *D. laciniata* x *maxima* Haberer. See House, Annotated List of the Ferns and Flowering Plants of New York State, p. 368

D. LACINIATA Muhl. Pepper-root

Bottomland woods along Deer river south of Copenhagen (2366)

CARDAMINE PRATENSIS L., var. PALUSTRIS Wimm. & Grab. (See Rhodora 22: 14. 1920) Cuckoo flower

Marsh meadows and stream banks; rare

Parkers (507); northeast of Salmon falls; west of Mud pond; east of Turin

C. PENNSYLVANICA Muhl. Bitter cress

Swamps, shallow brooks, sidehill seepage etc.; occasional

ARABIS GLABRA (L.) Bernh. Tower mustard

Open slope in limestone country, Martinsburg (656)

A. HIRSUTA (L.) Scop. Rock cress

Limestone gorge of Deer river, Copenhagen (619)

A. LAEVIGATA (Muhl.) Poir. Rock cress

Dry woods over limestone, Felts Mills (911)

RESEDACEAE

RESEDA LUTEA L. Mignonette

Roadside west of Champion Huddle (890); dry pasture southwest of Castorland (2671)

SARRACENIACEAE

SARRACENIA PURPUREA L. Pitcher-plant

Bogs; occasional

DROSERACEAE

DROSERA ROTUNDIFOLIA L. Round-leaved sundew
Bog meadows and open shrubby bogs, wet roadsides etc.; occasional

CRASSULACEAE

PENTHORUM SEDOIDES L. Ditch stonecrop
Arbor vitae swamp northwest of Turin (935)

SEDUM TRIPHYLLUM (Haw.) S. F. Gray (*S. purpureum* of Gray's Manual, ed. 7. See Rhodora 11: 46. 1909) Live-forever
Roadsides; occasional

SAXIFRAGACEAE

SAXIFRAGA PENNSYLVANICA L. Swamp saxifrage
Wet roadsides and swamps; common

S. VIRGINIENSIS Michx. Early saxifrage
Calcareous cliffs along gorges; rare
Northeast of Taberg (405); gorge of Salmon river above Bennett Bridge (2189); northeast of New Boston (2379); Chimney Point gulf; Copenhagen

S. AIZOIDES L. Yellow mountain saxifrage
Mossy cliff, Salmon falls (2195); cliffs of Fish creek above Taberg, House 5653 and Peck, June

TIARELLA CORDIFOLIA L. False miterwort
Climax forest, pastures etc.; common

MITELLA DIPHYLLA L. Miterwort; Bishop's cap
Climax forest, especially along gorges at lower altitudes; occasional

M. NUDA L.
Arbor vitae and balsam swamps etc.; rare
East of Parkers (2295); northwest of Turin; Windecker

CHRYSOSPLENIUM AMERICANUM Schwein. Golden saxifrage
Wet woods and swamps; occasional

PARNASSIA CAROLINIANA Michx. Grass of Parnassus
Wet calcareous cliffs; rare
Northeast of Taberg; Salmon falls; Copenhagen

RIBES CYNOSBATI L. Prickly gooseberry; Dogberry
Rich woods on bottoms, ravine banks etc.; rare
South of Copenhagen (2347); West Lowville (2657)

R. HIRTELLUM Michx. (*R. oxyacanthoides* of Gray's Manual, ed. 7. See Rhodora 13: 73. 1911) Smooth gooseberry
Open pastures, borders of meadows, and swamps; rare
Near Whetstone gulf (517); Rector (582); Turin (2240)

R. AMERICANUM Mill. (*R. floridum* of Gray's Manual, ed. 7. See Rhodora 11: 46. 1909) Wild black currant
Swamp, Turin (2242)

R. LACUSTRE (Pers.) Poir. Swamp black currant
Shady gorge slopes; occasional

R. PROSTRATUM L'Hér. Skunk currant
Climax forest; common

R. TRISTE Pall., var. ALBINERVIUM (Michx.) Fernald Swamp red currant
Wet woods and swamps; occasional

HAMAMELIDACEAE

HAMAMELIS VIRGINIANA L. Witch-hazel
Pastures and woods, mostly at lower altitudes; occasional

PLATANACEAE

PLATANUS OCCIDENTALIS L. Sycamore; Buttonwood
Near Fish creek below Taberg (1823); bottom of Lorraine gulf northwest of Lorraine

ROSACEAE

PHYSOCARPUS OPULIFOLIUS (L.) Maxim. Nine-bark
"Rocky woods. West Turin." Hough, p. 257 (as *Spiraea opulifolia* L.)

SPIRAEA ALBA DuRoi (*S. salicifolia* of Gray's Manual, ed. 7. See Weigand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 243) Meadowsweet
Roadsides, swampy woods etc. at lower altitudes; rare
West Branch (944); south of Great Bend (2712); south of Champion (2736); Pleasant lake

S. LATIFOLIA (Ait.) Borkh. (See Rhodora 11: 47. 1909) Meadowsweet
Dry roadsides, pastures, marsh meadows, brooksides etc.; common

S. TOMENTOSA L. Hardhack; Steeple bush
Dry sandy roadsides and pastures, mostly at lower altitudes; rare
Southeast of Point Rock (947); Rector; Orwell; Mack pond; Felts Mills; southeast of Bennett Bridge

PYRUS MALUS L. Apple
Open shrubby pasture, Parkers (573)

P. MELANOCARPA (Michx.) Willd. Black chokeberry
Bogs, dry roadsides, and pastures; common

P. AMERICANA (Marsh.) DC. American mountain ash
Climax forest, roadsides, swamps, pastures etc.; common

P. AUCUPARIA (L). Ehrh. European mountain ash; Rowan tree
Fence row northeast of Gardners Corners (2336)

AMELANCHIER LAEVIS Wiegand (*A. canadensis* of Gray's Manual, ed. 7. See Rhodora 14: 154. 1912) Shadbush; Juneberry
Roadsides, gorge banks, bushy pastures etc.; occasional
Crosses with *A. Bartramiana* are apparently more common than the typical form of either species

A. CANADENSIS (L.) Medic. (*A. canadensis,* var. *Botryapium* of Gray's Manual, ed. 7. See Rhodora 14:150. 1912) Juneberry
Specimen closely resembling this species collected along edge of clearing east of Parkers (2320)

A. INTERMEDIA Spach (See Rhodora 22: 147. 1920) Juneberry
Specimen closely resembling this species collected along road south of Greenboro (2204)

A. SANGUINEA (Pursh) DC. (*A. spicata* of Gray's Manual, ed. 7. See Rhodora 14: 138. 1912) Juneberry
Dry shaly gorge banks and cliffs in gorge of Deer river; rare
South of Copenhagen (2350); northeast of New Boston (2380)

A. BARTRAMIANA (*Tausch*) Roemer (*A. oligocarpa* of Gray's Manual. ed. 7. See Rhodora 14: 158. 1912) Juneberry
Swamps, bogs etc.; occasional

CRATAEGUS PUNCTATA Jacq. Hawthorn
Open pasture west of Parkers (491)

C. ROTUNDIFOLIA Moench Hawthorn
Open pasture west of Parkers (492)

FRAGARIA VIRGINIANA Duchesne Wild or field strawberry
Roadsides and pastures; common

F. VESCA L., var. AMERICANA Porter Wood strawberry
Woods along the gorge of Deer river below Copenhagen (623)

WALDSTEINIA FRAGARIOIDES (Michx.) Trattinick Barren strawberry
Grassy roadside bank southwest of Hooker (2207); wooded gorge bank below Copenhagen (633); south of Copenhagen

POTENTILLA ARGUTA Pursh
Open gravel bed south of Great Bend (2711)

P. NORVEGICA L., var. HIRSUTA (Michx.) Lehm. (*P. monspeliensis* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 259)
Wet or dry meadows, alder swamps etc.; common

P. ARGENTEA L. Silvery cinquefoil
Dry field in limestone country east of Copenhagen (610); Felts Mills; open bottom of Whetstone gulf

P. RECTA L.
Open bank along Roaring brook below Martinsburg (652); Lowville

P. PALUSTRIS (L.) Scop. Marsh cinquefoil
Marsh meadows; occasional

P. FRUTICOSA L. Shrubby cinquefoil
Gorge cliffs and bottoms; rare
Lorraine gulf (2500); gorge of Deer river northeast of New Boston (2377); northeast of Taberg; Salmon falls

P. CANADENSIS L. Common cinquefoil
Pastures in open sand land and in other poor soil, meadows etc.; common

GEUM CANADENSE Jacq. White avens
Low wet woods west of Harrisburg (594)

G. STRICTUM Ait. Yellow avens
Brookside in meadow, Rector (173)

G. RIVALE L. Water or purple avens
Moist meadows and roadsides, swamps etc.; common

RUBUS IDAEUS L., var. STRIGOSUS (Michx.) Maxim. (*R. idaeus,* var. *aculeatissimus* of Gray's Manual, ed. 7. See Rhodora 21: 96. 1919) Red raspberry
Clearings, pastures, swamps, roadsides and woods; common

R. OCCIDENTALIS L. Black raspberry
Woods along the gorge of Deer river below Copenhagen (630); Felts Mills; Pleasant lake

R. ODORATUS L. Purple flowering raspberry
Rocky gorge banks; occasional

R. PUBESCENS Raf. (*R. triflorus* of Gray's Manual, ed. 7. See Rhodora 11: 236. 1909) Dwarf raspberry
Dry to wet and mucky rich woods, banks, alder or arbor vitae swamps etc.; common

R. ALLEGHENIENSIS Porter Blackberry
Roadside east of Florence (2432); moist, open gorge slope northeast of Taberg (419)

R. CANADENSIS L. Blackberry
Roadsides and clearings; occasional

R. SETOSUS Bigel.
Meadows, roadsides etc.; common

DALIBARDA REPENS L.
Rich climax forest, clearings, hummocks in swamps, bogs, etc.; common

AGRIMONIA GRYPOSEPALA Wallr. Agrimony
Rich, rather dry, limestone woods, Felts Mills (2703); rather dry clearing in arbor vitae swamp southwest of Castorland (2664)

A. STRIATA Michx. Agrimony
Open woods, shady roadsides etc.; occasional

SANGUISORBA CANADENSIS L. Canadian burnet
Marsh meadows; occasional

ROSA BLANDA Ait. Rose
Roadside, Felts Mills (642)

R. CINNAMOMEA L. Cinnamon rose
Roadside north of Tabolt Corners (529)

R. RUBIGINOSA L. Sweetbrier; Eglantine
Open pasture along Roaring brook below Martinsburg (653)

R. PALUSTRIS Marsh. (*R. carolina* of Gray's Manual, ed. 7. See Rhodora 20:91. 1918) Swamp rose
Marsh meadows and bogs; rare
Parkers (180)

R. PALUSTRIS, var. INERMIS (Schuette) Erlanson
Mud pond (2787)

PRUNUS SEROTINA Ehrh. Wild black or rum cherry
Climax forest, roadsides etc.; occasional

P. VIRGINIANA L. Choke cherry
Fence rows, roadsides etc.; occasional

P. PENNSYLVANICA L. f. Wild red, bird or fire cherry
Fence rows, roadsides, and clearings; common

P. NIGRA Ait. Wild or Canada plum
Roadside, Pleasant lake (875)

LEGUMINOSAE

TRIFOLIUM PRATENSE L. Red clover
Roadsides and meadows; occasional

T. REPENS L. White clover
Dry pasture northwest of Rector (188); open stream bottom south of Copenhagen

T. HYBRIDUM L. Alsike clover
Moist pasture northwest of Rector (186)

T. AGRARIUM L. Yellow or hop clover
Dry fields and roadsides, open gorge bottoms etc.; occasional

MELILOTUS OFFICINALIS (L.) Lam. Yellow sweet clover
Roadside north of Champion (640); northwest of Lorraine (this species ?)

M. ALBA Desr. White sweet clover
Glenfield and Western railroad tracks; Lowville; Deer River Station

MEDICAGO LUPULINA L. Black medick
Roadside, West Lowville hill (545); open gorge bottom northwest of Lorraine

ROBINIA PSEUDO-ACACIA L. Common or black locust
Roadsides; rare
West Lowville hill (550); Point Rock

VICIA CRACCA L. Blue vetch
Roadside, West Lowville hill (548)

V. VILLOSA Roth Hairy or winter vetch
Roadside north of Champion (639)

AMPHICARPA MONOICA (L.) Ell. Hog peanut
Moist gorge banks and open bottoms; rare
Northeast of Taberg; northeast of Bellwood

OXALIDACEAE

OXALIS MONTANA Raf. (*O. Acetosella* of Gray's Manual, ed. 7. See Rhodora 22: 144. 1920) Common wood sorrel
Climax forest; common

O. MONTANA, forma RHODANTHA Fernald (*O. Acetosella,* var. *subpurpurascens* of Gray's Manual, ed. 7. See Rhodora 22: 144. 1920)
Rich woods southwest of Widmer pond (2440)

O. VIOLACEA L. Violet wood sorrel
"Rocky woods. Turin." Hough, p. 254. Doubtful

O. EUROPAEA Jord., forma VILLICAULIS Wiegand (*O. corniculata,* in part, of Gray's Manual, ed. 7. See Rhodora 27: 135. 1925) Yellow wood sorrel
Low places along brooks etc.; occasional (this or some other form of *O. europaea*)
Specimen collected at Parkers (190) is this form

GERANIACEAE

GERANIUM MACULATUM L. Wild cranesbill
Roadsides, appearing as though escaped from cultivation; rare
South of Point Rock (423); Sears pond

G. ROBERTIANUM L. Herb robert
Rich moist roadsides, low woods, and gorges; occasional

RUTACEAE

ZANTHOXYLUM AMERICANUM Mill. Prickly ash
Dry woods in limestone country, Felts Mills (912); dry shady slope in Lorraine gulf northwest of Lorraine (2507)

POLYGALACEAE

POLYGALA POLYGAMA Walt. ? Milkwort
"Dry woods. West Turin." Hough, p. 252 (as *P. polygama* Wr.)

EUPHORBIACEAE

ACALYPHA VIRGINICA L. Three-seeded mercury
"Road sides. Leyden." Hough, p. 272

EUPHORBIA HIRSUTA (Torr.) Wiegand Hairy spurge
Railroad tracks in gorge of House creek above Houseville (934); roadside west of Champion Huddle (891)

E. CYPARISSIAS L. Cypress spurge
Roadsides; rare
South of Point Rock (424); east of Rector; north of Highmarket

CALLITRICHACEAE

CALLITRICHE PALUSTRIS L. Water starwort
Brooks, pools in open swamps, mud holes in wood roads etc.; occasional

LIMNANTHACEAE

FLOERKEA PROSERPINACOIDES Willd. False mermaid
Swampy woods; rare
Southwest of Orwell (2174); northwest of Widmer pond (2383)

ANACARDIACEAE

RHUS TYPHINA L. Staghorn sumach
Roadsides, thickets, along gorges etc., at lower altitudes; occasional

R. COPALLINA L. Dwarf sumach
"Osceola. West Turin." Hough, p. 255

R. TOXICODENDRON L. Poison ivy; Poison oak
Roadsides, arbor vitae swamps, rocks in gorges etc.; occasional

AQUIFOLIACEAE

ILEX VERTICILLATA (L.) Gray (including var. *tenuifolia* (Torr.) Wats. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 292) Black alder; Winterberry
Open swamps and bogs; occasional

NEMOPANTHUS MUCRONATA (L.) Trel. Mountain holly
Swamps, bogs etc.; common

CELASTRACEAE

CELASTRUS SCANDENS L. Bittersweet
Dry, open or wooded gorge slopes; rare
Copenhagen (621); south of Copenhagen; New Boston (2381); northwest of Lorraine

ACERACEAE

ACER PENNSYLVANICUM L. Striped maple; Moosewood
Climax forest, arbor vitae swamps etc.; common

A. SPICATUM Lam. Mountain maple
Rich low woods, gorge banks, climax forest etc.; common

A. SACCHARUM Marsh. Sugar maple
Climax forest etc.; common

A. RUBRUM L. Red or swamp maple
Wet woods, climax forest, bogs etc.; common

BALSAMINACEAE

IMPATIENS PALLIDA Nutt. Pale touch-me-not
Wet places along wood roads etc.; occasional

I. BIFLORA Walt. Spotted touch-me-not; Orange jewelweed
Brooksides, wet roadsides etc.; occasional

RHAMNACEAE

RHAMNUS ALNIFOLIA L'Hér. Swamp buckthorn
Margins of marsh meadows; occasional

R. CATHARTICA L. Common buckthorn
Edge of woods on limestone slope, Copenhagen (602)

VITACEAE

PARTHENOCISSUS QUINQUEFOLIA (L.) Planch., var. HIRSUTA (Donn) Planch. (*Psedera quinquefolia,* var. *hirsuta* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 296) Virginia creeper; Woodbine
Open rocky creek bottoms etc.; rare
North of Bellwood (2341); Bennett Bridge (2186); roadside southeast of Mud pond (2404)—approaches the typical form

P. VITACEA (Knerr) Hitchc. (*Psedera vitacea* of Gray's Manual, ed. 7. See Wiegand & Eames, p. 296) Virginia creeper; Woodbine
Open rocky bottom of Whetstone gulf (2611) Specimen has some tendrils ending in disks but the inflorescence is dichotomous etc. This or the preceding species occur in several of the gorges at lower altitudes

VITIS VULPINA L. Frost grape
Roadside, Copenhagen (599); open bottom of Lorraine gulf northwest of Lorraine (2501)

TILIACEAE

TILIA AMERICANA L. Basswood
Wet woods, climax forest etc.; common—more so at lower altitudes, along gorges etc.

MALVACEAE

ABUTILON THEOPHRASTI Medic. Velvet leaf
Roadside, Rutland Hollow (925)

MALVA ROTUNDIFOLIA L. Common mallow; Cheeses
Roadside south of Felts Mills (921)

M. MOSCHATA L. Musk mallow
Roadsides and fields; occasional

HYPERICACEAE

HYPERICUM ASCYRON L. Great St John's-wort
Rocky margin of Salmon river below Bennett Bridge (2178)

H. PERFORATUM L. Common St John's-wort
Roadsides, meadows etc.; common

H. PUNCTATUM Lam. St John's-wort
Marsh or bog meadows; rare
Parkers (204); southwest of Hooker (2761)

HYPERICUM ELLIPTICUM Hook St John's-wort
Marsh meadows; rare
Parkers (201); Whetstone creek (2617)

H. BOREALE (Britton) Bicknell St John's-wort
On open mat of white water lily rhizomes at Mud pond (2782)

H. MUTILUM L. St John's-wort
Wet muddy pastures and marsh meadows; occasional

H. CANADENSE L. St John's-wort
Wet gravelly ditch along old road south of Greenboro (2770)

H. VIRGINICUM L. Marsh St John's-wort
Marsh meadows; occasional

VIOLACEAE

VIOLA CUCULLATA Ait. Marsh blue violet
Wet meadows and gorge cliffs, gorge bottoms, rich roadsides, pastures etc.; common

V. SORORIA Willd.
Dry, often open, woods; rare
Northeast of Salmon falls (2200); Sears pond (2218); Parkers (2329)

V. FIMBRIATULA Sm.
Open sand land, Felts Mills (914)

V. SELKIRKII Pursh Great-spurred violet
Rich climax forest; rare
Northeast of Rector (2325); Parkers (2461); northwest of Rector

V. PALLENS (Banks) Brainerd Sweet white violet
Marsh meadows etc.; occasional

V. BLANDA Willd. Sweet white violet
Dry rocky open woods southwest of Orwell (2170); wooded roadside, Salmon falls

V. INCOGNITA Brainerd Sweet white violet
Rich coniferous woods and climax forest; occasional

V. RENIFOLIA Gray, var. BRAINERDII (Greene) Fernald (See Rhodora 14: 88. 1912)
Arbor vitae swamp east of Parkers (2297); mossy arbor vitae swamp northwest of Turin (2281); shady shale bank in Whetstone gulf (2606)

V. ROTUNDIFOLIA Michx. Round-leaved or early yellow violet
Rich woods, often in more or less sandy soil; occasional

V. PUBESCENS Ait. Downy yellow violet
Border of woods near Chimney Point gulf (2227)

V. ERIOCARPA Schwein., var. LEIOCARPA Fern. & Wieg. (*V. scabriuscula,* in part, of Gray's Manual, ed. 7. See Bul. Torr. Bot. Club 38: 194. 1911; and Rhodora 23: 275. 1921) Smooth yellow violet
Rich climax forest, wooded gorge bottoms, etc.; occasional

V. CANADENSIS L. Canada violet
Rich wooded roadsides and climax forest; common

V. CONSPERSA Reichenb. Dog violet
Dry or evergreen woods etc.; rare
Chimney Point gulf (2223); Parkers (2306); south of Copenhagen; Turin and northwestward

V. ADUNCA J. E. Smith (*V. arenaria* of Gray's Manual, ed. 7. See Rhodora 15: 108. 1913)
Dry roadside, Parkers (446, 2219)

V. ROSTRATA Pursh Long-spurred violet
Dry rocky open woods southwest of Orwell (2163); Bennett Bridge

THYMELAEACEAE

DIRCA PALUSTRIS L. Leatherwood; Moosewood
Brook bank in woods south of Felts Mills (913); creek bottom south of Copenhagen (2345)

ELAEAGNACEAE

SHEPHERDIA CANADENSIS (L.) Nutt.
Dry shale banks and cliffs in gorges, limestone river banks etc.; rare
Felts Mills (899); south of Copenhagen (2351); northwest of Lorraine (2508)

LYTHRACEAE

DECODON VERTICILLATUS (L.) Ell., var. LAEVIGATUS T. & G. (See Rhodora 19: 154. 1917) Swamp loosestrife
Shore of Mack pond, House 11255

CUPHEA PETIOLATA (L.) Koehne Clammy cuphea
"Woods and fields. Pinckney." Hough, p. 258 (as *C. viscosissima* Jacq.)

ONAGRACEAE

LUDVIGIA ALTERNIFOLIA L. ? Seedbox
"Swamps. West Turin." Hough, p. 259 (as *Isnardia alternifolia* L.). Doubtful

L. PALUSTRIS (L.) Ell. Water purslane
Wet roadsides etc.; occasional

EPILOBIUM ANGUSTIFOLIUM L. Fireweed; Great willow-herb
Clearings, roadsides etc.; common

E. MOLLE Torr.
"near Fish Creek and Point of Rock Lake." Paine, p. 80

E. DENSUM Raf.
Marsh meadows; occasional

E. GLANDULOSUM Lehm., var. ADENOCAULON (Haussk.) Fernald (*E. adenocaulon* of Gray's Manual, ed. 7. See Rhodora 20: 35. 1918)
Brooksides and wooded swamps and clearings; occasional

OENOTHERA MURICATA L., var. CANESCENS (T. & G.) Robinson Evening primrose
Meadows and roadsides; occasional—this or the typical form
This variety collected at Rector (210)

O. PERENNIS L. (*O. pumila* of Gray's Manual, ed. 7. See Rhodora 25: 47. 1923) Small sundrops
Wet places in pastures etc.; occasional

CIRCAEA LATIFOLIA Hill (*C. lutetiana* of Gray's Manual, ed. 7. See Rhodora 17: 222. 1915) Enchanter's nightshade
Rich woods southwest of Castorland (2670)

C. ALPINA L. Enchanter's nightshade
Rich damp woods; occasional

HALORAGIDACEAE

PROSERPINACA PALUSTRIS L. Mermaid-weed
Margin of pool in woods south of Great Bend (2722)

ARALIACEAE

ARALIA RACEMOSA L. Spikenard
Rocky gorge banks, wooded roadsides and climax forest, mostly at lower altitudes; occasional

A. HISPIDA Vent. Bristly sarsaparilla
Bushy pastures and dry clearings; occasional

A. NUDICAULIS L. Wild sarsaparilla
Coniferous woods, climax forest etc.; common

PANAX TRIFOLIUM L. Dwarf ginseng; Ground-nut
Climax forest; occasional

UMBELLIFERAE

SANICULA MARILANDICA L. Sanicle; Black snakeroot
Roadsides, brooksides etc.; occasional

HYDROCOTYLE AMERICANA L. Water pennywort
Moist soil, along brooks etc.; rare
Parkers (214); east of Lanesburg; south of Great Bend

OSMORHIZA CLAYTONI (Michx.) Clarke Sweet cicely
Rich low woods and roadsides; occasional

CONIUM MACULATUM L. Poison hemlock
"Very abundant on the banks of Sandy Creek, Pinckney." Hough, p. 260

CARUM CARVI L. Caraway
Roadsides and yards; common

SIUM SUAVE Walt. (*S. cicutaefolium* of Gray's Manual, ed. 7. See Rhodora 17: 131. 1915) Water parsnip
Open marshy meadows, wet pastures and mud flats; common

CRYPTOTAENIA CANADENSIS (L.) DC. Honewort
Open or wooded gorge bottoms at lower altitudes; rare
Lorraine gulf northwest of Lorraine (2504); northeast of Taberg

ZIZIA AUREA (L.) Koch Golden alexanders
Rich soil along roads, in low meadows, woods etc., mostly at lower altitudes; occasional

PASTINACA SATIVA L. Parsnip
Roadsides; rare
North of Kings falls on Deer river (638); Rector

HERACLEUM LANATUM Michx. ? Cow parsnip
"near Collinsville." Hough, p. 260 (as *H. lanatum* L.)

CONIOSELINUM CHINENSE (L.) BSP. Hemlock parsley
Wet cliffs in gorge of Salmon river above Bennett Bridge (2191)

ANGELICA ATROPURPUREA L. Angelica
Wet roadsides and meadows; rare
Parkers (212); Sears pond (2642)

DAUCUS CAROTA L. Wild carrot; Queen Anne's lace
Roadsides; rare
Rector (798)

CORNACEAE

CORNUS CANADENSIS L. Bunchberry
Dry pastures, roadsides, climax forest, swamps, bogs etc.; common

C. RUGOSA Lam. (*C. circinata* of Gray's Manual, ed. 7. See Rhodora 12: 122. 1910) Round-leaved dogwood
Wooded gorge banks; rare
Gorge of Deer river below Copenhagen (628); south of Copenhagen (2359); West Lowville

C. AMOMUM Mill. Silky cornel; Kinnikinnik
Brookside in limestone country southeast of Felts Mills (895); roadside, Pleasant lake (2750)

C. STOLONIFERA Michx. Red-osier dogwood
Swamps and wet roadsides; common

C. ALTERNIFOLIA L. f. Alternate-leaved dogwood
Roadsides, gorge banks, borders of woods, climax forest etc.; common

ERICACEAE

CHIMAPHILA UMBELLATA (L.) Nutt., var. CISATLANTICA Blake (See Rhodora 19: 241. 1917) Prince's pine; Pipsissewa
Dry evergreen woods along the gorge of Deer river south of Copenhagen (2368)

PYROLA SECUNDA L.
Dry bank under evergreens, Chimney Point gulf (2220); dry hemlock woods, Pleasant lake (2748)

P. SECUNDA, var. OBTUSATA Turcz.
Somewhat open, boggy arbor vitae swamp, Houseville (2287, 2603)

P. CHLORANTHA Sw.
Dry evergreen woods along the gorge of Deer river south of Copenhagen (2369)

P. ELLIPTICA Nutt. Shin leaf
Climax forest; common

P. ROTUNDIFOLIA L., var. AMERICANA (Sweet) Fernald (*P. americana* of Gray's Manual, ed. 7. See Rhodora 22: 122. 1920)
Dry roadsides; rare
Southeast of Greenboro (2769); southeast of Vorea

P. ASARIFOLIA Michx., var. INCARNATA (Fisch.) Fernald
Somewhat open arbor vitae swamp, Houseville (2288)

MONOTROPA UNIFLORA L. Indian pipe
Low or evergreen woods; occasional

PTEROSPORA ANDROMEDEA Nutt. Pine drops
"Shady woods. Turin." Hough, p. 266 (as *P. andromeda* Nutt.)

LEDUM GROENLANDICUM Oeder Labrador tea
Bogs; common

RHODODENDRON CANADENSE (L.) BSP. Rhodora
"Swamps. West Turin." Hough, p. 266. Doubtful

R. MAXIMUM L. Great laurel
"Swamps. Leyden." Hough, p. 266

KALMIA ANGUSTIFOLIA L. Sheep laurel; Lambkill
Bog at Point Rock pond (2415); border of marsh meadow east of Parkers (2654)

K. POLIFOLIA Wang. Pale laurel
Bogs; common

ANDROMEDA GLAUCOPHYLLA Link Bog rosemary
Bogs and marsh meadows; occasional

CHAMAEDAPHNE CALYCULATA (L.) Moench Leather leaf; Cassandra
Bogs; common

EPIGAEA REPENS L. Trailing arbutus
Dry wooded gorge banks, sandy soil etc.; rare
Southwest of Point Rock (429); Salmon falls and gorge of the Salmon river below the falls; Taberg

GAULTHERIA PROCUMBENS L. Wintergreen; Checkerberry
Dry pastures and wood, bogs etc.; occasional

CHIOGENES HISPIDULA (L.) T. & G. Creeping snowberry
Mossy logs, stumps etc., in low or well-drained woods, arbor vitae swamps, bogs etc.; common

GAYLUSSACIA BACCATA (Wang.) K. Koch Black huckleberry
Bogs; rare
Point Rock pond (433, 2419); Mud pond (2790); southwest of Orwell

VACCINIUM PENNSYLVANICUM Lam. Low sweet or early sweet blueberry
Dry roadsides, woods and pastures; rare
Rector (225); east of Parkers (2648); east of Turin (2247); north of Lyons Falls; Copenhagen and Point Rock (probably the typical form of the species ?)

V. CANADENSE Kalm Sour-top or velvet-leaf blueberry
Roadsides, pastures, swamps, bogs and woods; common

V. VACILLANS Kalm Late low blueberry
Sandy roadside east of Felts Mills (644)

V. CORYMBOSUM L. High or swamp blueberry
Roadsides, pastures, bogs etc., in the southern part of the region; rare
South of Point Rock (422); northwest of Point Rock (2409); southwest of Orwell

V. CORYMBOSUM, var. AMOENUM (Ait.) Gray
Open sandy stony field northeast of Point Rock (2413); northwest of Point Rock (2409)—collected with the typical form
These two collections have flowers with shorter corollas than the typical material

V. OXYCOCCOS L. Small cranberry
Bogs; common

V. MACROCARPON Ait. Large cranberry
Bogs; occasional

PRIMULACEAE

PRIMULA MISTASSINICA Michx., var. NOVEBORACENSIS Fernald (See Rhodora 30: 91. 1928) Canadian primrose
Moist shale cliffs in gorges; rare
Fish creek northeast of Taberg (297, 409); Salmon river below Salmon falls (2192); Lorraine gulf (2499); Deer river northeast of New Boston (2378)

LYSIMACHIA TERRESTRIS (L.) BSP. Loosestrife
Marsh meadows and wet roadsides; common

L. NUMMULARIA L. Moneywort
Moist roadsides and pastures; rare
East Martinsburg (645); Rector; east of Lanesburg

L. THYRSIFLORA L. Tufted loosestrife
Open muddy meadow south of Great Bend (2735)

STEIRONEMA CILIATUM (L.) Raf. Fringed loosestrife
Marsh meadows, alder swamps, wet roadsides etc.; occasional

TRIENTALIS BOREALIS Raf. (*T. americana* of Gray's Manual, ed. 7. See Rhodora 11: 236. 1909) Star flower
Fairly dry climax forest, pastures under balsams, roadsides etc.; common

OLEACEAE

FRAXINUS AMERICANA L. White ash
Climax forest, roadsides etc.; occasional

F. NIGRA Marsh. Black ash
Low wet woods, arbor vitae swamps etc.; common

GENTIANACEAE

GENTIANA LINEARIS Froel. Gentian
Dry roadsides, pastures and marsh meadows; common

MENYANTHES TRIFOLIATA L. Buckbean
Marsh meadows, bogs etc.; rare
East of Parkers (2652); Mud pond (2395); Houseville (2285); south of Great Bend (2726)

APOCYNACEAE

VINCA MINOR L. Periwinkle; Myrtle
Roadsides; rare
Northeast of Taberg (420); southeast of Greenboro; Sears pond

APOCYNUM ANDROSAEMIFOLIUM L. Spreading dogbane
Roadsides and clearings; common

A. CANNABINUM L. Indian hemp
Open rocky stream bottoms at lower altitudes; occasional
Specimens collected combine the characters given in Gray's Manual and in The Flora of the Cayuga Lake Basin for *A. cannabinum* and var. *hypericifolium,* but seem to be nearer typical *cannabinum*

ASCLEPIADACEAE

ASCLEPIAS INCARNATA L. Swamp milkweed
Open swamp at Mud pond (2783); shallow water of marshy pond south of Great Bend (2727)

A. SYRIACA L. Common milkweed
Roadsides; rare
Martinsburg (655); Rector; northeast of Lanesburg

CONVOLVULACEAE

CONVOLVULUS JAPONICUS Thunb.
Turin, Hill, no date

C. SEPIUM L. Hedge bindweed
Roadside east of Parkers (782)

POLEMONIACEAE

PHLOX MACULATA L. Wild sweet william
Moist roadsides; rare
Southeast of Sears pond (2487); Hooker

P. DIVARICATA L. Blue phlox
Rich wooded stream bottom south of Copenhagen (2346)

P. SUBULATA L. Ground or moss pink
Roadside, escaped from cemetery southeast of Greenboro

POLEMONIUM VAN-BRUNTIAE Britton
Wet roadsides, swamps and marsh meadows on the higher part of the plateau; rare
Parkers (661, 231); Sears pond

HYDROPHYLLACEAE

HYDROPHYLLUM VIRGINIANUM L. Waterleaf
Climax forest, low wet woods, fence rows etc.; common

H. CANADENSE L. Waterleaf
Leafy hollow in open woods east of Turin (2249)

BORAGINACEAE

CYNOGLOSSUM OFFICINALE L. Common hound's tongue
Roadsides etc.; rare
Gorge of Mill creek above Turin (539); east of Turin; northeast of Bellwood

LAPPULA ECHINATA Gilibert Stickseed
Pasture along Roaring brook at East Martinsburg (646); open stony creek bottom at mouth of Whetstone gulf (2605)

SYMPHYTUM OFFICINALE L. Common comfrey
Moist roadside in gorge of Mill creek above Turin (534)

MYOSOTIS SCORPIOIDES L. Forget-me-not
Moist pastures, roadside ditches etc. in the southeastern part of the region; occasional

LITHOSPERMUM OFFICINALE L. Common gromwell
Dry roadsides and pastures at lower altitudes; rare
West Lowville hill (547); Pleasant lake (876); north of Bellwood

ECHIUM VULGARE L. Blue-weed; Viper's bugloss
Roadside, Rutland Center (927); open bottom of Lorraine gulf northwest of Lorraine; Lowville

VERBENACEAE

VERBENA URTICAEFOLIA L. White vervain
Roadside south of Pleasant lake (873)

V. HASTATA L. Blue vervain
Wet roadsides, open swamps and brooksides; occasional

LABIATAE

SCUTELLARIA LATERIFLORA L. Mad-dog skullcap
Open swamp, Rector (239)

S. EPILOBIIFOLIA Hamilton (*S. galericulata* of Gray's Manual, ed. 7. See Rhodora 23:85. 1921) Marsh skullcap
Brooksides and swamps; common

NEPETA CATARIA L. Catnip
Pasture in limestone country, Copenhagen (600); roadside east of Lanesburg

N. HEDERACEA (L.) Trevisan Ground ivy; Gill-over-the-ground
Wet woods west of Harrisburg (592)

PRUNELLA VULGARIS L. Self-heal; Heal-all
Roadsides and pastures; common
The only specimen collected—in a dry field northwest of Rector (236)—is var. LANCEOLATA (Barton) Fernald (See Rhodora 15: 183. 1913)

GALEOPSIS TETRAHIT L., var. BIFIDA (Boenn.) Lejeune & Court. (See Rhodora 12: 142. 1910) Hemp nettle
Yards and clearings; occasional

LAMIUM MACULATUM L. Spotted dead nettle
Roadside northeast of Taberg (421)

LEONURUS CARDIACA L. Motherwort
Pastures and roadsides at lower altitudes; rare
Copenhagen (601); West Lowville hill; east of Lanesburg

STACHYS TENUIFOLIA Willd., var. ASPERA (Michx.) Fernald Hedge nettle
Redfield, Peck, July

MONARDA DIDYMA L. Oswego tea; Bee balm
Shady brook banks, wet roadsides etc.; occasional

M. FISTULOSA L. Wild bergamot
"Rocky ravines. Harrisburg." Hough, p. 269. Perhaps *M. fistulosa,* var. *mollis*

M. FISTULOSA, var. RUBRA Gray
Low shady roadside south of Copenhagen (2752)

M. FISTULOSA, var. MOLLIS (L.) Benth. (*M. mollis* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 361)
Roadside west of Pleasant lake (884); weedy meadow southwest of Castorland (2668)

BLEPHILIA HIRSUTA (Pursh) Benth. ? Wood mint
"Wet woods. Martinsburg." Hough, p. 269 (as *Blephilla hirsuta* Raf.)

SATUREJA VULGARIS (L.) Fritsch Basil
Dry pastures and borders of woods; occasional

PYCNANTHEMUM FLEXUOSUM (Walt.) BSP. Mountain mint
Roadside ditch southeast of Felts Mills (893)

LYCOPUS UNIFLORUS Michx. Bugle weed
Meadows etc.; rare
Parkers (2622); New Scriba

L. AMERICANUS Muhl. Water horehound
Open swamps, wet roadsides etc.; occasional

MENTHA SPICATA L. Spearmint.
Moist pastures and roadsides; occasional

M. PIPERITA L. Peppermint
Moist roadsides and open rocky stream bottoms; occasional

M. ARVENSIS L., var. CANADENSIS (L.) Briquet Wild mint
Swamps, ditches etc.; common

COLLINSONIA CANADENSIS L. Horse balm; Stone-root
Low woods in limestone country, Copenhagen

SOLANACEAE

SOLANUM DULCAMARA L. Bittersweet
Shady woods and swamps etc.; occasional

S. NIGRUM L. Common nightshade
Roadside, Rutland Hollow (924)

PHYSALIS HETEROPHYLLA Nees Ground cherry
Roadside west of Champion

DATURA STRAMONIUM L. Jimson weed
"Roadsides. Denmark." Hough, p. 269

SCROPHULARIACEAE

VERBASCUM THAPSUS L. Common mullein
Dry pastures; rare
Rector (243)

LINARIA VULGARIS Hill Butter and eggs
Roadsides etc.; rare
Near Whetstone gulf; Felts Mills (900, 923)

L. MINOR (L.) Desf.
Railroad tracks, Castorland (2672)

SCROPHULARIA LANCEOLATA Pursh (*S. leporella* of Gray's Manual, ed. 7. See Wiegand & Eames, The Flora of the Cayuga Lake Basin, New York, p. 370) Figwort
Pastures, roadsides etc.; occasional

CHELONE GLABRA L. Turtlehead; Snakehead
Brooksides, ditches and swamps; common

MIMULUS RINGENS L. Monkey flower
Open swamps etc.; occasional

M. MOSCHATUS Dougl. Musk flower
Open swamp northwest of Turin (2600); roadside ditch, Greenboro (2767); rocks along Fish creek, Taberg (1820); House 11238

GRATIOLA NEGLECTA Torr. (*G. virginiana* of Gray's Manual, ed. 7. See Rhodora 20: 65. 1918) Hedge hyssop
Roadside ditches, muddy pastures etc.; occasional

VERONICA AMERICANA Schwein. American brookline
Swamps and mucky places in pastures; occasional

V. SCUTELLATA L. Marsh speedwell
Marsh meadows; occasional

V. OFFICINALIS L. Common speedwell
Dry wood roads, pastures, clearings, wet woods etc.; common

V. CHAMAEDRYS L. Bird's-eye
Roadside west of Turin (544)

V. SERPYLLIFOLIA L. Thyme-leaved speedwell
Pastures etc.; rare
Alexander pond (511); Parkers; Salmon falls

V. SERPYLLIFOLIA, var. HUMIFUSA (Dickson) Vahl (*V. humifusa* of Gray's Manual, ed. 7. See Rhodora 23: 16. 1921)
Roadside southeast of Greenboro (2205)

V. PEREGRINA L. Neckweed; Purslane speedwell
Dry open soil east of Turin (2252)

V. ARVENSIS L. Corn speedwell
Open gorge slope, Salmon falls (2196); dry open soil east of Turin (2253)

PEDICULARIS CANADENSIS L. Lousewort; Wood betony
Dry woods; rare
Bennett Bridge (2185); Salmon falls

LENTIBULARIACEAE

UTRICULARIA INTERMEDIA Hayne Bladderwort
Pool in marsh meadow east of Parkers (2653)

U. CORNUTA Michx. Bladderwort
Sedge bog at Mud pond (2789)

OROBANCHACEAE

EPIFAGUS VIRGINIANA (L.) Bart. Beech-drops
Dry wooded slope southwest of Taberg (1814)

OROBANCHE UNIFLORA L. One-flowered cancer-root
Wooded roadsides and gorge bottoms; rare
Parkers (245); northeast of Bellwood (2340); northeast of Hooker

PHRYMACEAE

PHRYMA LEPTOSTACHYA L. Lopseed
Rich low woods south of Great Bend (2724); Pleasant lake

PLANTAGINACEAE

PLANTAGO MAJOR L. Common plantain
Yards and roadsides; occasional

P. RUGELII Dcne. Plantain
Roadside, Parkers (824)

P. LANCEOLATA L. Rib grass; English plantain
Yards etc.; rare
Rector (246); northwest of Redfield

RUBIACEAE

GALIUM APARINE L. Cleavers; Goose grass
Rich woods in limestone country east of Copenhagen (611)

G. LANCEOLATUM Torr. Wild liquorice
Dry limestone woods, Felts Mills (910)

G. BOREALE L. Northern bedstraw
Limestone shore of Black river east of Felts Mills (897)

G. PALUSTRE L. Marsh bedstraw
Brooksides, marsh meadows etc.; occasional

G. CLAYTONI Michx.
Wet meadows and brooksides; occasional

G. ASPRELLUM Michx. Rough bedstraw
Brooksides in meadows, low roadsides etc.; occasional

G. TRIFLORUM Michx. Sweet-scented bedstraw
Climax forest; occasional

MITCHELLA REPENS L. Partridge-berry
Climax forest, dry pastures and woods etc.; common

HOUSTONIA CAERULEA L. Bluets; Innocence
Grassy roadsides, meadows etc.; rare
Widmer pond (2442); north of Hooker (2489); east of Turin (2254); southwest of Bennett Bridge (2177); Salmon falls; north of Lyons Falls

H. LONGIFOLIA Gaertn.
Sandy roadside east of Felts Mills (643); weedy meadow southwest of Castorland (2669)

CAPRIFOLIACEAE

DIERVILLA LONICERA Mill. Bush honeysuckle
Dry roadsides, gorge banks etc.; common

LONICERA VILLOSA Roem. & Schultes, var. TONSA Fernald (*L. caerulea,* var. *villosa,* in part, of Gray's Manual, ed. 7. See Rhodora *27*: 9. 1925) Mountain fly honeysuckle
Roadsides, pastures, and marsh meadows, especially on the summit of the plateau; common—rare elsewhere
Quite variable: some young branchlets more or less hirsute; some peduncles over 1 cm. long

L. CANADENSIS Marsh. Fly honeysuckle
Arbor vitae swamps, wet woods, wooded gorge banks etc.; common

L. DIOICA L.
Shale gorge cliffs; rare
Northeast of New Boston (2374); south of Copenhagen (2349)

LINNAEA BOREALIS L., var. AMERICANA (Forbes) Rehder Twinflower
Arbor vitae swamp, Parkers (2300); arbor vitae swamp northwest of Turin (2277); shady gorge slope, West Lowville

TRIOSTEUM PERFOLIATUM L., var. AURANTIACUM (Bicknell) Wiegand (*T. aurantiacum* of Gray's Manual, ed. 7. See Rhodora 25: 202. 1923) Feverwort; Horse gentian
Open or wooded gorge bottoms, rich open woods etc. at low altitudes in the northern part of the region; rare
South of Copenhagen (2357); Felts Mills (2701); New Boston and northeastward

VIBURNUM ALNIFOLIUM Marsh. Hobble-bush; Witch hobble
Climax forest and somewhat swampy woods; common

V. OPULUS L., var. AMERICANUM (Mill.) Ait. Cranberry-tree; High-bush cranberry
Roadsides and open arbor vitae swamps; rare
Parkers (563, 258); east of Orwell

V. ACERIFOLIUM L. Maple-leaved viburnum; Dockmackie
Gorge banks at lower altitudes; occasional

V. AFFINE Bush, var. HYPOMALACUM Blake (*V. pubescens* of Gray's Manual, ed. 7. See Rhodora 20: 14. 1918) Downy arrow-wood
Thin, dry, open soil over limestone, Felts Mills (2708)

V. DENTATUM L. Arrow-wood
Margins of marsh meadows, wet woods etc.; occasional

V. CASSINOIDES L. Withe-rod; Wild raisin
Swamps and bogs, dry roadsides etc.; common

V. LENTAGO L. Sweet viburnum; Nannyberry
Gorge banks and roadsides at lower altitudes; occasional

SAMBUCUS CANADENSIS L. Common elder
Brooksides and roadsides, alder swamps etc.; occasional

S. RACEMOSA L. Red-berried elder
Roadsides, gorges etc.; common

S. RACEMOSA, var. LACINIATA Koch
Climax forest east of Hooker (829)

DIPSACACEAE

DIPSACUS SYLVESTRIS Huds. ? Wild teasel
"Leyden." Hough, p. 262 (as *D. sylvestris* L.)

CUCURBITACEAE

ECHINOCYSTIS LOBATA (Michx.) T. & G. Wild cucumber
"Along fences. Pinckney." Hough, p. 259 (as *Hexamena echinata* Torr. & Gray)

CAMPANULACEAE

CAMPANULA RAPUNCULOIDES L., var. UCRANICA (Bess.) K. Koch Bellflower
Roadsides and meadows; occasional—this or the typical form
Specimen collected at Parkers (260) is this variety

C. ROTUNDIFOLIA L. Harebell; Bluebell
Dry or wet gorge banks and cliffs; occasional

C. APARINOIDES Pursh Marsh bellflower
Grassy roadsides and marsh meadows; rare
Greenboro (2764); New Scriba (2772)

C. ULIGINOSA Rydb.
Marsh meadows etc.; occasional

LOBELIACEAE

LOBELIA CARDINALIS L. Cardinal-flower
Marshy grounds and creek banks; common

L. SPICATA Lam.
Weedy meadow southwest of Castorland (2667)

L. KALMII L.
Moist cliffs, gorge of Fish creek northeast of Taberg (296); wet shore of Pleasant lake (2742)

L. INFLATA L. Indian tobacco
Meadows, roadsides etc.; common

COMPOSITAE

EUPATORIUM MACULATUM L. (*E. purpureum*, in part, of Gray's Manual, ed. 7. See Rhodora 22:64. 1920) Joe-pye weed
Arbor vitae and alder swamps, wet roadsides, marsh meadows etc.; common

E. PERFOLIATUM L. Boneset; Thoroughwort
Open swampy depressions in woods, arbor vitae swamps, wet meadows etc., more common at lower altitudes; occasional

E. URTICAEFOLIUM Reichard White snakeroot
Open swampy woods, dry wooded banks etc.; occasional

SOLIDAGO CAESIA L., var. AXILLARIS (Pursh) Gray Goldenrod
Wooded roadside southwest of Copenhagen (867)

S. LATIFOLIA L. Goldenrod
Wooded roadsides and banks; rare
Southwest of Copenhagen (868); Whetstone gulf

S. BICOLOR L. White goldenrod
Dry roadside north of Pleasant lake (883)

S. HISPIDA Muhl. Goldenrod
Dry open margin of Whetstone gulf (931)

S. MACROPHYLLA Pursh Goldenrod
Open swampy woods south of Parkers (291)

S. HUMILIS Pursh (*S. uliginosa* of Gray's Manual, ed. 7. See Rhodora 17:6. 1915) Goldenrod
Marsh meadows, bogs, dry roadsides etc.; common

S. JUNCEA Ait. Goldenrod
Roadside west of Champion (889)

S. RUGOSA Mill. Goldenrod
Roadsides, swamps etc.; common

S. NEMORALIS Ait. Goldenrod
Dry roadsides; occasional

S. CANADENSIS L. Goldenrod
Roadsides, marsh meadows etc.; occasional

S. GRAMINIFOLIA (L.) Salisb. Goldenrod
Roadsides, pastures, marsh meadows etc.; common

ASTER MACROPHYLLUS L.
Dry roadside bank, Rector (852)

A. NOVAE-ANGLIAE L. New England aster
Open, dry soil in the limestone country; rare
Pleasant lake (874); South Rutland

A. CORDIFOLIUS L.
Dry banks and roadsides; rare
New Boston (863); Whetstone gulf (932)

A. TRADESCANTI L.
Wet or dry roadsides, pastures, marsh meadows etc.; common

A. TARDIFLORUS L.
Moist railroad embankment in gorge of House creek above Houseville (933)

A. PRENANTHOIDES Muhl.
Roadsides and wet gorge banks, mostly at lower altitudes; occasional

A. PUNICEUS L.
Wet roadsides and swamps; common

A. UMBELLATUS Mill.
Swamps, pastures, marsh meadows and roadsides; common

A. LINARIIFOLIUS L.
Sand land, Felts Mills (894, 915)

A. ACUMINATUS Michx. Mountain aster
Open swampy woods on the summit of the plateau; occasional

ERIGERON PULCHELLUS Michx. Robin's plantain
Roadside southeast of Wetmore (2445)

E. PHILADELPHICUS L. Fleabane
Shale slopes and bottoms in gorges; occasional

E. ANNUUS (L.) Pers. Daisy fleabane; Sweet scabious
Dry roadsides etc.; occasional

E. RAMOSUS (Walt.) BSP. Daisy fleabane
Dry roadsides etc.; occasional

E. CANADENSIS L. Horse-weed; Butter-weed
Railroad tracks west of Page (836)

ANTENNARIA PARLINII Fernald Pussy's toes
Thin woods, Copenhagen, House 10093

A. CANADENSIS Greene Pussy's toes
Roadsides and pastures; common

A. FALLAX Greene Pussy's toes
Pastures, open woods, roadsides etc., mostly at lower altitudes; occasional

A. NEODIOICA Greene Pussy's toes
Dry roadsides and pastures; common

A. PETALOIDEA Fernald Pussy's toes
Roadside near Barnes Corners (2); dry grassland along the Deer river south of Copenhagen (2356); heavy open soil near arbor vitae thicket on north side of Chimney Point gulf (2228)

ANAPHALIS MARGARITACEA (L.) B. & H. Pearly everlasting
Dry roadsides and pastures; common

GNAPHALIUM OBTUSIFOLIUM L. (*G. polycephalum* of Gray's Manual, ed. 7. See Rhodora 20:71. 1918) Common everlasting
Open sand land, Felts Mills (918)

G. DECURRENS Ives Everlasting
Roadsides etc.; rare
East of Hooker (835); west of Boyd

G. ULIGINOSUM L. Low cudweed
Roadside ditches etc.; common

INULA HELENIUM L. Elecampane
Roadsides east of Rector (797)

POLYMNIA CANADENSIS L. Leafcup
Rich limestone woods, Felts Mills (2707)

AMBROSIA ARTEMISIIFOLIA L. Ragweed
Roadsides, yards and railroad tracks; occasional

RUDBECKIA HIRTA L. Black-eyed Susan
Meadows; occasional

R. LACINIATA L. Tall cone-flower
Roadsides and yards; rare
Rector (286); Parkers (783)

BIDENS VULGATA Greene Beggar-ticks; Stick-tight
Moist yards, ditches and roadsides; occasional

B. CERNUA L. Stick-tight
Mud flats, open swamps etc.; occasional

B. BIPINNATA L. Spanish needles
"Denmark. Road sides." Hough, p. 262. Doubtful

HELENIUM AUTUMNALE L. Sneezeweed
Limestone shore of Black river east of Felts Mills (898); rocky bank of Whetstone creek at head of Whetstone gulf

ACHILLEA PTARMICA L. Sneezeweed
Roadsides; rare
Parkers (784); Tabolt Corners (845)

A. MILLEFOLIUM L. Yarrow; Milfoil
Roadsides; occasional

ANTHEMIS COTULA L. Mayweed
Yards and roadsides; occasional

CHRYSANTHEMUM LEUCANTHEMUM L., var. PINNATIFIDUM Lecoq. & Lamotte Ox-eye or white daisy
Meadows, pastures etc.; common

C. BALSAMITA L., var. TANACETOIDES Boiss. Costmary; Mint geranium
Pasture by site of old house southwest of Mohawk Hill (938)

TANACETUM VULGARE L. Tansy
Roadside south of Rector (294); Osceola, Peck, August

TUSSILAGO FARFARA L. Coltsfoot
Railroad tracks, moist gorge slopes and bottoms etc.; occasional

SENECIO VULGARIS L. Common groundsel
Yard, Parkers (288)

S. OBOVATUS Muhl.
Dry exposed shale slope in Whetstone gulf (2612)

S. AUREUS L. Golden ragwort
Marsh meadows, wet pastures etc.; common

ARCTIUM LAPPA L. Great burdock
Roadside southwest of Copenhagen (872); roadside, Lowville

A. MINUS (Hill) Bernh. (See Rhodora 11:60. 1909) Common burdock
Yards and roadsides; occasional

CIRSIUM LANCEOLATUM (L.) Hill Bull thistle
Dry pastures etc.; rare
Parkers (274)

C. DISCOLOR (Muhl.) Spreng.
"Grassy woods. Martinsburgh." Hough, p. 262

C. MUTICUM Michx. Swamp thistle
Open swampy woods and marsh meadows; occasional

C. ARVENSE (L.) Scop. Canada thistle
Pastures etc.; rare
Rector (273)

CENTAUREA NIGRA L., var. RADIATA DC. Knapweed; Spanish buttons
Meadow northwest of West Leyden (2777)

C. MACULOSA Lam.
Dry pasture southwest of Taberg (1809); dry roadside south of Great Bend (2710)

CICHORIUM INTYBUS L. Chicory; Succory
Roadsides; rare
Northwest of Whetstone gulf (929); Rector

TRAGOPOGON PRATENSIS L. Goat's beard
Roadsides; occasional

TARAXACUM OFFICINALE Weber Dandelion
Gardens, yards, roadsides etc.; occasional

LACTUCA CANADENSIS L. Wild lettuce
Roadsides, etc.; occasional (some form of this species)
Var. TYPICA Wiegand (See Rhodora 22:10. 1920) was collected at Rector (282)

L. SPICATA (Lam.) Hitchc. Blue lettuce
Moist roadsides; occasional

PRENANTHES ALBA L. White lettuce; Rattlesnake-root
Roadside west of Boyd

P. ALTISSIMA L. Rattlesnake-root
Roadsides and shady banks; occasional

HIERACIUM AURANTIACUM L. Devil's paint-brush; Orange hawkweed
Dry pastures and meadows, roadsides etc.; common

H. FLORENTINUM All. King devil
Dry pastures and meadows; common

H. PANICULATUM L. Hawkweed
Dry wooded slope southwest of Taberg (1811)

H. SCABRUM Michx. Hawkweed
Dry roadside southwest of Mohawk Hill (939)

H. CANADENSE Michx. Hawkweed
Roadside west of Champion (888)

BIBLIOGRAPHY

Abrams, Leroy

1923 An Illustrated Flora of the Pacific States. Volume I. 558p., 1299 figs. Stanford University

Bendrat, T. A.

1913 The Flora of Mohawk Hill, N. Y., North of the Watershed. Torreya, 13: 45–63, map

Brainerd, Ezra

1921 Violets of North America. Vermont Agric. Exp. Sta. Bul., 224: 1–172, 66 figs., 25 colored pls.

Bray, W. L.

1915 The Development of the Vegetation of New York State. N. Y. State Coll. of Forestry Tech. Pub., 3:1–186, frontispiece and 52 figs., colored map

Britton, N. L. & Brown, Addison

1913 An Illustrated Flora of the Northern States, Canada and the British Possessions. Second edition. Volume I, 680p.; Volume II, 736p.; Volume III, 638p.; 4666 figs. New York

Carr, M. E., Gilbert, B. D., Morrison, T. M. & Maxon, E. T.

1913 Soil Survey of Jefferson County, New York. U. S. Dep't of Agriculture, Advance Sheets—Field Operations of the Bureau of Soils, 1911. 84p., 1 fig., 2 colored maps

Churchill, J. C.

1895 Landmarks of Oswego County, New York. Part I. 844p., with portraits and other illustrations. Syracuse

Cushing, H. P., Fairchild, H. L., Ruedemann, R. & Smyth, C. H. jr

1910 Geology of the Thousand Island Region. N. Y. State Mus. Bul., 145: 1–194, 14 figs., 63 pls., 5 geologic maps

Emerson, E. C.

1898 Our County and Its People. A Descriptive Work on Jefferson County, New York. 936 and 318p., 22 portraits, 36 illustrations. Boston

Fairchild, H. L.

1912 The Glacial Waters in the Black and Mohawk Valleys. N. Y. State Mus. Bul., 160:1–48, 1 fig., 25 pls.

Hitchcock, A. S.

1920 The Genera of Grasses of the United States. U. S. Dep't of Agriculture Bul., 772:1–308, 174 figs., 20 pls.

Hough, F. B.

1846 A Catalogue of the Indigenous, Naturalized, and Filicoid Plants, of Lewis County. Fifty-ninth Ann. Rep't of the Regents of the Univ. of the State of New York, p. 249–83

1860 A History of Lewis County, in the State of New York. 320p., with portraits and other illustrations. Albany

House, H. D.

1916 A Bibliography of the Botany of New York State. N. Y. State Mus. Bul., 188:66–106

1924 Annotated List of the Ferns and Flowering Plants of New York State. N. Y. State Mus. Bul., 254:1–760

Jones, Pomroy

1851 Annals and Recollections of Oneida County. 894p. Rome

Livingston, B. E. & Shreve, Forrest

1921 The Distribution of Vegetation in the United States, as related to Climatic Conditions. Carnegie Inst. of Wash. Pub., 284:1–590, 74 figs., 73 pls., including 2 colored maps

Marie-Victorin, Frère

1925 Les Lycopodinées du Québec. Contrib. du Lab. de Bot. de l'Univ. de Montréal, 3: 1–122, frontispiece and 11 figs., 1 pl.

Maxon, E. T., Carr, M. E. & Stevens, E. H.

1915 Soil Survey of Oneida County, New York. U. S. Dep't of Agriculture, Advance Sheets—Field Operations of the Bureau of Soils, 1913. 60p., 1 fig., 2 colored maps

Merriam, C. H.

1898 Life Zones and Crop Zones of the United States. U. S. Dep't of Agriculture, Div. of Biol. Survey Bul., 10: 1–80, colored map

Miller, W. J.

1910 Geology of the Port Leyden Quadrangle, Lewis County, N. Y. N. Y. State Mus. Bul., 135: 1–62, 5 figs., 11 pls., geologic map

1917 The Adirondack Mountains. N. Y. State Mus. Bul., 193:1–98, 15 figs., 30 pls.

1924 The Geological History of New York State. N. Y. State Mus. Bul., 255:1–148, 39 figs., frontispiece and 52 pls.

Mooney, C. N., Maxon, E. T., Morgan, R. J. & Bromley, J. H.

1919 Soil Survey of Oswego County, New York. U. S. Dep't of Agriculture, Advance Sheets—Field Operations of the Bureau of Soils, 1917. 44p., 1 fig., colored map

Mordoff, R. A.

1925 The Climate of New York State. Cornell Univ. Agric. Exp. Sta. Bul., 444:1–38, 39 figs.

Nichols, G. E.

1918 The Vegetation of Northern Cape Breton Island, Nova Scotia. Trans. Conn. Acad. of Arts and Sciences, 22:249–467, 70 figs.

1923 A Working Basis for the Ecological Classification of Plant Communities. Ecology, 4:11–23, 154–79

Paine, J. A. jr

1865 Catalogue of Plants Found in Oneida County and Vicinity. Eighteenth Ann. Rep't of the Regents of the Univ. of the State of New York, on the Condition of the State Cabinet of Natural History, p. 53–192

Robinson, B L. & Fernald, M. L.

1908 Gray's New Manual of Botany. Seventh edition. 926p., 1036 figs. New York

1909 Emendations of the Seventh Edition of Gray's Manual,—I. Rhodora, 11:33–61

Rydberg, P. A.

1917 Flora of the Rocky Mountains and Adjacent Plains. 1110p. New York

Stephen, J. W.

1911 Forest Conditions of Oneida County. N. Y. State Conservation Com. Bul., 4:1–20, 14 pls., colored map

Wiegand, K. M. & Eames, A. J.

1926 The Flora of the Cayuga Lake Basin, New York. Cornell Univ. Agric. Exp. Sta. Mem., 92:1–492, 1 fig., map

Wilson, W. M.

1912 Frosts in New York. Cornell Univ. Agric. Exp. Sta. Bul., 316:505–44, figs. 135–51

Figure 8 Sand delta overlying limestone near Felts Mills

Figure 9 Gorge and falls of the Deer river at Copenhagen. The rock is Trenton limestone.

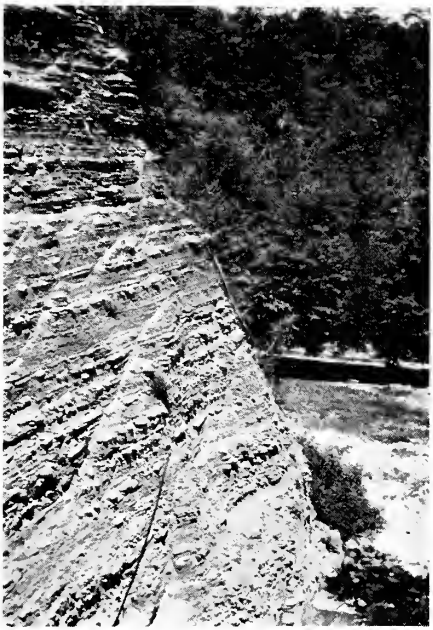

Figure 10 Lorraine gulf northeast of Lorraine. The rock is Lorraine shale.

Figure 11 Marsh meadow bordered by alders, near Parkers

Figure 12 Shrubs invading a marsh meadow northwest of Page

Figure 13 Marsh meadow and swamp forest east of Parkers

Figure 14 Mixed bog near Parkers. Black spruce and tamarack, with *Nemopanthus, Ledum, Viburnum cassinoides* and other shrubs.

Figure 15 Point Rock Pond bog. A narrow zone of sedges and dwarf shrubs nearly all the way around the pond.

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