Airborne Pollen and Fungus Spores of New York State

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NEW YORK STATE MUSEUM
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The University of the State of New York
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INTRODUCTION

During 1953 and 1954, samplers were operated in 35 localities in New York State to determine the abundance of various microscopic organic particles in the air. The Durham sampler, a device approved by the Pollen Survey Committee of the Research Council of the American Academy of Allergy, was used at each station. The samplers were in operation for 200 days each growing season: April 1 through October 17 during 1953 and March 15 through September 30 during 1954. During these periods over 14,000 samples were obtained requiring approximately 2,500,000 determinations.

The localities where sampling stations were installed were chosen to place the samplers about 50 miles apart and, where possible, near centers of population. Fortunately, dependable cooperators were found to service the stations seven days a week throughout the sampling periods. And this with no remuneration other than the satisfaction of contributing to a worthy cause!

The general location of these stations is shown on the map (page 27). The specific locations, names of cooperators, types of installation and other pertinent data are found in the descriptions of the individual localities.

Most of the samplers were installed on the roofs of buildings, including water filtration plants (8), sewage disposal plants (7), hospitals (6), schools (3) and other public buildings (5).

The particles that were caught, identified and recorded were primarily pollen grains and fungus spores but included spores of ferns and mosses, alga cells, plant hairs and insect scales.

PROCEDURE

The samplers were installed to give the best possible samples for the area and allow reasonably easy access for daily servicing. They were mostly well above ground to prevent undue influence of local conditions and a sufficient distance from objects that would obstruct or divert air movement. The sampler uses greased microscope slides on which the tiny airborne particles are impinged. The slides were uniformly greased in the laboratory in Albany. During 1953 this was with petrolatum jelly. Experiments conducted by us indicated that silicone grease worked equally well, gave the same readings and lessened the danger of melting in summer heat, so it was used in 1954.

Boxes of 25 slides each were mailed periodically to the cooperators who exposed each slide for a 24-hour period on consecutive days. The slides were changed each morning at the same time which varied somewhat from station to station but usually at 9 a.m. The cooperator wrote the date of exposure on the frosted end of each slide and periodically mailed the exposed slides to our laboratory.

As soon as convenient, our technicians stained the slides with Calberla's solution, which employs basic fuchsin as a dye, and added a No. 1, 22 mm. square cover glass. Identification and counting was done using a binocular microscope with an apochromatic lens system and a built-in light. Most of the determinations were made at 100 diameters but greater magnifications were used when necessary. An extensive collection of check slides, from authentically identified material, and several useful publications were constantly at hand.

Two square centimeters of each sample were examined and the data recorded on tally sheets. If counts were low, three or four square centimeters were examined. The data were reported as the average per square centimeter.

To estimate the daily counts from slides exposed more than one day, the total count was divided by the number of days. Experiments which we conducted with one-, two- and three-day samples indicated that one three-day sample would have the same count as three one-day samples. Missing samples for less than one week were estimated to be intermediate between the known counts.

The tally sheets were processed by the Bureau of Statistical Services of the State Education Department where the data were recorded on IBM cards allowing the sorting and tabulation of the information for study and presentation as graphs.

In Albany, two sampling stations were installed approximately one mile apart to determine the uniformity of particles in the air over a given locality. These stations were operated continuously from April 1, 1953, through September 30, 1954. During the summer of 1955, two samplers were operated 15 feet apart on the roof of the Education Building in Albany. The data from these supplementary stations are mentioned under station 25.

To determine the probable range of variation among samplers in various locations in the same general area, a dozen samplers were operated for 25 days at Newburgh in cooperation with Dr. Richard E. Passenger. Ragweed pollen only was counted. The daily counts were extremely variable, often with some counts more than ten times as much as others. The 25-day averages exhibited a wide range with the highest count three times the lowest.

From research we conducted in cooperation with meteorologists at Brookhaven National Laboratory on Long Island it was determined that a number of factors. other than pollen concentration, affect the count. The principal one appears to be wind velocity. Samplers at various heights above the ground and in situations having different average wind speeds cannot properly be compared. These experiments are being continued.

The primary purpose of this survey is to furnish information of value in studies on pollinosis (hay fever). Although it is designed for use by patients and physicians who need to know what, where and when organic particles are in the air in sufficient quantities to cause medical concern, the presentation and discussion are from a botanical standpoint only.

ACKNOWLEDGMENTS

Our first and most grateful thanks go to the many cooperators who accepted the responsibility for collecting the daily samples and mailing them to the Albany laboratory. Many of them assisted in the installation of the sampling stations and several constructed elaborate devices to insure that proper samples were obtained. They are individually named in the descriptions of sampling stations.

Numerous persons helped in various ways but special thanks are due the following:

Fay Hyland, professor of botany, University of Maine, whose similar survey in Maine has been used as a model, has been continuously generous with much appreciated advice.

F. Wellington Gilcreas, formerly assistant director, Division of Laboratories and Research, New York State Department of Health, for advice, loan of equipment and making several of the research laboratory facilities available.

Doris McGlynn, now on the staff of the State Department of Health, was responsible for most of the routine identification and counting. She handled all of the samples for 1953 as well as the 1954 samples through most of the tree pollens. Assistance in completing the samples for 1954 and preparation of the graphs has come from Margaret Curtin and Charles Downing. Mrs. Emily Dixon helped with the analysis of data and planning of graphs.

Stanley J. Smith, curator of botany in the New York State Museum, has assisted in numerous ways, especially in the identification of troublesome plant parts and even taking time from his own research to help in the installation of the sampling stations. John Wilcox, curator of entomology, has frequently helped with the identification of insect parts.

Louis H. Conger, formerly of the Bureau of Statistical Services of the State Education Department and now with the U. S. Department of Health, Education, and Welfare, has been our source of advice on mathematical matters. Without the aid of the bureau's machine room, in the charge of Kenneth Duryea, the analysis of the data would have taken a much longer time.

O. C. Durham of Abbott Laboratories, North Chicago, Illinois, advised relative to procedures acceptable to the Pollen Survey Committee of the American Academy of Allergy.

PLANTS PRODUCING AIRBORNE POLLEN

Pollen is produced by flowering plants and conifers. The individual grains of pollen are too small to be seen with the unaided eye but in quantity they appear to be a yellowish powdery mass. The conifers and some flowering plants are wind-pollinated. Such plants usually produce large quantities of dry, buoyant pollen grains. Most flowering plants are insect-pollinated; their pollen is not transported any appreciable distance by air currents. For convenience, those plants that produce buoyant pollen in large quantities may be divided into trees, grasses and weeds. Most airborne tree pollens are shed during spring and early summer, the grasses during midsummer, while the weed pollen is in the air during the late summer and fall. Overlaps occur as will be seen from an examination of the graphs.

Trees

While the order of appearance of the various tree (trees and shrubs) pollens varies slightly among localities, the average order of appearance in quantity is somewhat as follows: juniper (*Juniperus*), alder (*Alnus*), willow (*Salix*), elm (*Ulmus*), maple (*Acer*), poplar (*Populus*), birch (*Betula*), sweet fern (*Comptonia*), oak (*Quercus*), hemlock (*Tsuga*), sycamore (*Platanus*), pine (*Pinus*), spruce (*Picea*), beech (*Fagus*), ash (*Fraxinus*), hickory (*Carya*) and walnut (*Juglans*). Small amounts of hazel (*Corylus*), yew (*Taxus*), hackberry (*Celtis*), larch (*Larix*), blue beech (*Carpinus*), hop hornbeam (*Ostrya*), fir (*Abies*), mulberry (*Morus*), red gum (*Liquidambar*), black gum (*Nyssa*), tree-of-heaven (*Ailanthus*) and basswood (*Tilia*) were recorded. The total tree pollen for 1953 was much higher than for 1954, being 76,446 to 48,788—this in spite of the later activation of the samplers in 1953 and the consequent loss of some of the earliest pollens.

Juniper pollen includes that from red cedar (*Juniperus virginiana*) and low juniper (*J. communis*). The former sheds its pollen first, beginning some two weeks before the latter. In both years nearly all of the stations reported sufficient juniper pollen to warrant inclusion on the graphs. The total count from all stations for 1953 was nearly four times that for 1954 in spite of the evident loss of some juniper pollen in 1953 because of the later starting date. Juniper accounted for approximately 2 percent of all the pollen during the two 200-day periods and 4 percent of the tree pollen. The areas of highest counts were not the same both years, being: Saranac Lake, Watertown and Dannemora in 1953 but Ticonderoga, one of the Albany stations and Zena in 1954.

Alder pollen is mostly from the common alder (*Alnus rugosa*) which is the earliest alder to flower. Less than half of the stations recorded sufficient pollen for inclusion on the graphs. It consituted only 1 percent of the tree pollen.

Willow pollen is from several species of *Salix*. This pollen is mostly not airborne but may be produced in such abundance that sometimes considerable quantities get into the air. In 1953 nearly all stations reported graphable amounts; in 1954 one-half of them. In 1953 the amount caught was nearly five times that in 1954. The average catch for the two years was little more than 2 percent of the total tree pollen.

Elm pollen is mostly from the American elm (*Ulmus americana*) which is a part of our native forest, especially in swampy lowlands, and has been planted commonly as a street tree. All of the 1953 stations recorded elm pollen in sufficient amounts to graph and all but Belle Ayre Mountain, Indian Lake and Turin in 1954. The average for both years was 4 percent of all pollen and 8 percent of the tree pollen. In general, the stations with the highest counts were Albany, Geneva and Utica.

Maple pollen is from several species of *Acer* but chiefly from the boxelder (*A. negundo*), except in the mountains. The earliest one to flower is silver maple (*A. saccharinum*), which may be shedding pollen before the last snowfall in the spring, followed soon by red maple (*A. rubrum*) and then boxelder. Norway maple (*A. platanoides*) follows soon but it is doubtful if much of its pollen gets into the air. Sugar maple (*A. saccharum*) sheds its pollen a month or more later than silver maple. These five maples are common in cities. The striped maple (*A. pensylvanicum*) and mountain maple (*A. spicatum*) may be responsible for small amounts of late maple pollen in some woodland areas. Practically all of the stations recorded maple both years. This pollen was 3 percent of the total pollen and 6 percent of the pollen from trees during the two years.

Poplar pollen is mostly from the aspens but large amounts may come from the eastern cottonwood and other species. The earliest is from trembling aspen (*Populus tremuloides*) followed soon by the large-toothed aspen (*P. grandidentata*). Where the Lombardy poplar (a cultivated variety of *P. nigra*) occurs, its pollen will be found with that of the large-toothed aspen. The eastern cottonwood (*P. deltoides*) accounts for much of the later poplar pollen. On some city streets the Carolina poplar (a hybrid) occurs as a shade tree. It produces large quantities of pollen. Nearly all the stations recorded poplar pollen. In general, poplar comprised 3 percent of the total pollen and 6 percent of the tree pollen.

Birch pollen is mostly from gray birch (*Betula populifolia*), white birch (*B. papyrifera*) and yellow birch (*B. lutea*). Their pollens usually appear at approximately the same time. River birch (*B. nigra*) is common on Long Island and in the Hudson Valley. Black birch (*B. lenta*) is scattered in the State, except in the Adirondacks, and is common in some areas. Birch pollen was recorded from all stations and in moderate to high amounts except for those in the western part of the State. In 1953 the birch count was highest of all the trees being over 25,000 grains or more than 30 percent of the total tree pollen for that year. In 1954 the count was much lower, being less than 6,000 or 12 percent of the pollen from trees. The stations that contributed most heavily to these counts were Saranac Lake, St. Regis Falls and Dannemora in 1953 and one of the Albany stations, Hudson Falls and St. Regis Falls again in 1954.

It is very difficult to separate the pollen of birch, sweet fern, blue beech and hop hornbeam. Birch pollen exhibits variation due to the different species. During May 1953, especially between the 5th and 15th of the month, nearly all of the stations collected pollen that did not match well with birch and did not correlate with the occurrence of blue beech and hop hornbean. It was therefore recorded as unidentified pollen and for most of the stations the amount was too low to warrant mention. However, for several stations amounts were recorded too large to ignore. This type of pollen was not seen in the 1954 samples and it now appears likely that at least some of the 1953 unidentified pollen should be included with birch. Where it is probable that the counts for birch should be increased, mention is made in the discussions of the stations involved.

Sweet fern pollen is mostly from *Comptonia peregrina* which is common over all but the western end of the State. The pollens of sweetgale (*Myrica gale*) and of bayberry (*M. pensylvanica*) are too similar to those of sweet fern for distinguishing in routine counting. They are common only on Long Island. There is some question about the counts on sweet fern. Its occurrence on the 1953 graphs does not correlate well with its occurrence in the State. It was found in very low amounts in 1954. Either the shedding of sweet fern pollen was much different between the two years or some other pollen (probably birch) was recorded as sweet fern in 1953.

Oak pollen is from several species of *Quercus*, mostly shedding pollen at the same time. The scrub oak barrens are composed primarily of bear oak (*Quercus ilicifolia*) and dwarf chinquapin oak (*Q. prinoides*). Red oak (*Q. borealis*) and white oak (*Q. alba*) are common forest trees. Other species may be locally common. Oak pollen was recorded from all stations in moderate to high amounts except in the Adirondack region. In 1953 oak pollen comprised 9 percent of the total tree pollen; in 1954 it was 30 percent. Yonkers contributed most heavily to this count both years. All of the southeastern stations gave high counts for oak.

Hemlock pollen is almost entirely from the native hemlock (*Tsuga canadensis*) which is common in nearly all sections of the State except on Long Island and Staten Island. In 1953 hemlock pollen was recorded from all but the Long Island stations, totaling 3 percent of the tree pollen; in 1954 only 10 stations showed sufficient amounts to graph, with a total less than 1 percent of the total of tree pollen.

Sycamore pollen is from *Platanus occidentalis,* a native species, and *P. acerifolia* which is commonly planted. In 1953 all of the stations recorded graphable amounts of sycamore pollen with the exception of Indian Lake which showed only a trace. In 1954 a little over one-half of the graphs showed sycamore. The amount averages 3 percent of the total tree pollens over the two-year period. Stations with the highest amounts are Yonkers and Newburgh. The Adirondack stations are very low.

Pine pollen is from several species of *Pinus.* Usually the order of appearance is roughly as follows: jack pine (*P. banksiana*), pitch pine (*P. rigida*), Scotch pine (*P. sylvestris*), red pine (*P. resinosa*) and white pine (*P. strobus*). Pine pollen was recorded from all stations both years. In 1953 5 percent of the total tree pollen was pine; in 1954 it was 12 percent. Each year Wanakena recorded the highest amount, Gloversville second and Hornell third. Turin was lowest both years.

Spruce pollen is largely from the red spruce (*Picea rubens*), a common forest tree in the northern and eastern parts of the State. Black spruce (*P. mariana*) is locally abundant in bogs and on mountain summits. White spruce (*P. glauca*) is common in the Adirondack region and planted elsewhere. Norway spruce (*P. abies*) is a commonly planted introduced species. Nearly all stations recorded spruce pollen both years. The total was 4 percent of all the tree pollen.

Beech pollen is from the native American beech (*Fagus grandifolia*), a common forest tree on rich soil throughout the State. Nearly all of the stations recorded beech both years. The total was 3 percent of all tree pollen.

Ash pollen is from white ash (*Fraxinus americana*), red ash (*F. pennsylvanica*) and black ash (*F. nigra*). They shed their pollen at approximately the same time, although black ash may begin pollen release a week or so earlier than the other two. Ash pollen was recorded from most of the stations but totaled only 2 percent of all the tree pollen. For some unexplained reason the count at Rochester in 1954 was nine times that in 1953.

Hickory pollen is from several species of *Carya* which release their pollen approximately over the same period of time. Most of the stations recorded hickory pollen both years but the total was only 1 percent of all the tree pollen. The Adirondack stations recorded no hickory pollen or only trace amounts.

Walnut pollen is from black walnut (*Juglans nigra*) and butternut (*J. cinerea*), both scattered in rich woods throughout the State. Their pollen is shed at approximately the same time. Less than one-half of the stations had graphable amounts. The total was less than 1 percent of the total tree pollen.

Grasses

There are over 400 species of grasses in New York but it is likely that most of the grass pollen is from 20 to 25 of the common species. Among those producing pollen in large quantities are: sweet vernal grass (*Anthoxanthum odoratum*), Kentucky bluegrass (*Poa pratensis*), orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*) and redtop (*Agrostis alba*), usually flowering in that order. Although sweet vernal grass is reported to produce large quantities of pollen and it is known to occur throughout the State, our graphs do not indicate much sweet vernal pollen at the stations as this grass flowers early: April and May. Another early flowering grass that may produce much pollen in local areas is annual spear grass (*Poa annua*). Some grasses are found in abundance in special ecological situations. These include the poverty grasses (*Andropogon scoparius* and *Danthonia spicata*) of dry sterile soil, the salt grasses (*Spartina patens* and *Distichlis spicata*) and giant reed (*Phragmites communis*) of salt marshes. Crab grass (*Digitaria sanguinalis*) is among the last to shed its pollen. Corn pollen is too large and heavy to get far from the source and was seldom caught by our samplers. We found it impossible to distinguish the common grasses by their pollen grains.

The total grass pollen averaged approximately 19 percent of the pollen from all the stations during the two years. Stations recording the highest count were those adjacent to hayfields.

Weeds

In their production of pollen, all of the weeds are of minor importance, except ragweed (*Ambrosia*). The total count of the latter exceeded that from all other entities, with the exception that the total grass pollen was slightly more. Most of this pollen is from short ragweed (*A. artemisiifolia*) but in some areas giant ragweed (*A. trifida*) supplies large amounts. The time of year when ragweed will be pollinating can be predicted rather closely for, unlike most plants, the flowering period is dependent upon latitude. When the daylight period reaches a certain length the ragweed plants come into bloom regardless of their size. Giant ragweed is shedding its pollen a week or more before the short ragweed, but because of the overlap in production and close similarity of the grains we were unable to distinguish them. The total ragweed pollen was approximately 19 percent of the total pollen from all the stations.

Experiments conducted by O. C. Durham indicate that the factor 3.6 may be used to convert the number of ragweed pollen grains per square centimeter of greased slide surface, when exposed in the Durham sampler for 24 hours, to the average number per cubic yard of air. Thus a count of 7 as shown on the ragweed graph would indicate an average of 25 grains per cubic yard. The first three sets of the columns of figures on the following page are converted to the cubic yard basis. From such data the "ragweed pollen index" is obtained by assigning 1 point for each day when the count reaches or exceeds 25, 1 point for each 100 grains of pollen on the day of the highest count and 1 point for each 200 grains of pollen in the seasonal total.

This method of reporting is now current practice, although our recent experiments indicate that the factor for converting the number of ragweed pollen grains per square centimeter of slide surface to the average number per cubic yard of air varies greatly with the wind velocity and the orientation of the slide with respect to air flow.

Other weeds that produced sufficient buoyant pollen to be recorded on at least some of the graphs are, in order of their appearance: dock (*Rumex*), plantain (*Plantago*), pigweed (*Chenopodium* and *Amaranthus*), wormwood (*Artemisia*), marsh elder (*Iva*) and goldenrod (*Solidago*).

FUNGI

The total number of fungus spores for the seasons from the stations usually closely approached (and often surpassed) the total number of pollen grains. *Cladosporium* (including *Hormodendrum*) gave the highest readings, often being more than half the total count. *Alternaria* averaged second in abundance. It is probable that some *Stemphylium* spores were included in the counts for *Alternaria* as the spores of these genera are difficult to distinguish. In the counts of *Fusarium* it is likely

STATION	NO. OF DAYS WITH COUNTS OF 25 OR GREATER		MAXIMUM DAILY COUNT		TOTAL SEASONAL COUNT		RAGWEED POLLEN INDEX	
	1953	1954	1953	1954	1953	1954	1953	1954
1. Montauk Point	3	8	50	187	302	1051	5	15
2. Riverhead	21	23	490	194	2941	1944	41	35
3. Farmingdale	27	24	270	230	2898	2113	44	37
4. Yonkers	25	24	191	403	2300	2808	38	42
5. Newburgh	19	27	155	331	1897	3402	30	47
6. Zena	13	10	76	94	814	727	18	15
7. Belle Ayre Mountain	18	13	173	144	1382	1080	27	19
8. Liberty	17	19	284	101	1678	1134	28	26
9. Oneonta	19	27	284	216	2250	2506	33	42
10. Binghamton	20	?	158	?	1757	?	31	?
11. Cortland	21	25	259	202	2599	2243	37	38
12. Elmira	27	30	306	187	2660	2628	43	45
13. Hornell	21	24	216	234	2272	2142	34	37
14. Olean	28	27	216	173	2304	2063	42	39
15. Celoron	24	27	447	233	2538	2970	41	44
16. Springville	25	25	371	223	3910	3063	49	42
17. Lockport	33	34	565	504	6494	4241	71	60
18. Perry	31	27	2376	227	11722	2716	114	43
19. Rochester	31	31	994	360	7340	3877	79	54
20. Geneva	29	27	518	317	4611	3969	57	50
21. Oswego	18	?	256	?	2844	?	35	?
22. Syracuse	24	30	472	317	3478	3474	46	50
23. Utica	23	23	670	112	3906	1282	50	30
24. Gloversville	18	17	245	122	1829	1253	29	24
25. Albany	15	20	176	101	1602	1289	25	27
25A. Albany	19	31	295	227	2801	2556	35	46
26. Hudson Falls	20	21	407	277	2524	1872	37	33
27. Ticonderoga	18	16	252	194	1570	1400	29	25
28. Indian Lake	10	3	222	36	1091	304	17	5
29. Turin	10	7	72	72	738	554	12	11
30. Watertown	21	19	572	364	3215	2671	43	36
31. Wanakena	10	4	83	58	760	414	15	7
32. Saranac Lake	18	4	461	79	2494	450	34	7
33. Dannemora	12	10	140	86	1138	670	19	14
34. St. Regis Falls	17	14	443	166	2373	1357	33	23
35. Ogdensburg	21	22+	666	320+	3564	3406+	46	42+

that we have included spores of *Cylindrocarpon* and possibly *Curvularia*. Spores of rusts and smuts were recorded as such whenever possible but undoubtedly some were tallied under miscellaneous fungi.

Most fungi are difficult to recognize from spores alone. It is extremely likely that most of the spores recorded as miscellaneous fungi were from

Aspergillus and *Penicillium* but included many from *Pullularia, Mortierella, Epicoccum, Botrytis, Phoma* and various mushrooms.

A multicellular spore was always counted as a single spore but a clump of spores was counted (or estimated) as the number of individual spores in the clump. Some of the high daily counts are due to one or more large clumps. Bits of fungus tissue (hyphae) were recorded as spores.

MISCELLANEOUS

Ferns

The spores of most ferns are apparently too heavy to be plentiful in the air far from the source. Our counts include the club mosses (*Lycopodium*) with the true ferns (*Polypodiaceae* and *Osmundaceae*). The total for fern spores was roughly 3 percent of total pollen. Spores of the horsetails (*Equisetum*) were encountered occasionally.

Mosses

It is possible, though not probable, that the low counts for mosses are due to our inability to recognize them as such. If so, some of them are included with the ferns.

Algae

Small amounts of alga cells and filaments were encountered, but never in important amounts.

Plant Hairs

Our records from approximately 15,000 samples show plant hairs on every one. The counts were usually very high; too high to be conveniently included on the graphs with pollen and spores. At the Albany stations 25 and 25A, which were operated continuously from spring 1953 to fall 1954, plant hairs were found daily during the winter. Plant hairs vary greatly in size and no attempt was made to separate on that basis or on any other characteristic. With such high counts, the averages would be uniform and quite similar between stations.

Animal Parts

Scales of insects were usually common and often abundant in the samples. They have been recorded but are not included in the present graphs. This category is comprised of tiny roundish scales, long narrow scales (hairs), portions of wings, legs and even whole insects (usually mites). The stations that recorded large amounts of insect scales, in order of abundance, are: Ogdensburg, Oneonta, Liberty, Perry and Olean. These stations averaged over 1,000 scales each season. Most stations recorded several hundred. Stations that averaged less than 100 are: Montauk Point, Utica, Indian Lake, Belle Ayre Mountain, Farmingdale, Elmira and Springville.

Hairs of animals such as dogs, cats, horses and bats and down from birds were occasionally noticed but were never common.

LIST OF STATIONS

1. Montauk Point

Cooperators: for 1953, Archie W. Jones, B.M.1, Montauk Point Light Station; for 1954, C. E. Schumacker who succeeded Mr. Jones as B.M.1.

The sampler was on the lawn about 70 feet from the lighthouse. It was 6 feet above the ground which is 60 feet above sea level. There were few plants that produce airborne pollen in the immediate vicinity of the sampler. A few flowers of crab grass (*Digitaria*) escape the lawnmower. Bayberry (*Myrica*) is abundant on the east side several hundred feet away.

1953: As would be expected from a station nearly surrounded by water, the total pollen count from Montauk Point was the lowest of all the stations. This may be due, in part, to the early season causing juniper, elm, maple and poplar to shed pollen during March. The highest total count was from grass, with birch following a close second. The ragweed count was much lower than at any other station, with less than half the number of particles recorded for the next lowest (Turin) and approximately one-tenth that of Riverhead and Farmingdale.

1954: The total pollen count was somewhat higher but was still rather low. The highest count was from birch, followed by oak and then ragweed; grass was fourth. Ragweed was more than three times that of the previous year and approximately one-half that at Riverhead and Farmingdale. Six stations had lower ragweed counts in 1954: Indian Lake, Wanakena, Saranac Lake, Turin, Dannemora and Zena. During both years the total count of fungus spores was lower at Montauk Point than at any other station, followed by Farmingdale.

2. Riverhead

Cooperator: Dr. Stuart Dallyn, director. Long Island Vegetable Research Farm.

This station is 3 miles northeast of Riverhead and 1 mile south of the Sound, at an elevation of 100 feet. The sampler was 25 feet above the ground and 3 feet above the roof of a flat-topped building, well in the open and surrounded by flat farmland. It was lowered by rope and pulley for changing the slides.

During both years, Riverhead gave intermediate counts on pollen and fungus spores. It had more hickory pollen in 1953 than any other station but all stations were low. During 1954 it led the counts for *Alternaria* while just east at Montauk Point was recorded the lowest count. In 1953 there was a sizable count of sedge (*Cyperaceae*) pollen but practically none in 1954.

3. Farmingdale

Cooperator: Dr. Louis Pyenson, Long Island Agricultural and Technical Institute.

The sampler was mounted on the roof of one of the Institute buildings, attached to an unused chimney. This locality is 90 feet above sea level; the sampler was 25 feet above the ground and in the open, being surrounded by greenhouses, low shrubs and mowed lawn. The nearest trees were more than 100 feet distant: pine, maple, elm and cedar. There are many small spruce trees in the vicinity but probably too young to shed pollen.

Oak pollen was second highest here in 1953, being surpassed only at Yonkers. In 1954 oak jumped by three times but dropped to fourth place, being surpassed by Yonkers, Zena and Newburgh.

4. Yonkers

Cooperators: for 1953, Arthur Wallach, director, Division of Environmental Sanitation, Department of Public Health, Yonkers; for 1954, George J. Kupchik, who succeeded Mr. Wallach as director.

This station is at the health center building which is 200 feet above sea level. The sampler was mounted on the roof parapet over 100 feet above the ground entirely free from anything that would divert normal air currents. It was well above plants producing airborne pollen such as the usual street trees, mostly elm and maple.

Yonkers gave the highest count for oak pollen among all the stations for both years. In 1953 the sycamore count was fairly high and was surpassed only by Newburgh. In 1954 the sycamore count dropped considerably but it held second place, being surpassed by one of the Albany stations.

5. Newburgh

Cooperator: John F. Kingsley, superintendent of water.

This station was located at the southwest edge of the city at 240 feet above sea level. The sampler was on the roof of the filtration plant, well in the open. The usual street trees are apparently the only near source of airborne pollen in quantity.

The sycamore count was the highest of all the stations during 1953. This may be due to local street trees. The count dropped considerably in 1954 but this was a general trend and Newburgh was third high. Although ash was not especially high in 1953 it was higher than at any other station. In 1954 it was approximately the same but was slightly surpassed at Yonkers and greatly so at Rochester. In 1954 Newburgh was highest for hickory and walnut but neither count was especially high.

6. Zena

Cooperator: William Colsten, chief filter plant operator, Kingston Water Department.

This station was 400 feet above sea level. The sampler was some 30 feet above the ground, mounted on the peak of the gable roof of a filtration plant building, well in the open. Trees in the vicinity were sugar maple, red oak, sycamore, hickory, white pine and ash. The lawn on the south and west close to the building had plantain, dock and daisy fleabane (*Erigeron*).

7. Belle Ayre Mountain

Cooperator: Arthur G. Draper, superintendent, Belle Ayre Mountain Ski Center.

This station was our highest above sea level: 3,325 feet. The sampler was perched 30 feet above the ground on top of the tower at the upper end of the ski lift. It was in the open; the nearest trees, beech and maple, being 30 feet away.

The pine pollen count was next to the lowest for both years among all the stations, being nearly as low as Turin. The counts for ragweed indicate the situation on Belle Ayre Mountain and does not reflect the condition at Pine Hill in the valley, where the ragweed count is known to be low. For some unexplained reason there was a large reduction in pollen and a large increase in fungus spores for 1954 compared with 1953. The combined total pollen for both years was lowest of all the stations.

8. Liberty

Cooperator: Harry Eichenauer, superintendent of Sewage Disposal Plant.

This station was at the Sewage Disposal Plant, at an elevation of 1,400 feet above sea level. The sampler was 20 feet above the ground and in the open.

During May 1953, especially on the 8th, 9th and 10th, there were large amounts of pollen that could not be identified. It was probably birch or blue beech. 1953 smut spores were not graphed; the total was high but due to one clump of 170 grains on September 7; otherwise low and sporadic.

9. Oneonta

Cooperator: C. M. Taylor, superintendent of water; assisted by Frank Adamowicz.

This station was at the Sewage Disposal Plant, 1,070 feet above sea level. The sampler was on a flat roof 20 feet above the ground. There were hayfields nearby and a few trees: elm, sycamore, beech and willow. A forested area on the south is of mixed woods, mostly maple and pine with some hemlock.

Unidentified pollen collected on May 9 and 10, 1953, may be birch or blue beech. The high grass pollen for both years, highest for all stations in 1954, is probably due to its proximity to hayfields. During both years Oneonta was surpassed only by Ogdensburg in its count for insect scales.

10. Binghamton

Cooperator: H. G. Koach, administrator of Binghamton City Hospital.

The sampler was on the roof of the hospital, about 50 feet above the ground, which is 870 feet above sea level. Plants in the vicinity producing airborne pollen are the usual street trees: elm, maple and sycamore.

This station began operation in 1953 on April 3 and in 1954 on March 29. During 1954 a large number of slides appeared to have been unexposed. Whether other slides were exposed more than one day we have been unable to determine. The 1954 graph from July 30 to the end may be considered to be essentially worthless.

11. Cortland

Cooperator: H. B. Holcomb, superintendent of Sewage Treatment Plant.

This station is at the Sewage Treatment Plant, 1,100 feet above sea level. The sampler was on the flat roof, about 20 feet above the ground. The station is surrounded by hayfields. Along the river close by there are willows and some elms. The outlying woods are mostly maple with some beech and occasional poplar and walnut.

The high count for grass pollen in 1953 may be due to the nearby hayfields but the 1954 count was only a little above average for the State. The total count for all fungi for 1954 was higher at Cortland than at any other station. This is due, in great part, to the high count for *Cladosporium* which was exceeded only at Lockport.

12. Elmira

Cooperator: J. W. Colby, assistant superintendent of Arnot-Ogden Memorial Hospital.

The sampler was mounted about 50 feet above the ground on the roof parapet of the hospital, which is 880 feet above sea level. The station is surrounded by the usual street trees: maple and elm. There are a few spruce and pine trees on the hospital grounds.

13. Hornell

Cooperator: J. G. Cary, superintendent of water.

This station is at the Water Filtration Plant, 1,400 feet above sea level. The sampler was perched on the peak of the gable roof. 25 feet above the ground, of a building near the top of a hill. This hilltop is covered with young growth, mostly poplar (trembling aspen). On the north is a deep gorge with elm, maple, oak, blue beech, hop hornbeam, willow and scattered hickory. On the west are farms with hayfields. Plantain is abundant on the lawn near the station.

In 1954 this station began operation on March 22. We are unable to explain the high 1954 count for spruce, being highest for all stations that year and much higher than the next highest: Saranac Lake. Nor can we interpret the high pine count, making this station third highest both years. It is likely that the 1953 record for sweet fern is too high; this station had the highest 1953 count for this plant; the known distribution does not warrant it; its pollen is easily confused with birch; the 1954 count was very low.

14. Olean

Cooperator: Alfred H. Mann.

This station is at the Sewage Disposal Plant, 1,420 feet above sea level. The sampler was 15 feet above the ground and in the open, except for cedar trees nearby that are a few feet taller. Along the river near the station are elm, maple and willow. Goldenrod is abundant in the area.

15. Celoron

Cooperator: Homer Feidler, Sewage Treatment Plant operator.

The station is at the Sewage Treatment Plant, 1,320 feet above sea level. The sampler was on the roof, 15 feet above the ground and in the open. The nearest trees were willow and poplar. Elm and maple were scattered on all sides. There were two small, but flowering, cedars planted beside the building. A small swamp of cattail (*Typha*) was just east of the station. Goldenrod was plentiful. There were a few plants of plantain, pigweed (*Chenopodium*) and short ragweed nearby.

16. Springville

Cooperator: Elmer Ganschow, superintendent of water.

The sampler was 15 feet above the ground on the roof of a pumping station, 1,350 feet above sea level. The sampler was in the open, being surrounded by lawn and a large schoolyard. Farther away were houses, street trees (mostly sugar maple) and weed patches. Other trees in the area are pine, elm, willow and spruce.

It is possible that one or more high points on the graphs for maple may be due to the sugar maples nearby and the low position of the sampler. The birch counts were very low at this station, being lowest of all in 1953 and almost as low as the lowest (Perry) in 1954.

17. Lockport

Cooperator: Roger Foltz, superintendent of Water Filtration Plant.

This station is at the filtration plant, 620 feet above sea level. The sampler was on a corner of a flat roof 25 feet above the ground and more than 50 feet from a higher part of the building. There were large hayfields near and the usual street trees: maple and elm, also poplar and willow.

The large amounts of grass pollen recorded both years may be due, in part, to the hayfields in the vicinity. They were the second highest counts for grass, being surpassed only by Turin in 1953 and by Oneonta in 1954. Lockport had the highest ragweed pollen count in 1954 and was third high in 1953, being surpassed that year by Perry and Rochester. The two-year total of all fungus spores places Lockport at the top of the list; it had the highest count in 1953 and the second highest in 1954. Both years it was next to the highest for *Alternaria*. In 1954 it had the highest count for *Cladosporium*.

18. Perry

Cooperator: Ralph Laney.

This station is at the Perry Waterworks, 1,380 feet above sea level, on the shore of Silver Lake. The sampler was only 12 feet above the ground but in the open on a rise above the lake. The nearest trees were 100 feet distant, mostly elm. Willow, maple and elm fringe the lake.

This station had the lowest count for birch in 1954. In 1953 the count was low but Springville and Turin were lower. The 1953 ragweed count at Perry was the highest for all stations with the high point (September 4) reaching 660 grains per square centimeter or approximately an average of 2,400 per cubic yard of air. In 1954 the ragweed count was slightly above average for the State. Perry gave the highest count for *Alternaria* in 1953 but in 1954 it was average.

19. Rochester

Cooperator: Dr. John M. MacMillan, director of Iola Sanatorium.

This station is at the Sanatorium, at the south edge of the city, at an elevation of 550 feet. The sampler was on a flat roof, in the open, approximately 50 feet above the ground. Trees producing airborne pollen in the immediate vicinity are: sycamore, maple, spruce and ash. There is quite a bit of cultivated farmland in the area.

In 1954 this station began operation on April 6. This station had the highest count of all stations for ash in 1954. Even without the extremely high count on May 16 (which we are unable to explain) it would still be the highest count. The ragweed count was second high in 1953 (surpassed by Perry) and third in 1954 (surpassed by Lockport and Geneva). Rochester was third high both years for *Alternaria,* being surpassed by Perry and Lockport in 1953 and by Riverhead and Lockport in 1954.

20. Geneva

Cooperator: Robert E. Johnson, administrator of Geneva General Hospital; assisted by Andrew Christensen, maintenance engineer.

This station is at the Hospital, 520 feet above sea level. The sampler was on the roof parapet, in the open, approximately 50 feet above the ground. Plants producing airborne pollen in the vicinity are the usual shade trees, mostly elm.

For the period June 3 through June 11, 1954, no samples were taken so the figures given are estimates. Geneva had the highest count for elm among all the stations in 1954 and was third high in 1953. This station had the highest poplar count in 1954 due primarily to the very high count on April 21. The ragweed pollen count was surpassed only by Lockport in 1954 but by Perry, Rochester and Lockport in 1953.

21. Oswego

Cooperator: Dr. George E. Pitluga, professor of science, Teachers College, State University of New York.

The station is at the College, 320 feet above sea level. The city is on the east; Lake Ontario on the north and west. The sampler was on the flat roof of the Union Building, in the open, approximately 30 feet above the ground. It was surrounded by lawn and campus trees, mostly maple, spruce, poplar and birch.

The absence of records from August 12 through September 30 is due to the loss of samples between Oswego and our laboratory in Albany.

22. Syracuse

Cooperator: for 1953, William P. Gyatt, superintendent of the Bureau of Sewage Treatment; for 1954, Joseph D. Kieffer. who succeeded Mr. Gyatt as superintendent.

The station is at the Sewage Disposal Plant, near the south end of Onondaga Lake, 380 feet above sea level. The sampler was mounted, 30 feet above the ground, above the roof of the building. It was well in the open on a platform that was lowered, by means of rope and pulley sliding the platform down guiding rods, for changing slides. Plants producing airborne pollen in the vicinity are street trees, mostly elm and poplar. A swamp between the station and the lake has cattail (*Typha*) and reed grass (*Phragmites*).

In 1953 this station began operation on April 17. The lack of pollen that year from juniper, alder, poplar and low counts from willow, elm and maple may be due to their shedding before samples were taken.

23. Utica

Cooperator: H. F. Hoffman, senior public health engineer.

The station was at the YMCA Building, 500 feet above sea level, during 1953. The sampler was on the roof, well in the open, approximately 100 feet above the ground. During 1954 the sampler was on the roof the Health Office Building, about 40 feet from the ground. Plants producing airborne pollen are essentially the same in the vicinity of both stations, being the usual street trees, mostly elm and maple.

24. Gloversville

Cooperator: Stuart Heald, filtration plant operator.

This station is the Gloversville Water Works, approximately 2 miles north of the city, at 1,040 feet above sea level. The sampler was on the roof parapet. in the open, about 25 feet above the ground. There is a pine plantation nearby on the north.

The pine pollen count was surpassed only by Wanakena each year. The high count is probably due to the proximity of the sampler to the plantation. On May 8, 9, 10 and 11, 1953, there was much pollen that could not be identified; it is probable that some of it was birch.

25. Albany

Cooperator: John Bartnick, custodian. New York State Museum.

This station is the Education Building on Washington Avenue in downtown Albany, 160 feet above sea level. The sampler was on the roof, in the open, 140 feet above the ground. Plants in the vicinity producing airborne pollen are the usual city trees, mostly elm, maple and tree-of-heaven.

A comparison of graphs for the two Albany stations will indicate the amount of variation that may be expected between samplings in the same general area but separated by a mile or so. The two samplers operated 15 feet apart (25 and 25check) during 1955 gave rather uniform readings.

25A. Albany

Cooperator: Miss Eleanor Weeber, sanitary chemist, Division of Laboratories for Sanitary and Analytical Chemistry, New York State Department of Health.

This station is at the Health Department's Division of Laboratories and Research on New Scotland Avenue, 220 feet above sea level. The sampler was on the roof parapet, 70 feet above the ground.

The total pollen count each year at station 25A was nearly double that at station 25. We are unable to suggest an explanation but wish to emphasize that variations in counts may occur under different situations in the same general area. See our discussion of comparisons made at Newburgh and at Brookhaven National Laboratory on Long Island under Procedure. In 1954 this station had the highest count among all the stations for birch, maple and sycamore. It was next to the highest for elm and juniper.

26. Hudson Falls

Cooperator: J. A. Fitzgerald; assisted by Peter Keegan.

This station is the Sewage Treatment Plant, 240 feet above sea level. The sampler was mounted on top of an 8-foot upright column on the roof of the plant, which placed it approximately 25 feet above the ground and in the open. Plants producing airborne pollen in the vicinity are boxelder, maple, elm, oak, poplar, pine and willow. There were small amounts of ragweed nearby. Forests in the area are of spruce, fir, blue beech, maple, birch and some larch.

The slides from March 15 through April 8 (except March 16, 19, 20, 23, 30, April 4, 5, 6 and 7) were broken in transit so the samples could not be used.

27. Ticonderoga

Cooperator: Herbert Barber; assisted by Fred Warren.

This station is the Moses-Ludington Hospital, 200 feet above sea level. The sampler was on the roof, above the parapet, with no obstruction to modify air currents nearer than 60 feet. It was approximately 50 feet above the ground. Plants producing airborne pollen in the vicinity are elm, maple, poplar, birch and cedar. On the west side are hayfields with occasional elms. Forests in the general area are mixed hardwoods.

On May 11 and 12, 1953, there were rather large amounts of pollen that could not be identified. It is likely that some of it was birch.

28. Indian Lake

Cooperator: Guy Pelon, superintendent of water.

This station is the home of Mr. Pelon in the village, 1.740 feet above sea level. The sampler was mounted 25 feet above the ground on top of a pole in the open. The sampler was lowered by rope and pulley for changing slides. Principal plants producing airborne pollen in the immediate vicinity of the sampler were grasses as the pole was in a hayfield. Trees in the area are the typical Adirondack forest of maple and spruce.

On May 9, 10 and 11, 1953, there were rather large amounts of pollen that could not be identified. It is probable that some of it was birch. Indian Lake had the lowest count for ragweed pollen in 1954 and also the lowest total pollen that year, grass causing nearly one-half the amount.

29. Turin

Cooperators: for 1953, S. S. Sweet; for 1954, Donald Hughes.

This station is at the home of Mr. Sweet, 1,260 feet above sea level. The sampler was mounted 8 feet above the ground in an open hayfield. There were few plants (other than grasses) producing airborne pollen in the immediate vicinity of the sampler.

In 1954 this station began operation on March 26 and ended September 25. The slides for June 26 through July 13 were exposed but unaccountably lost. The pine pollen count was lowest for both years among all the stations. In 1954 it had the lowest counts for oak and maple. On May 9, 10 and 11, 1953, there were rather large amounts of pollen that could not be identified. It is likely that some of it was birch. The large amounts of grass pollen are in all probability due to the surrounding hayfield and low position of the sampler. This may be the reason for the high counts for plantain and *Cladosporium*.

30. Watertown

Cooperator: Dale Lawson, who has charge of water purification for Watertown.

This station is at the pumping plant of Watertown Water Works, 500 feet above sea level. The sampler was perched above the roof of one of the buildings using a device that allowed it to be lowered for changing slides. It was 20 feet above the ground and in the open. There were only a few scattered trees nearby that produce airborne pollen: maple, elm, poplar, cedar, willow and oak.

31. Wanakena

Cooperator: James Dubuar, superintendent of State Rangers School. This station is at the sunshine-transmitter tower near the School, 1,600 feet above sea level. The sampler was mounted on top of the tower, 30 feet above the ground. It was in the open except for three large pine trees on the north side, approximately 10 feet distant. It was in the midst of a pine-spruce forest.

Wanakena recorded the largest amounts of pine pollen both years. This is probably due, in part at least, to the tall white pine trees close to the sampler. On May 8-12, 1953, there were large amounts of pollen that could not be identified. It is likely that some of it was birch. The grass pollen counts were lowest of all stations both years here. The *Fusarium* count for 1954 was highest of all the stations. It may be that some of the fusiform spores identified as *Fusarium* were actually ascospores of some unknown fungus.

32. Saranac Lake

Cooperator: for 1953, Lyall DeLamater, sanitary inspector of Saranac Lake; for 1954, several cooperators assisted in succession, all proving to be unsatisfactory with the exception of Frank Buck, Jr. who took over late in the season.

This station during 1953 was at the Hotel Saranac, 1,580 feet above sea level. The sampler was on the roof of the hotel, some 50 feet above the ground. Unfortunately it was not realized until the end of the season that the sampler was not installed in the place approved. It cleared the parapet by only a few inches rather than the recommended 30 inches and was only 10 feet from construction that would divert normal air currents. The sampler was moved to the roof of the Paul Smith Building for 1954. This was an excellent location but poor cooperation resulted in a discontinuous record. The forested hills at this station are mostly maple and birch with pine and some spruce.

1953: Some of the counts for birch pollen were too large to show on the graph; May 9: 3,171 grains, May 10: 55, May 11: 888 and May 12: 463. This station had the highest total count for birch, being more than twice the next highest (Indian Lake). It also led with fir, spruce, hemlock and maple. It was surpassed only by Belle Ayre Mountain for beech and only by Newburgh for ash. The sum total for all pollen grains was higher than at any other station. The ragweed count was higher than would be expected at Saranac Lake and may not well reflect the situation at the lower levels. Large amounts of algae were found on the slides, probably due to the position of the sampler.

1954: The station began operation on March 25. There were no samples for April 21 through May 19. Saranac Lake had the second highest counts for fir and spruce. The total counts for several tree pollens were materially reduced by the discontinuous records.

33. Dannemora

Cooperator: Warden J. V. Jackson, Clinton Prison. The slides were changed by Woodbury Wallace, assisted by Charles Stewart.

This station is at the prison, 1,400 feet above sea level. The sampler was 35 feet above the ground on the roof parapet of the Administration Building. Plants producing airborne pollen in the immediate vicinity are the street trees: maple, elm and birch. The surrounding woods are of maple, ash, beech, birch and poplar, with spruce and some pine at the higher levels.

Through an error, poplar pollen for 1953 does not appear on the graph. There was a total of 73 grains from April 4 through May 6 with a high of 11 grains on April 9.

34. St. Regis Falls

Cooperator: Arthur Fadden.

This station is 1,300 feet above sea level with the sampler about 40 feet above the ground on the flat roof of the school building, in the open. Plants producing airborne pollen in the general vicinity are: maple, elm, pine, willow, poplar and larch. There is some ragweed and plantain in the schoolyard. Woods one-fourth mile west of the station are mostly maple.

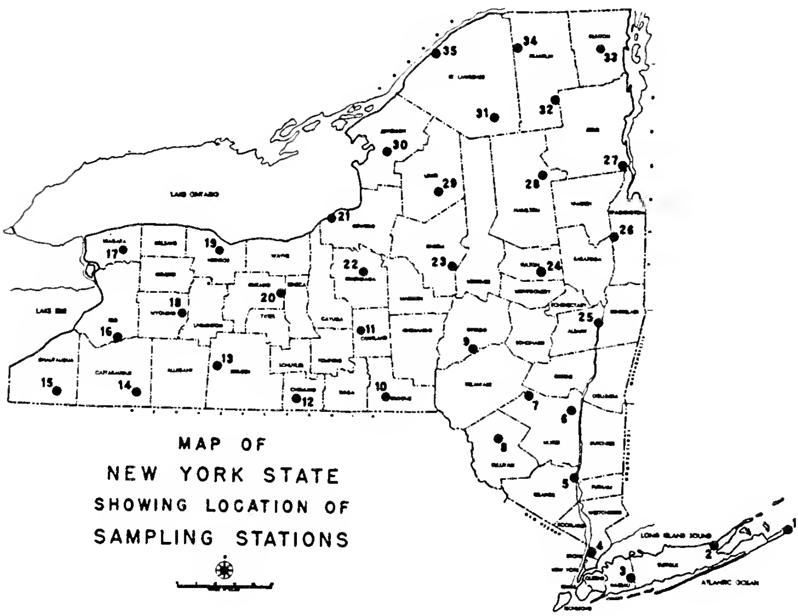
This station had the second highest count for birch in 1953 and the third highest in 1954.

35. Ogdensburg

Cooperator: Dr. George F. Etling, director, St. Lawrence State Hospital. The slides were changed by Mrs. Anna Martin.

This station is at the hospital, 250 feet above sea level. The sampler was mounted on the roof parapet, approximately 25 feet above the ground. It was in the open with nothing to divert air currents except a higher portion of the building 40 feet south of the sampler position. Plants producing airborne pollen in the vicinity are planted trees: poplar, maple, elm, oak, spruce and pine. Woods to the south are mostly maple. There are hayfields on the south and west.

In 1954, due to a misunderstanding, this station did not begin operation until July 1. For some unexplained reason it ended on September 16. Ogdensburg gave, by far, the highest counts among all the stations for insect scales during both years. In 1953 it was more than six times the next highest count. In 1954, in spite of the short record, it was more than seven times the next highest count. This may be due, in part, to the large hatches of aquatic insects, known locally as shad flies (presumably *Ephemeridae* and *Chirononidae*) and eel flies (presumably *Trichoptera* and *Plecoptera*) ; but it is probably due in great part to a habit—noticed too late to be corrected—of shaking a dust mop in the vicinity of the sampling device.



MAP OF
NEW YORK STATE
SHOWING LOCATION OF
SAMPLING STATIONS

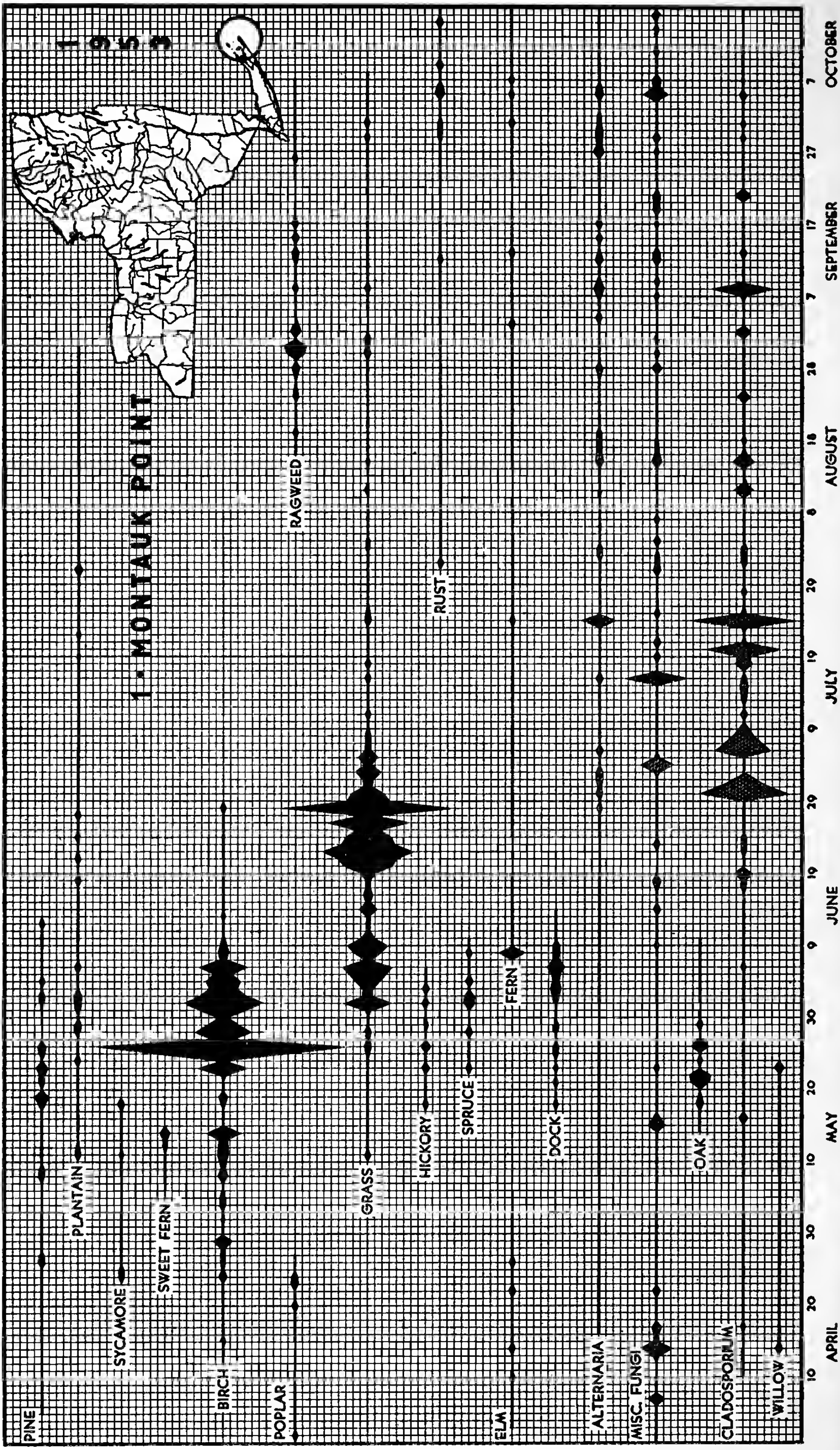
EXPLANATION OF GRAPHS

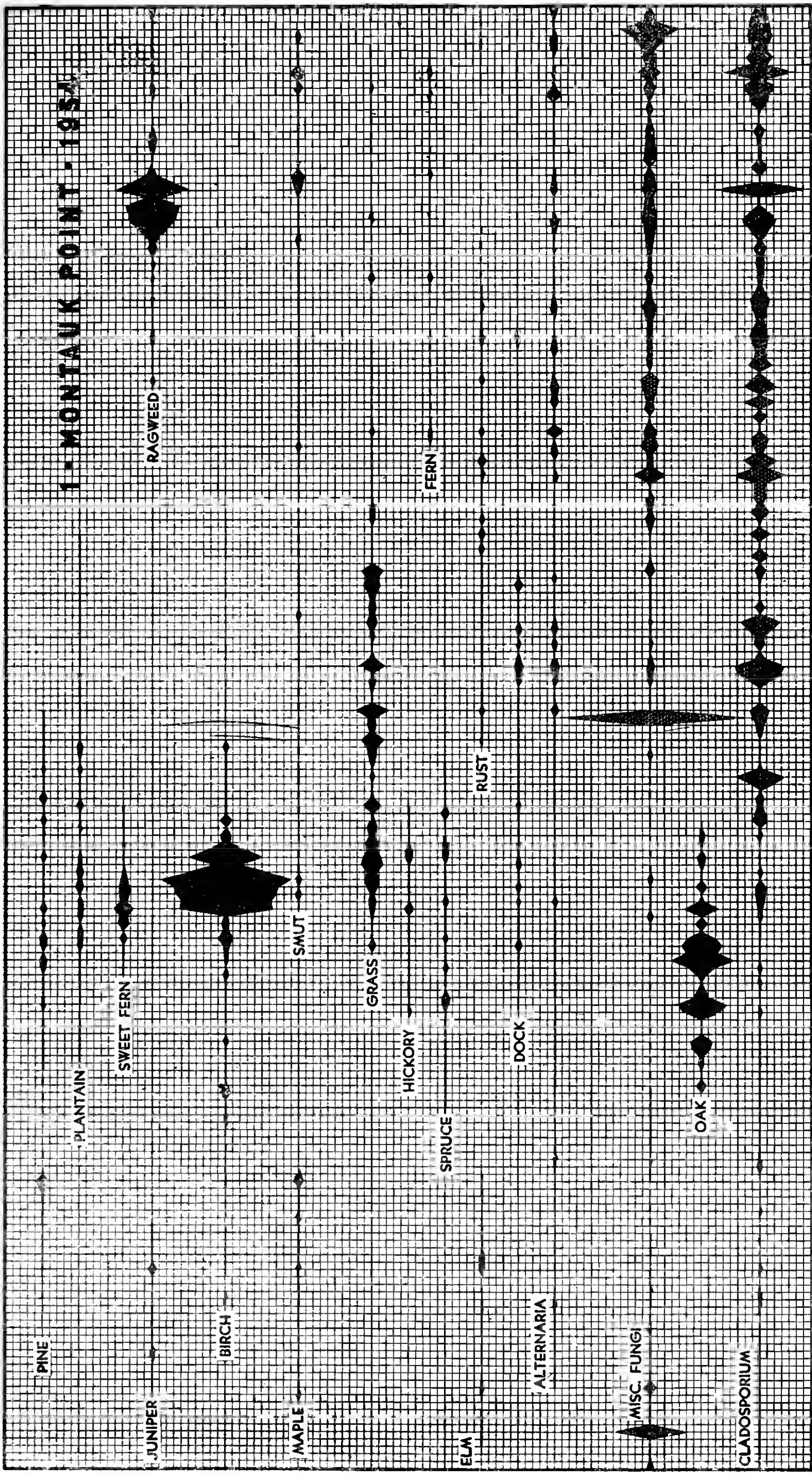
The following graphs present some of the data from the samples taken during 1953 and 1954 at 36 stations in 35 localities. Pollen grains and fern spores are shown in solid black; fungus spores are indicated by a pattern. Each tiny square (vertically) represents five (5) granules per square centimeter of slide surface exposed for a 24-hour period. A solid line indicates that the average daily count was one or zero. A broken line indicates more than one week of consecutive counts of zero. A dotted line indicates more than one week of missing slides. Extremely high points may be due to clumped particles. Multiple peaks may be due to different flowering dates of species in the genus or to fluctuations in the weather. The circle on the map has a 25-mile radius.

Only those pollen grains and fungus spores for which the total count for the 200-day period was 15 or more are shown, unless there was an individual day's count of 5 or higher.

It should be emphasized that the graphs indicate for any entity the average number of particles caught on a square centimeter of greased surface and do not directly indicate the average number per unit volume of air. Factors for converting greased slide data to a volumetric basis vary greatly with different plants and also vary with different conditions of weather and with different concentrations of particles. Thus, birch and pine may not be compared to the same degree that birch may be compared between stations. The graphs show what kinds of particles were in the air and their relative abundance at different times during the growing seasons of 1953 and 1954. It must be kept in mind that other years would furnish somewhat different data as is evident from comparisons of the graphs for these two years. It should be realized that these data may be used only to describe the situation for following years in much the same way that weather data for a couple of years may be used to indicate weather in the future.

For illustration of the variation that may occur between stations separated by only one mile, compare the Albany graphs (Nos. 25 and 25A) for 1953 and 1954. For similarity of records from stations 15 feet apart, compare 25 and 25check for 1955. For a very rough idea as to what may be expected during the winter months, see the graph on the last page.


1953
1 · MONTAUK POINT
PINE
PLANTAIN
SYCAMORE
SWEET FERN
BIRCH
POPLAR
GRASS
RAGWEED
HICKORY
SPRUCE
RUST
ELM
FERN
DOCK
ALTERNARIA
MISC. FUNGI
OAK
CLADOSPORIUM
WILLOW
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
10 20 30 10 20 30 9 19 29 9 19 29 8 18 28 7 17 27 7


1 • MONTAUK POINT • 195
PINE
PLANTAIN
SWEET FERN
JUNIPER
RAGWEED
BIRCH
MAPLE
SMUT
GRASS
HICKORY
FERN
SPRUCE
ELM
RUST
DOCK
ALTERNARIA
MISC. FUNGI
OAK
CLADOSPORIUM
24
3
13
23
3
13
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2
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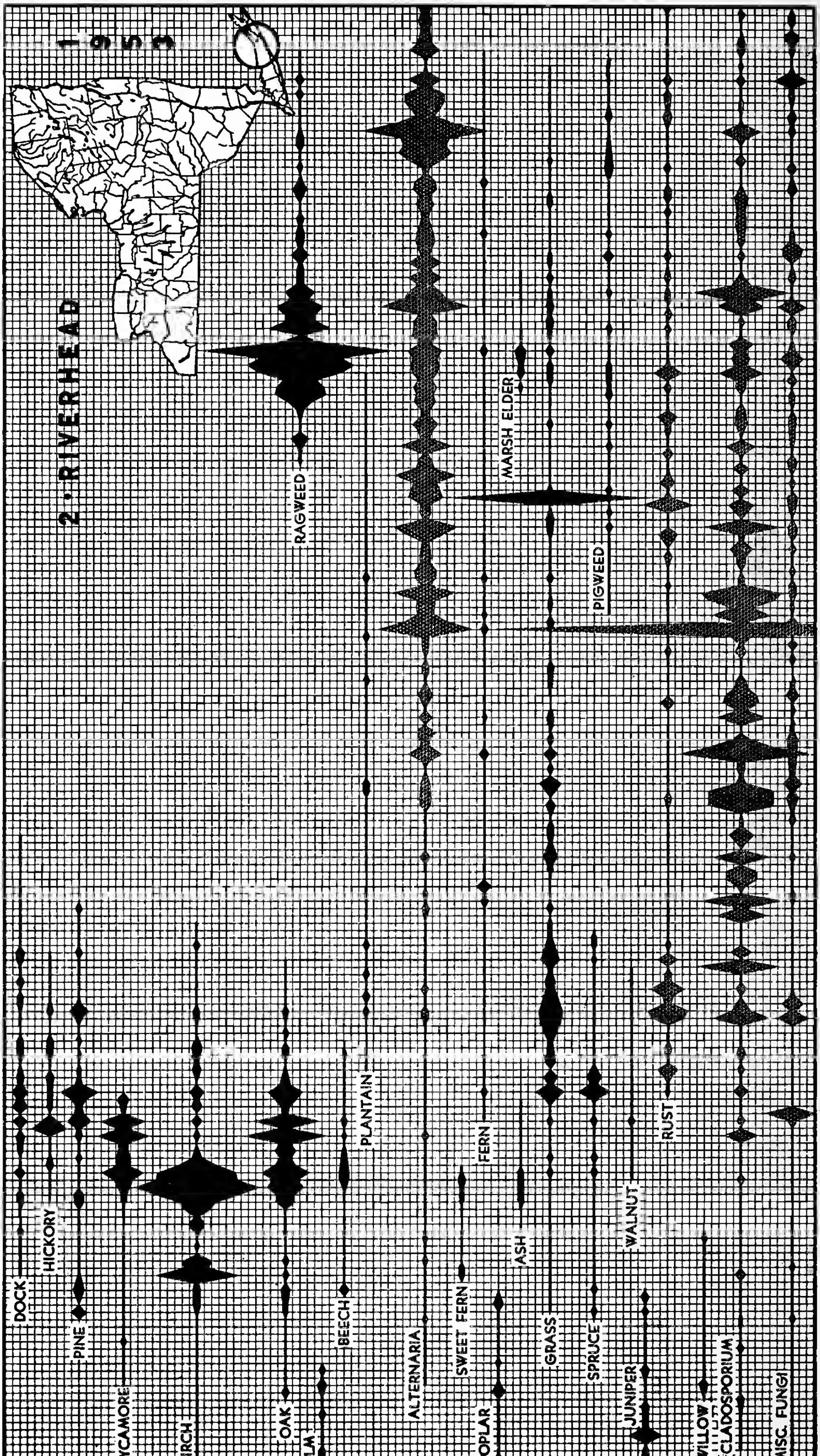
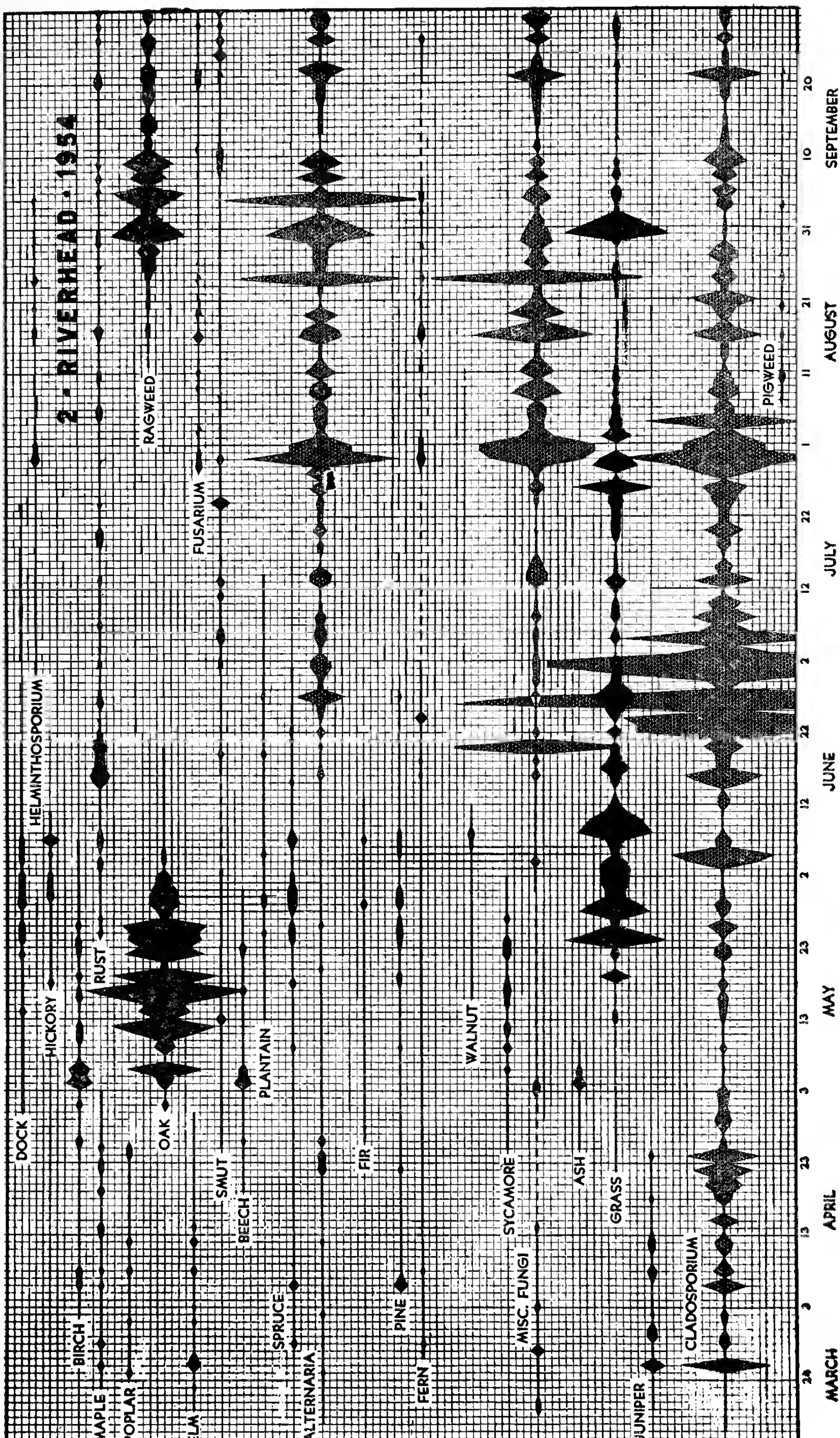
31
10
20
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER


2 · RIVERHEAD
1953
DOCK
HICKORY
PINE
SYCAMORE
BIRCH
OAK
ELM
BEECH
PLANTAIN
RAGWEED
ALTERNARIA
SWEET FERN
FERN
POPLAR
ASH
MARSH ELDER
GRASS
SPRUCE
PIGWEED
JUNIPER
WALNUT
RUST
WILLOW
CLADOSPORIUM
MISC. FUNGI
10 20 30 10 20 30 9 19 29 9 19 29 8 18 28 7 17 27 7
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER


2 · RIVERHEAD · 1954
DOCK
HELMINTHOSPORIUM
HICKORY
BIRCH
RUST
MAPLE
POPLAR
OAK
RAGWEED
ELM
SMUT
FUSARIUM
BEECH
PLANTAIN
SPRUCE
ALTERNARIA
FIR
PINE
FERN
WALNUT
SYCAMORE
MISC. FUNGI
ASH
GRASS
JUNIPER
CLADOSPORIUM
PIGWEED
24
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MARCH
APRIL
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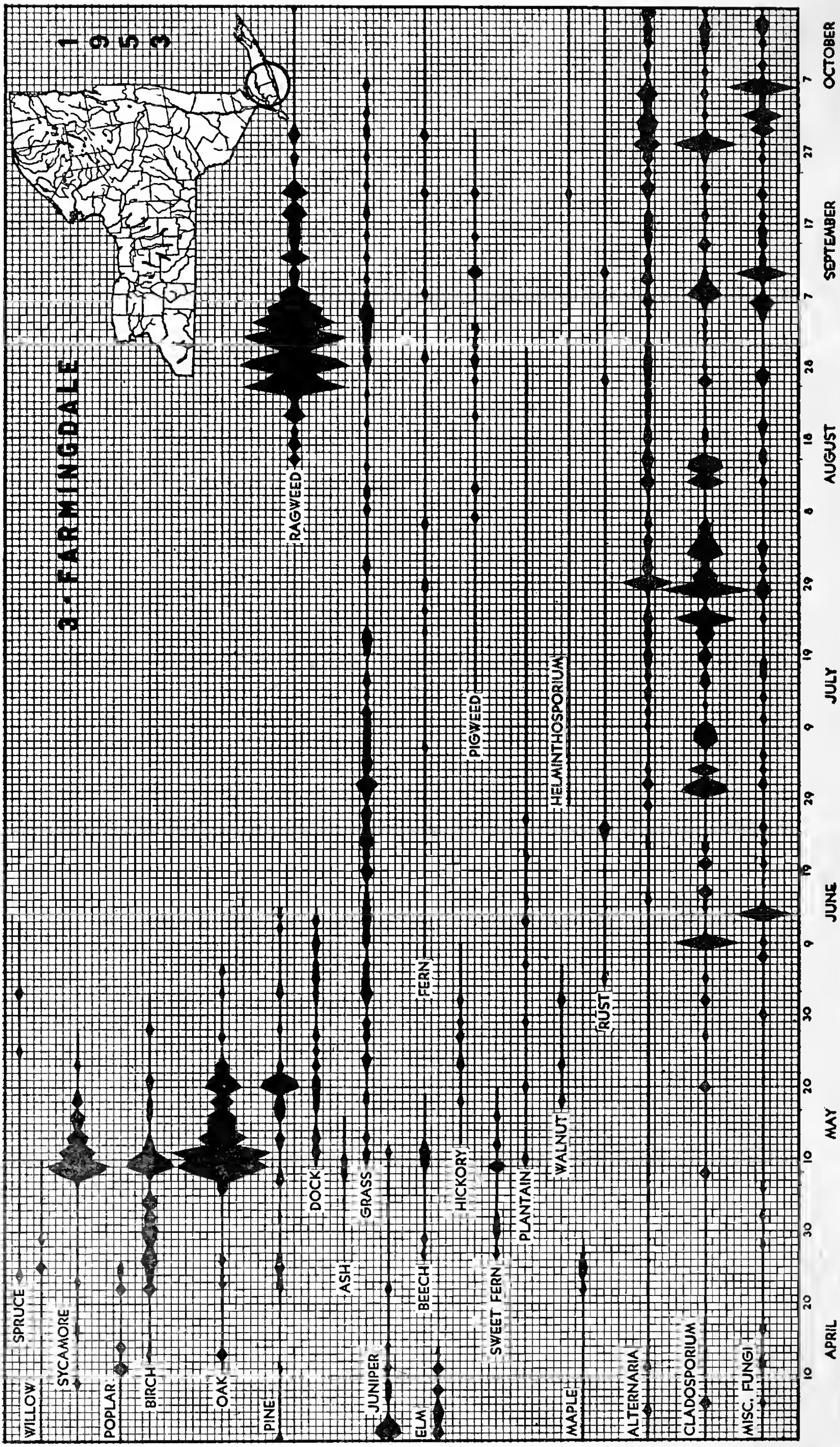
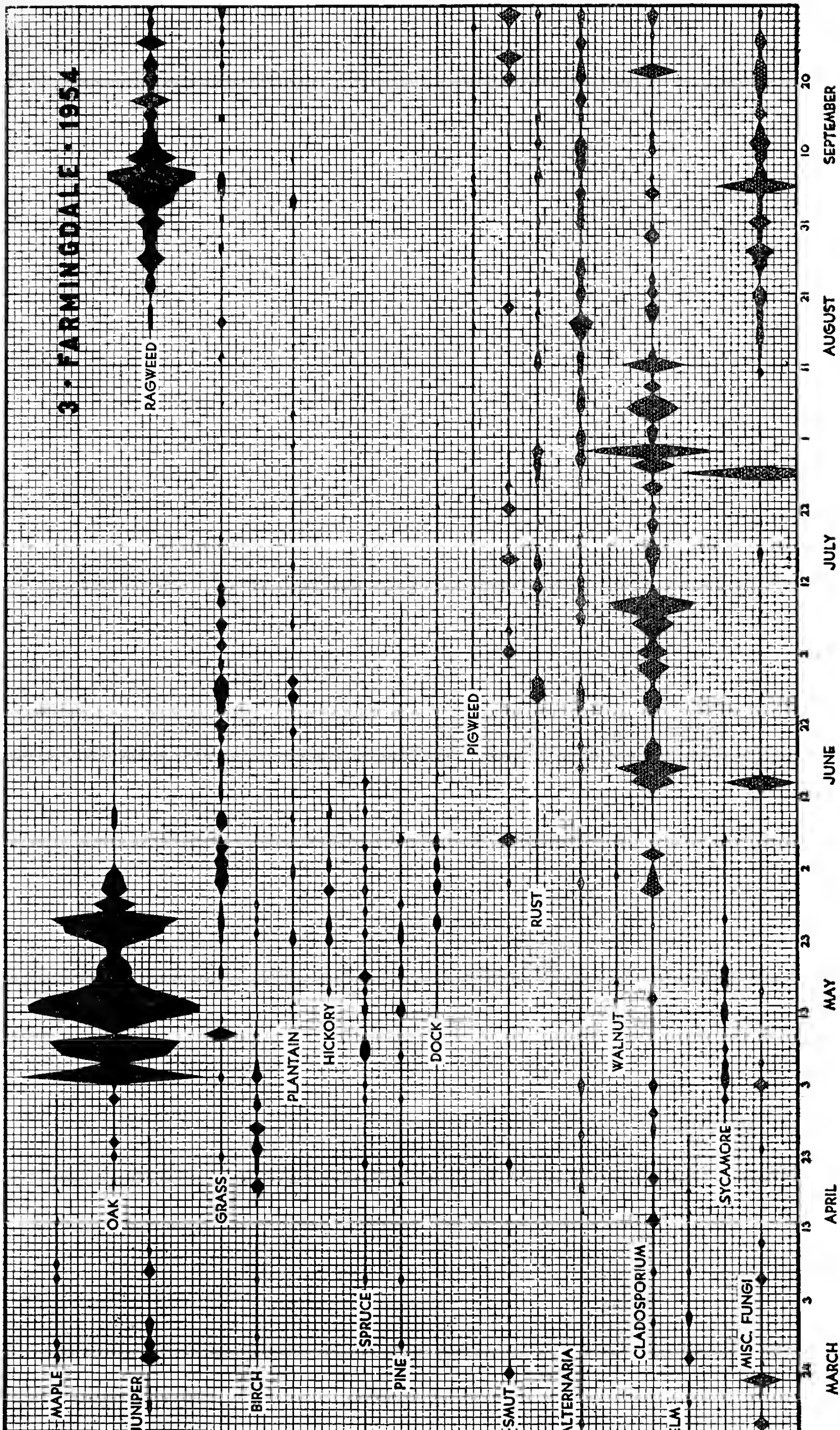
JUNE
JULY
AUGUST
SEPTEMBER



3 · FARMINGDALE
1953
WILLOW
SPRUCE
SYCAMORE
POPLAR
BIRCH
OAK
PINE
DOCK
ASH
GRASS
JUNIPER
ELM
BEECH
FERN
HICKORY
SWEET FERN
PIGWEED
PLANTAIN
WALNUT
HELMINTHOSPORIUM
MAPLE
RUST
RAGWEED
ALTERNARIA
CLADOSPORIUM
MISC. FUNGI
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER



3 • FARMINGDALE • 1954
MAPLE
OAK
JUNIPER
RAGWEED
GRASS
BIRCH
PLANTAIN
HICKORY
SPRUCE
PINE
DOCK
PIGWEED
SMUT
RUST
ALTERNARIA
WALNUT
CLADOSPORIUM
ELM
SYCAMORE
MISC. FUNGI
MARCH
24
3
13
APRIL
23
3
MAY
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JUNE
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22
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JULY
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AUGUST
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21
31
10
SEPTEMBER
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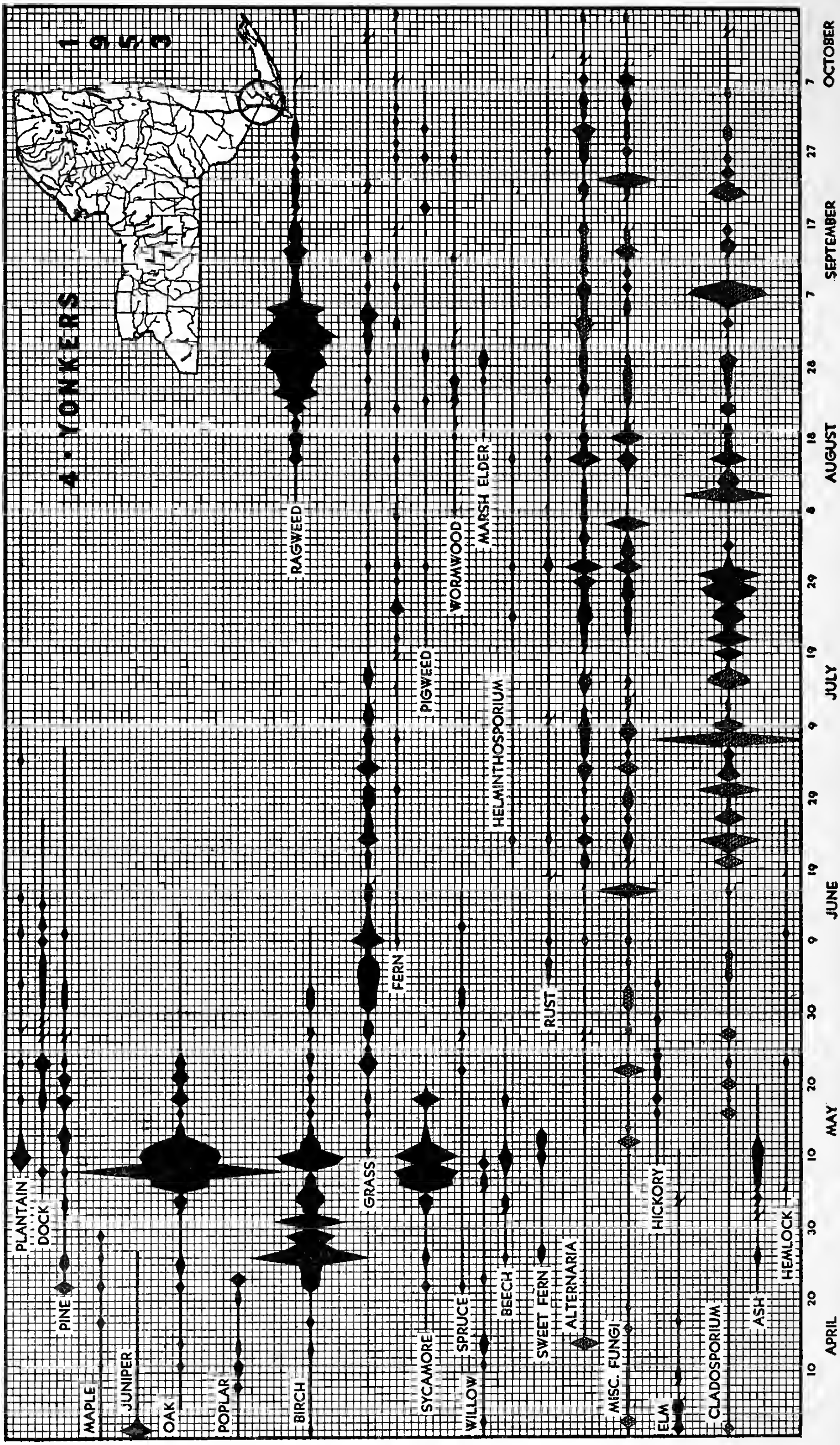
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FERN
PIGWEED
HELMINTHOSPORIUM
WORMWOOD
MARSH ELDER
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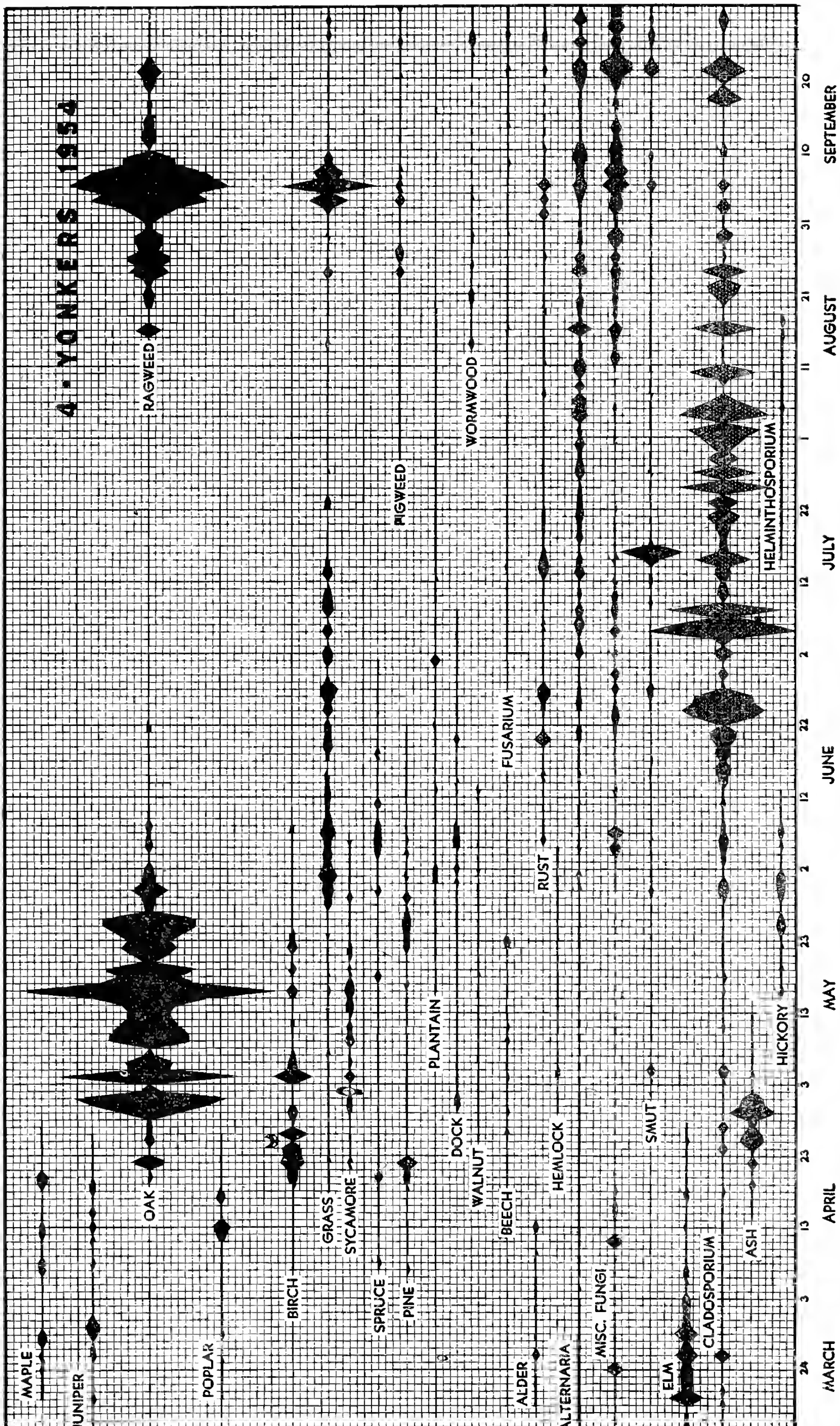
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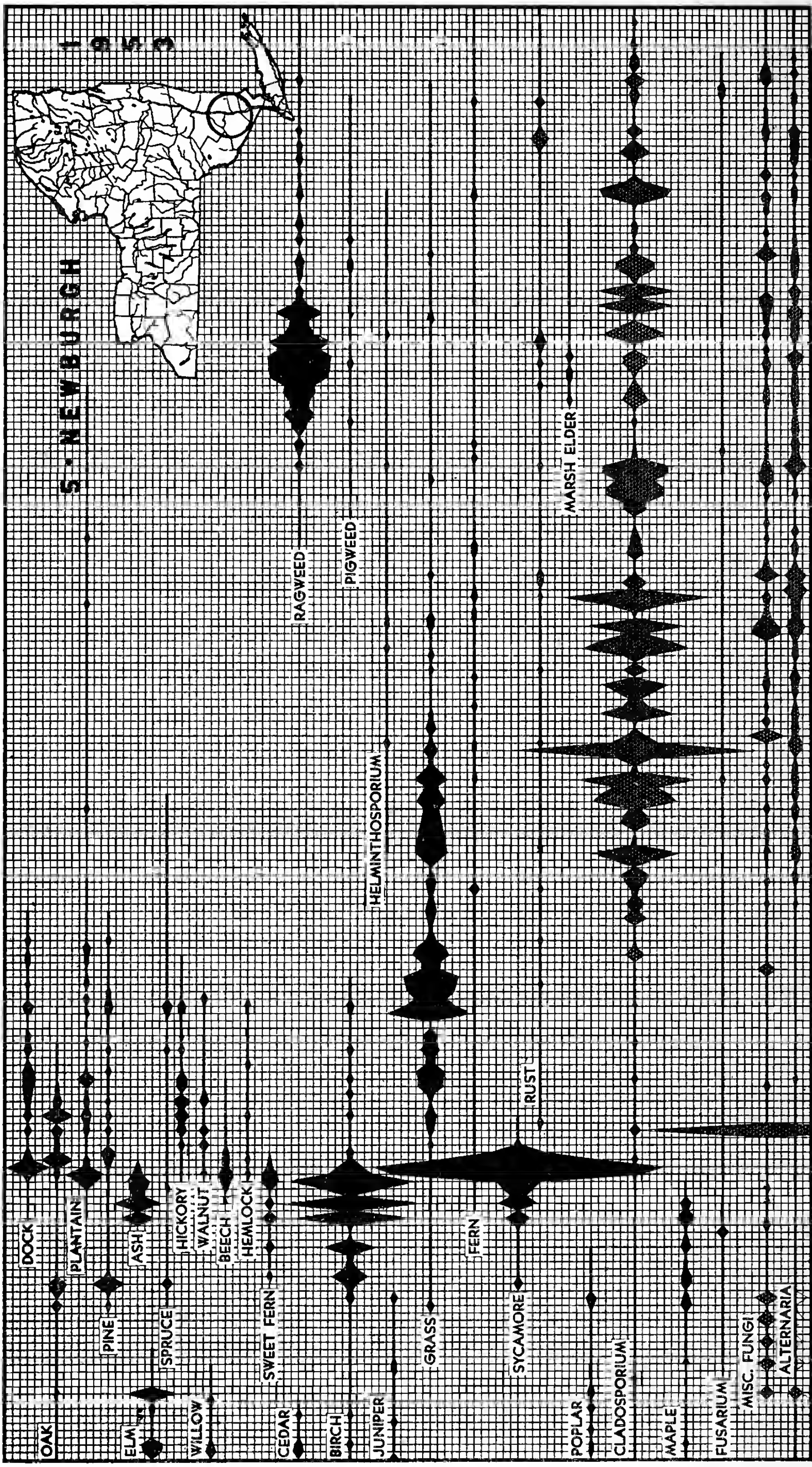
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HICKORY
WALNUT
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PIGWEED
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MARSH ELDER
CLADOSPORIUM
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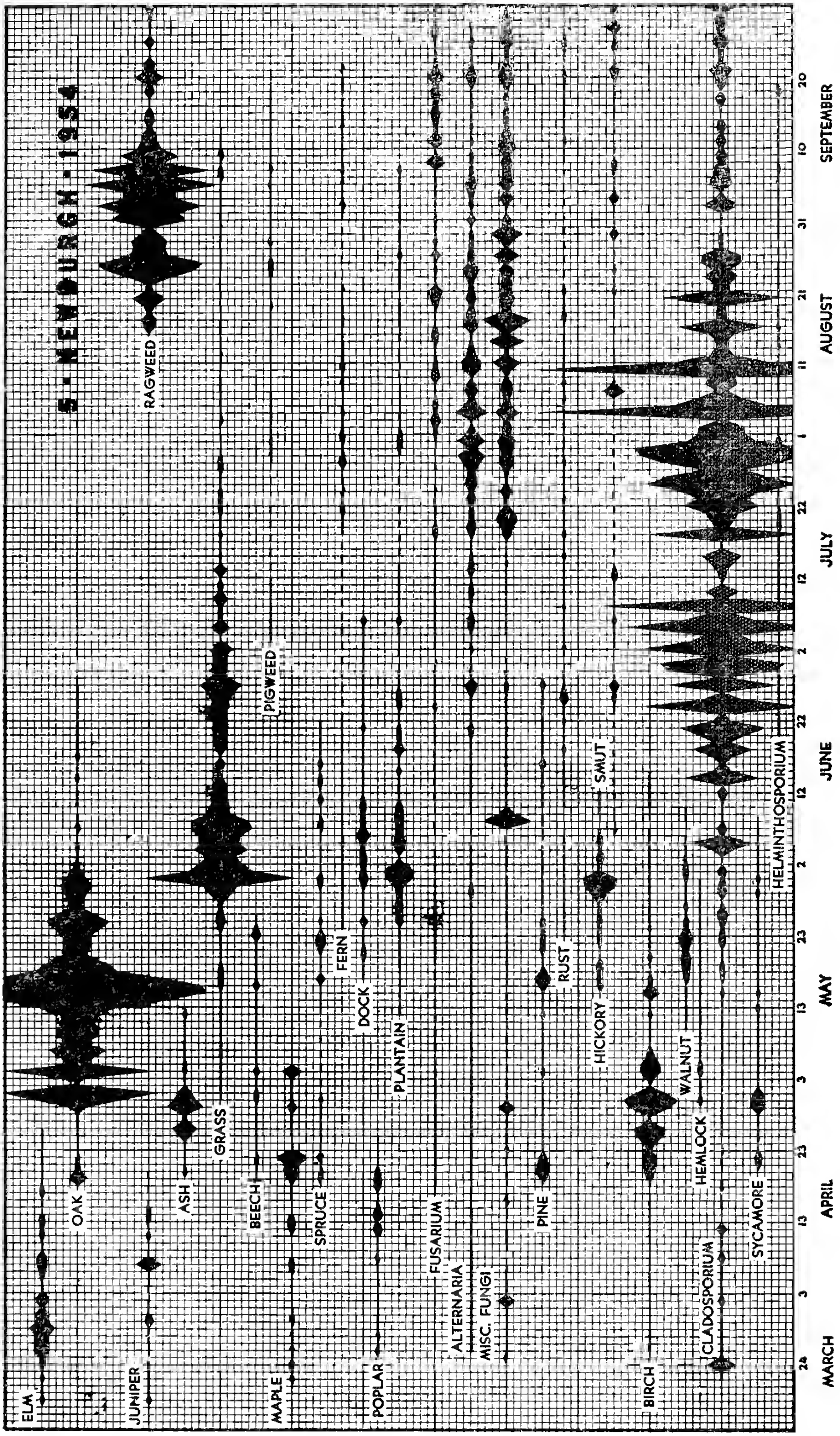
5 · NEWBURGH · 1954
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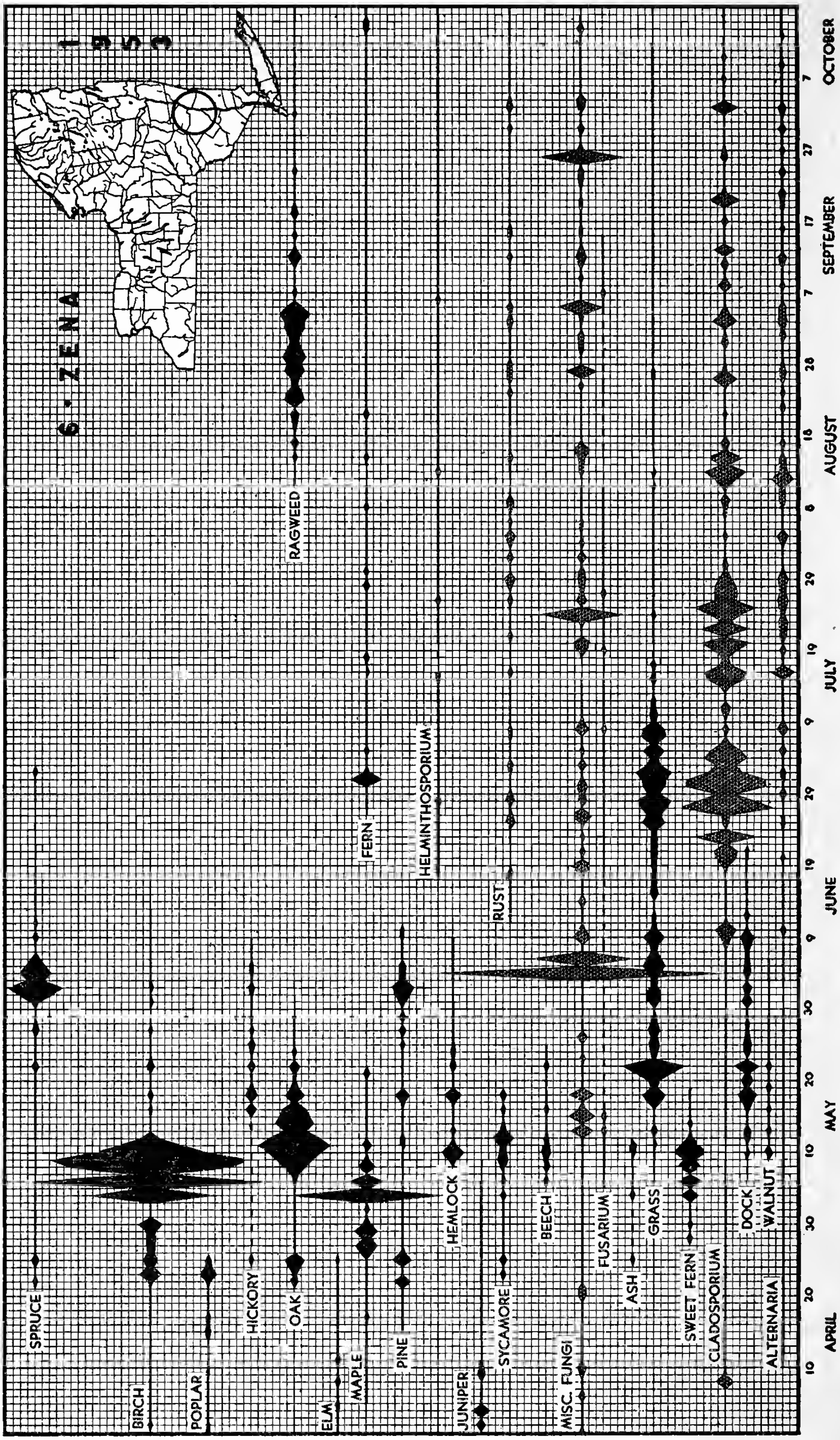

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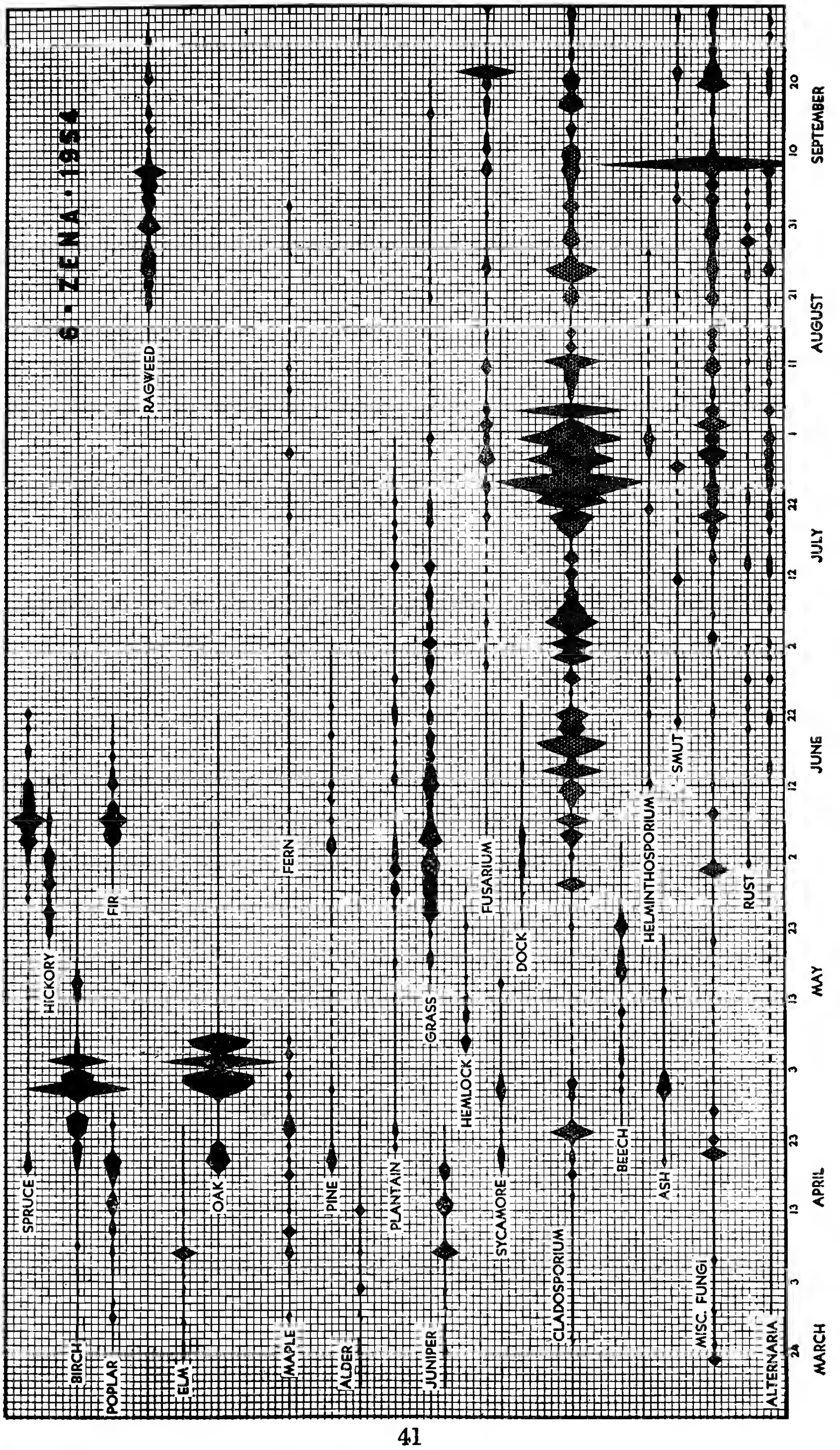
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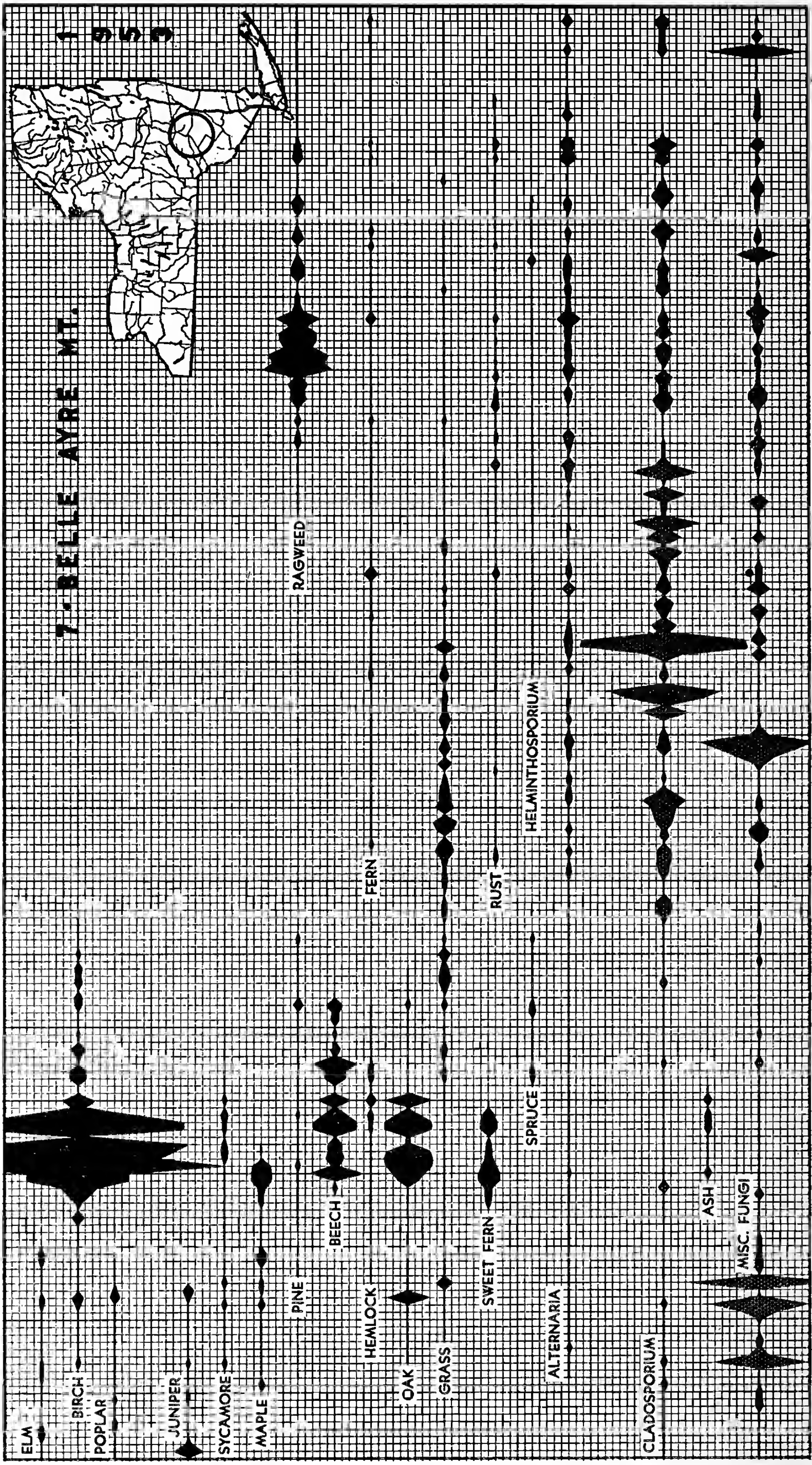
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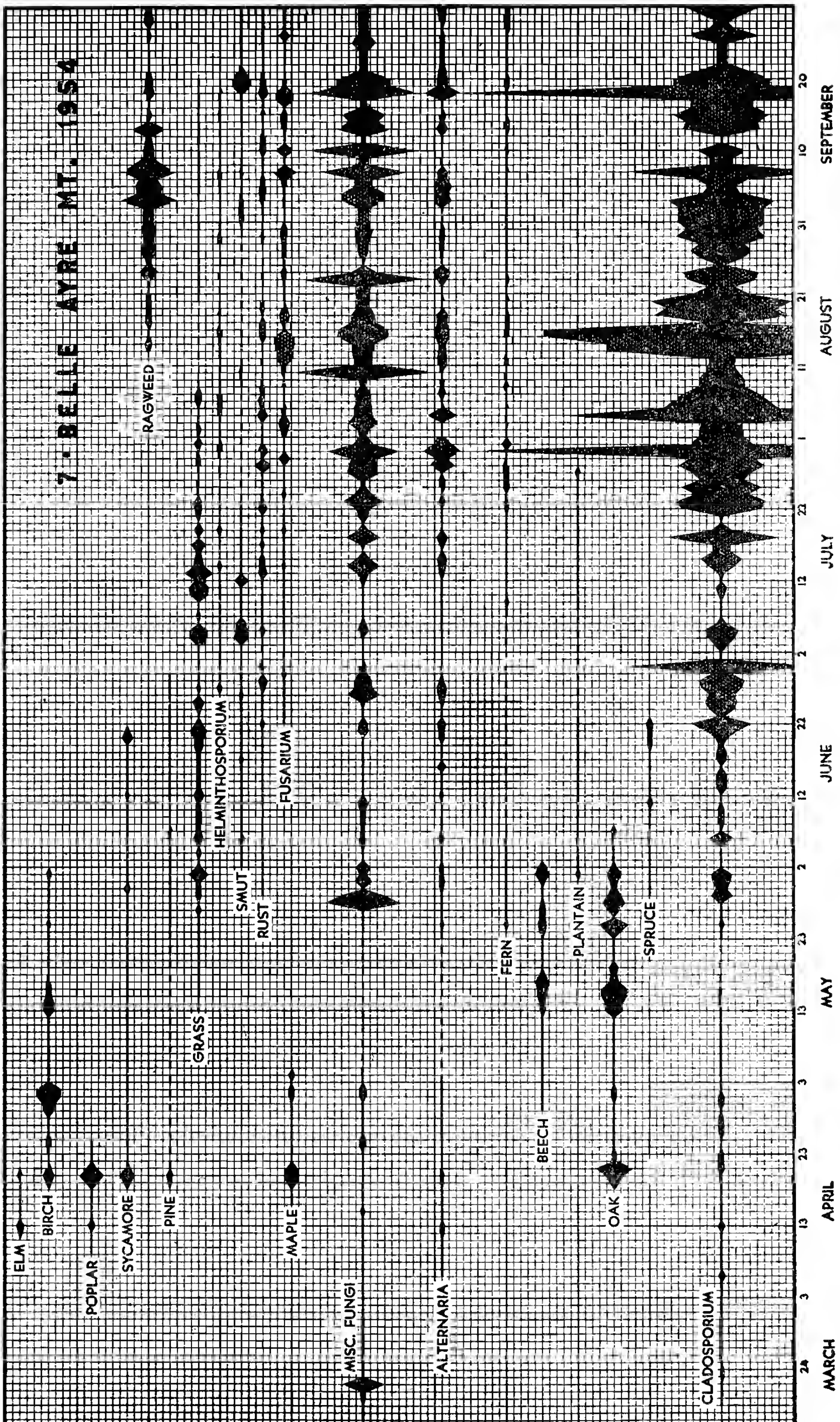
7. BELLE AYRE MT. 1954
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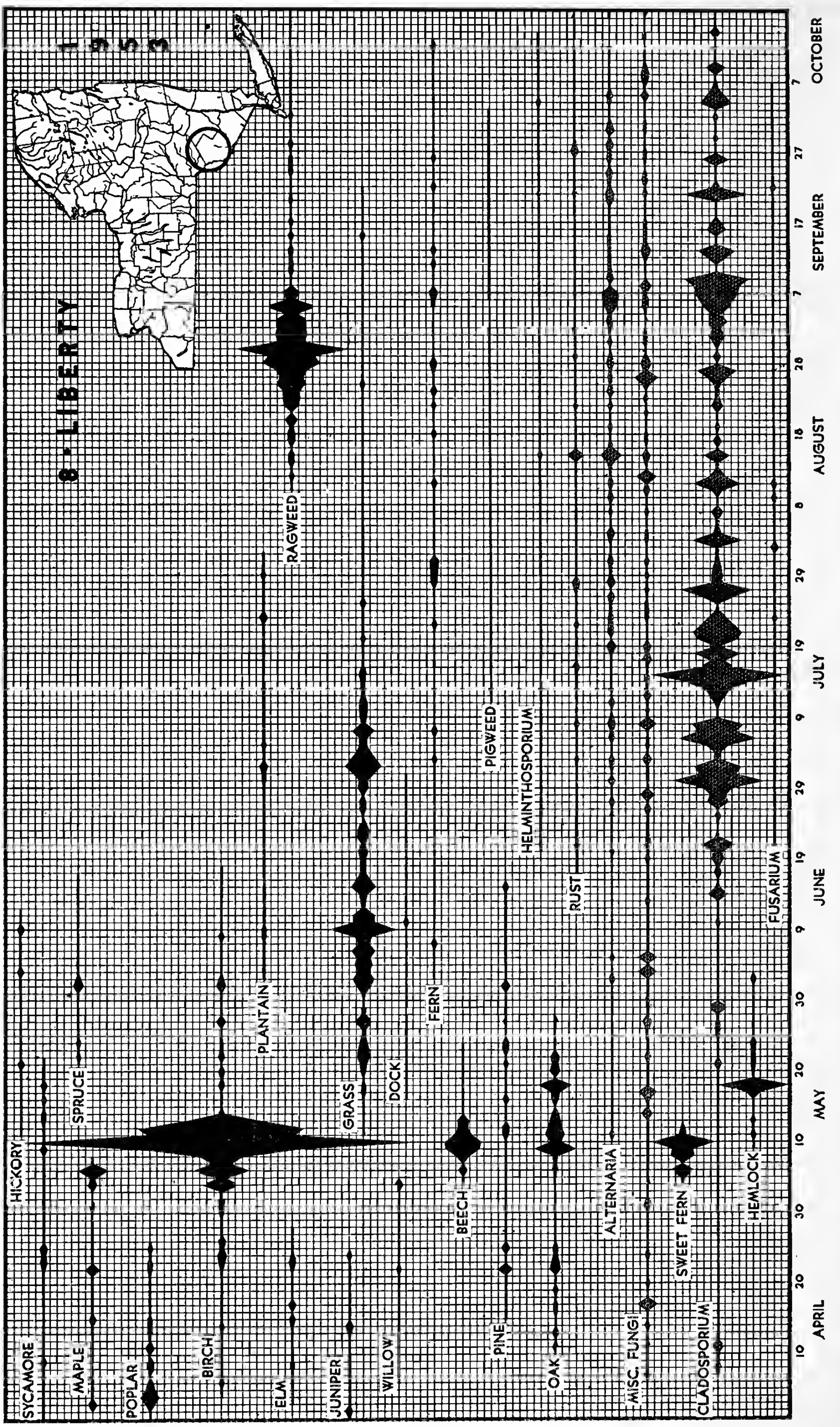
8 · LIBERTY
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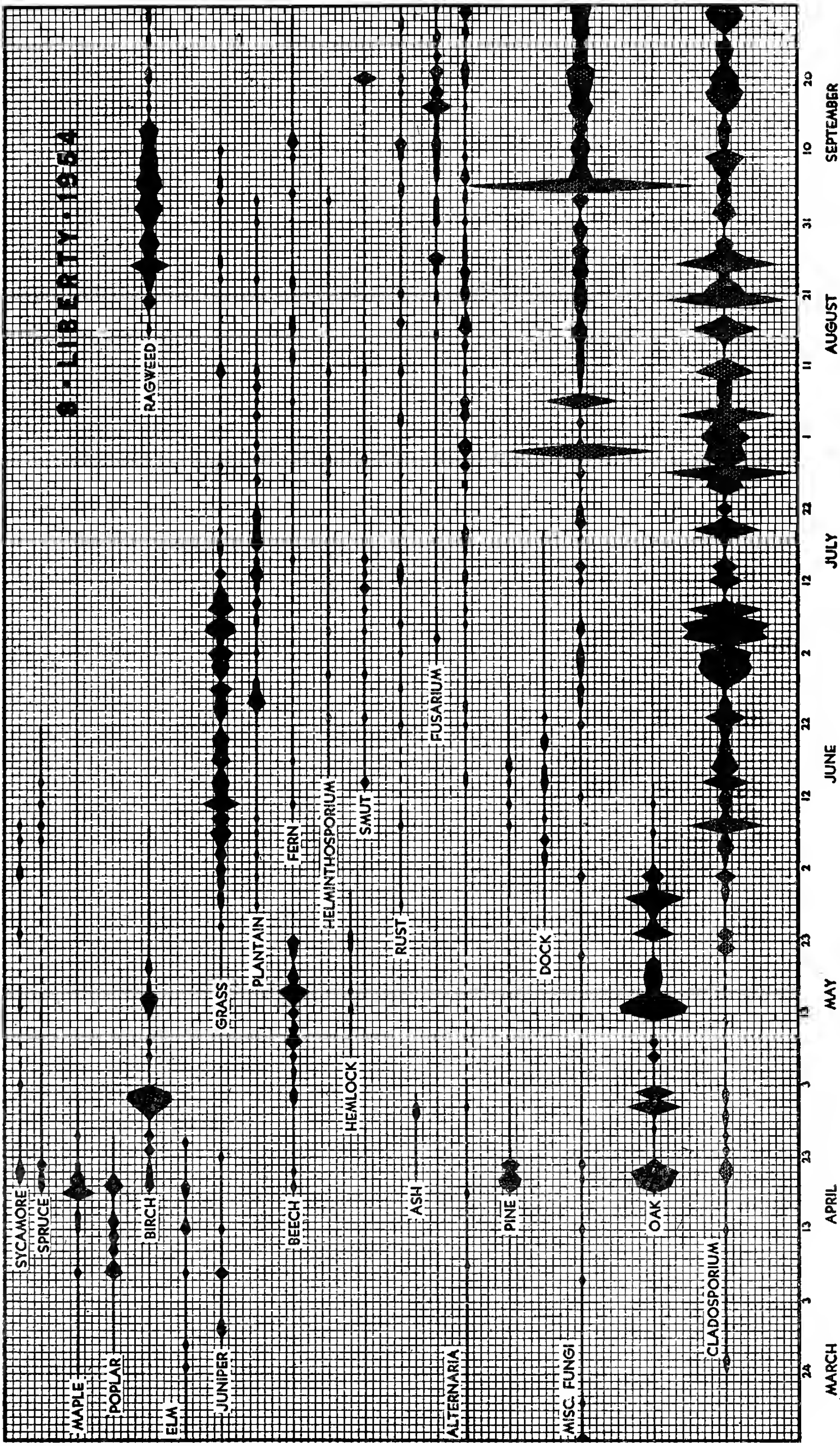
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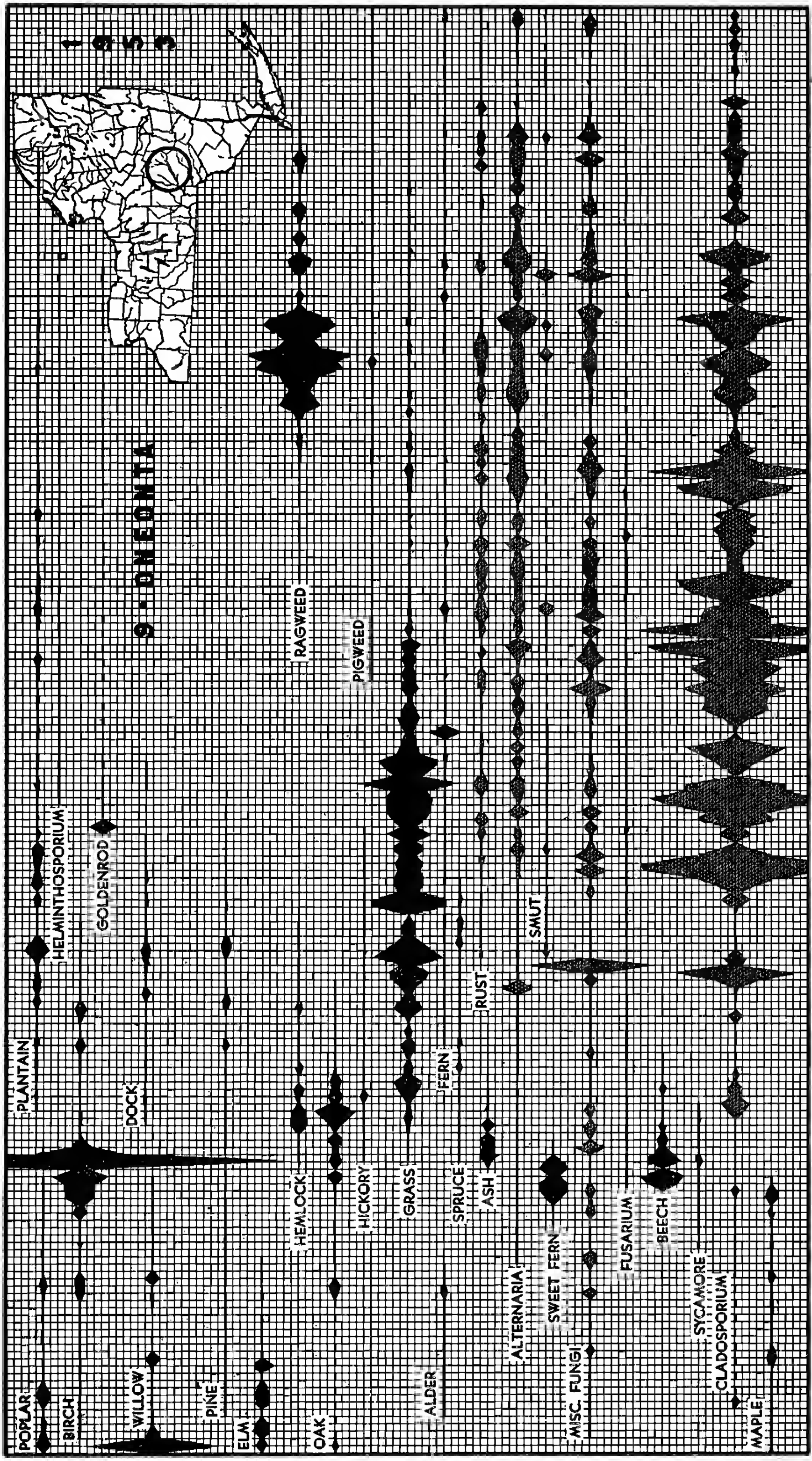
9 · ONEONTA
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PLANTAIN
HELMINTHOSPORIUM
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HEMLOCK
HICKORY
GRASS
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FUSARIUM
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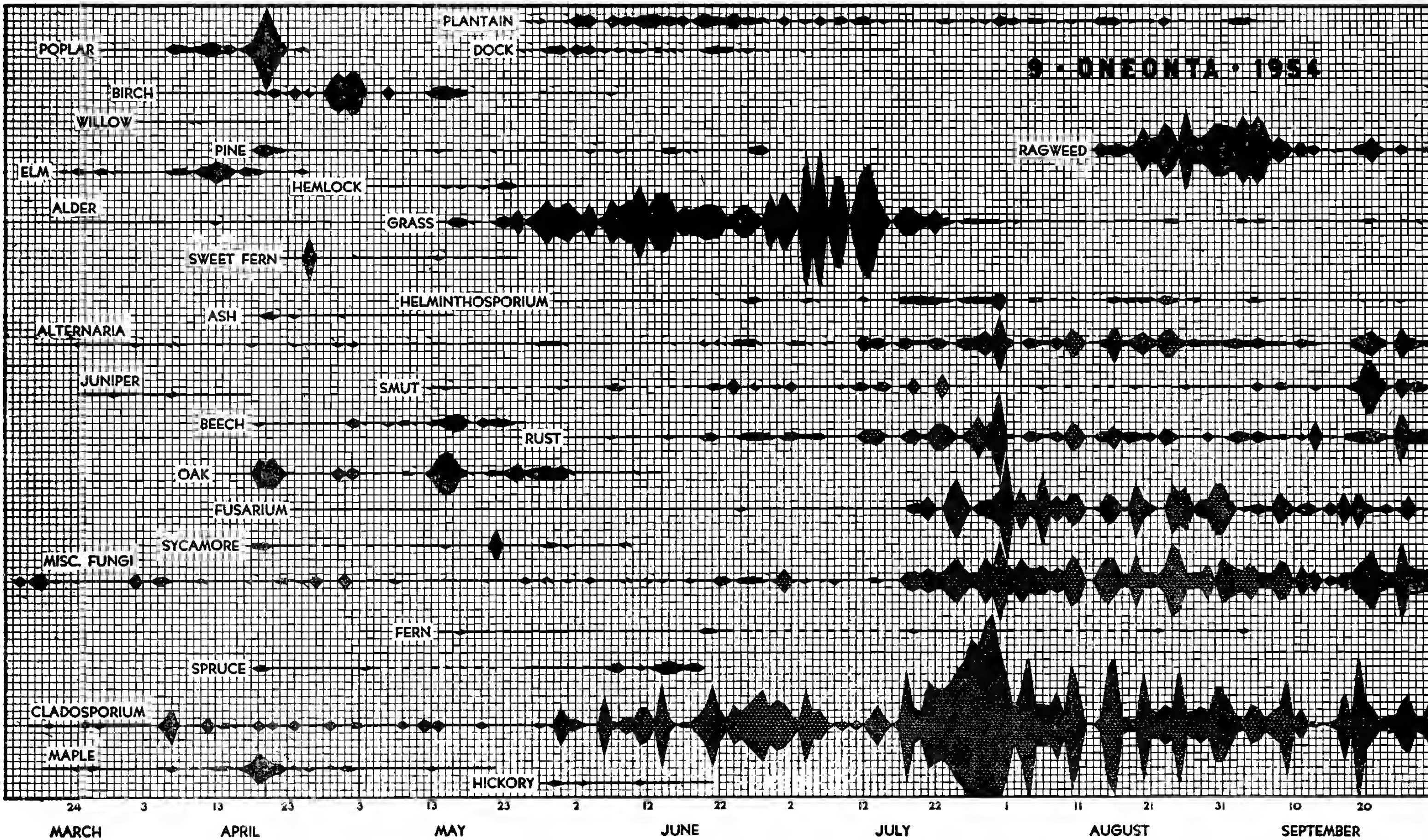
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10 - BINGHAMTON
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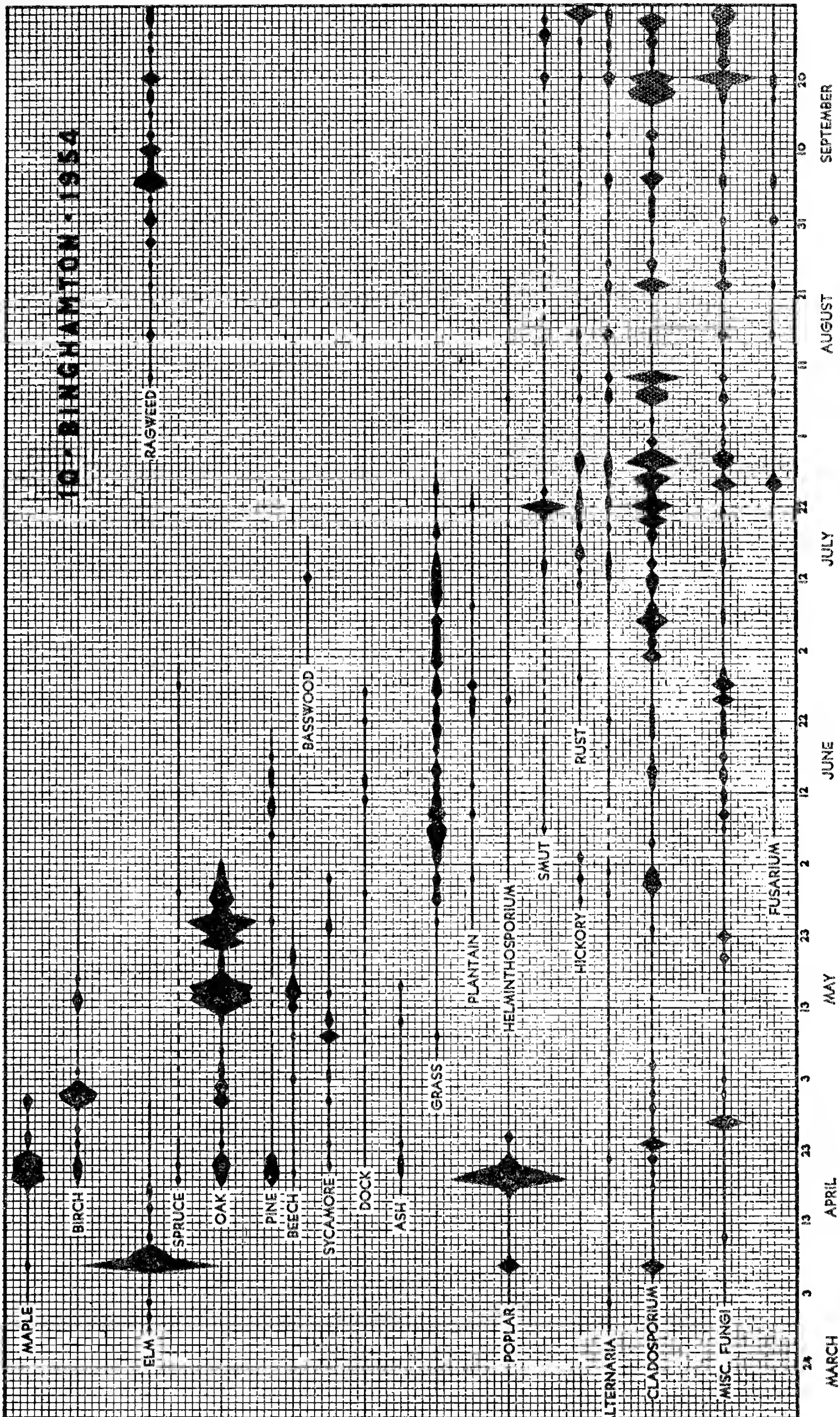
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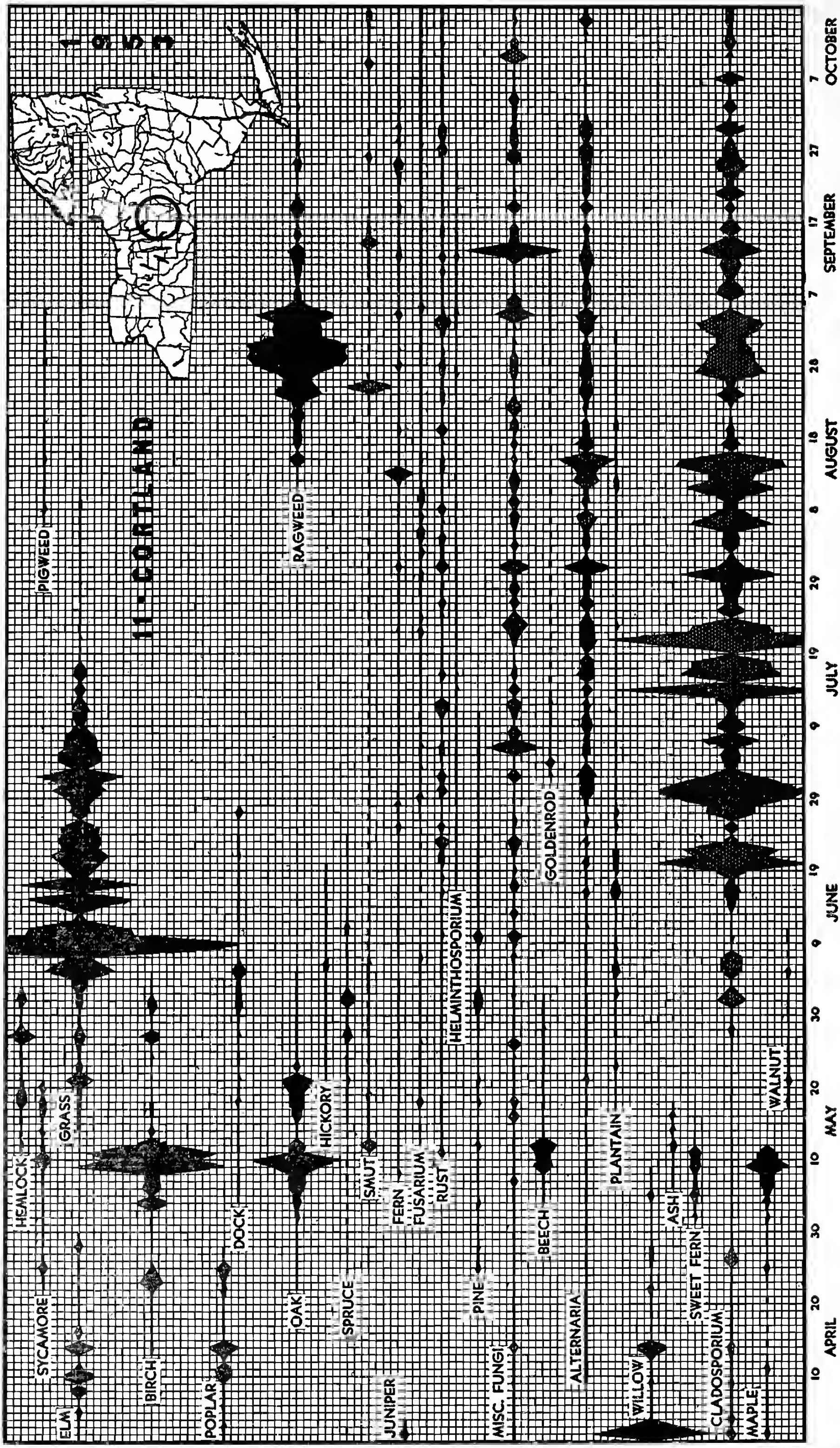
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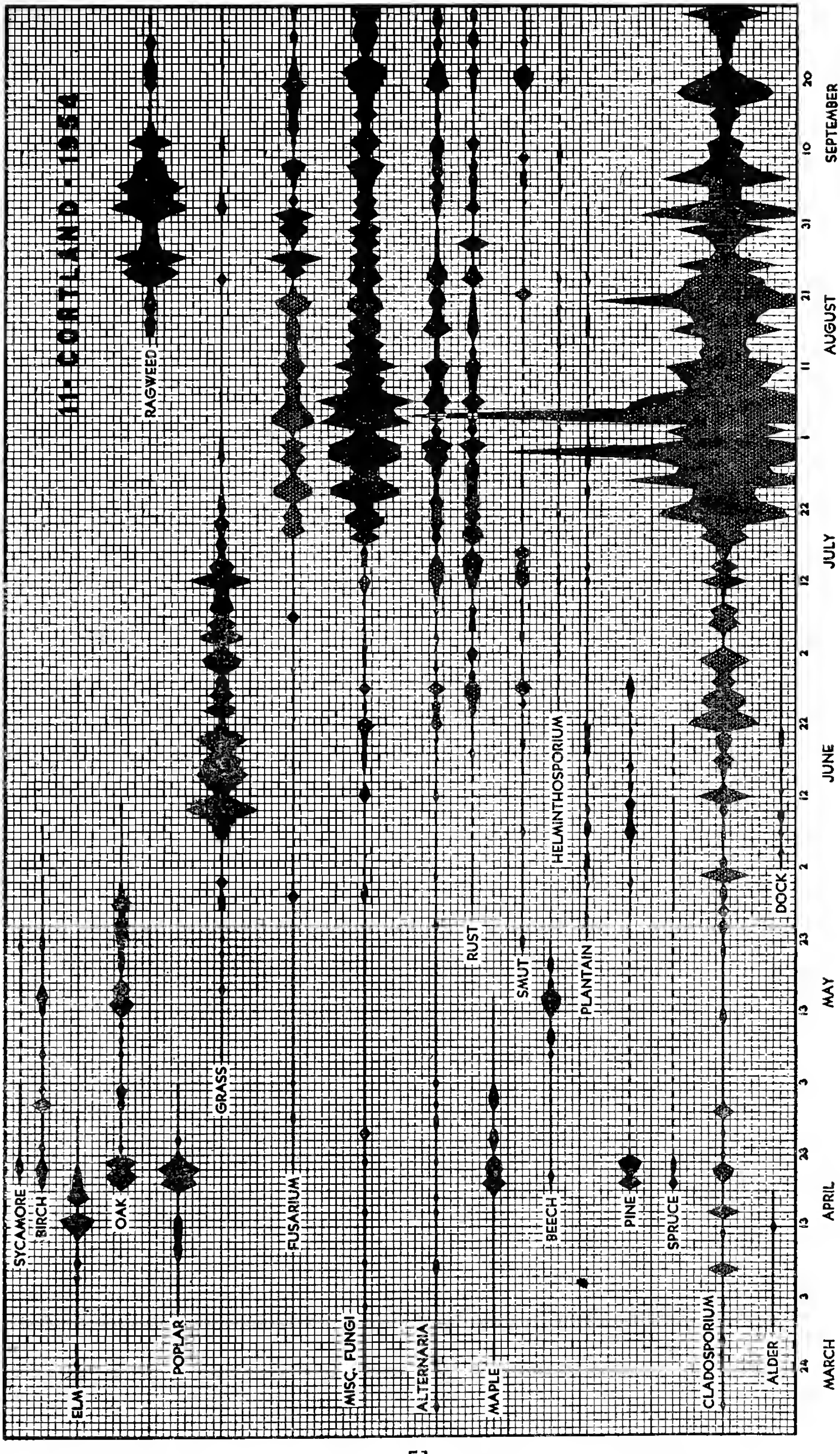
11 · CORTLAND · 1954
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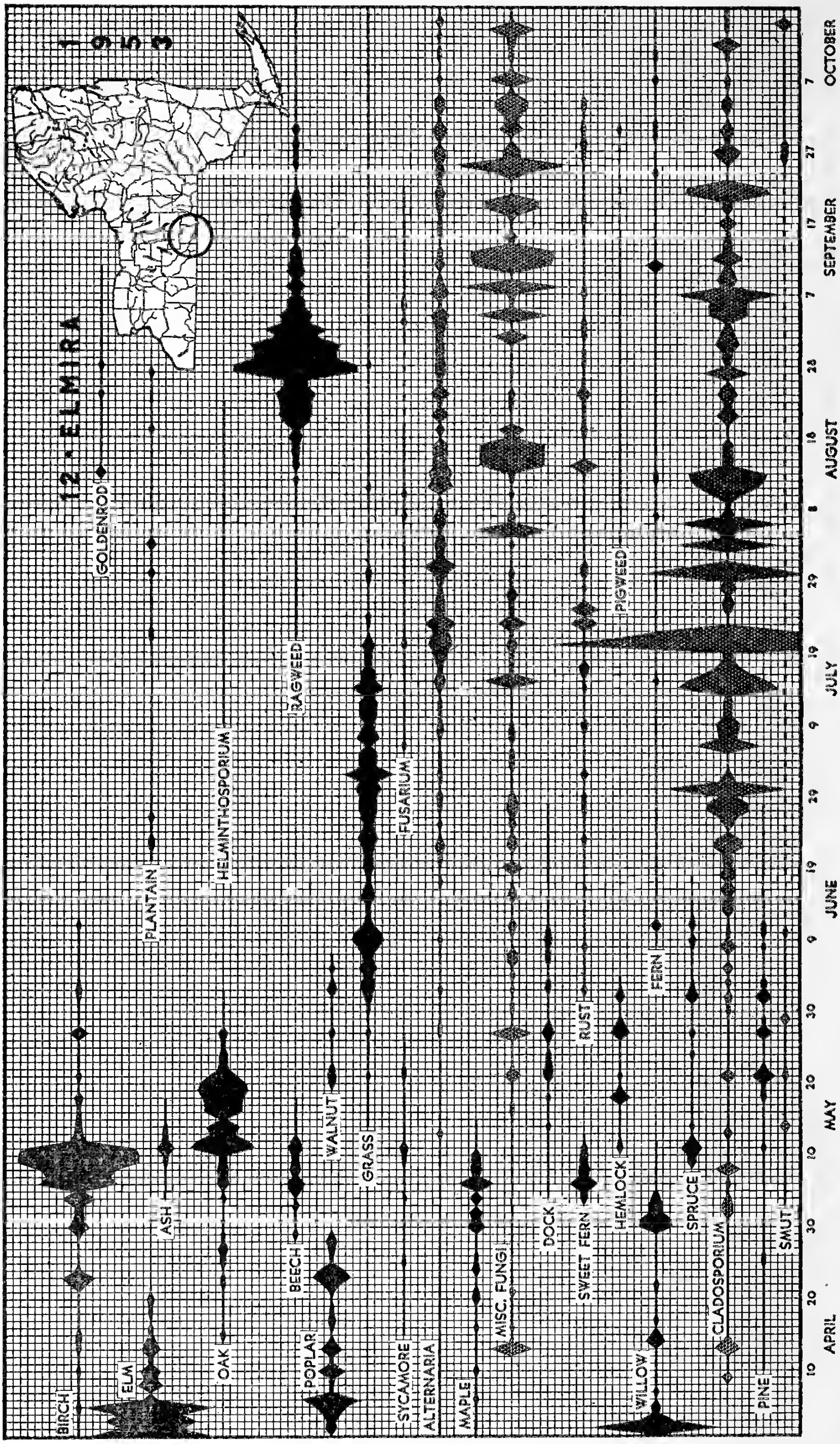
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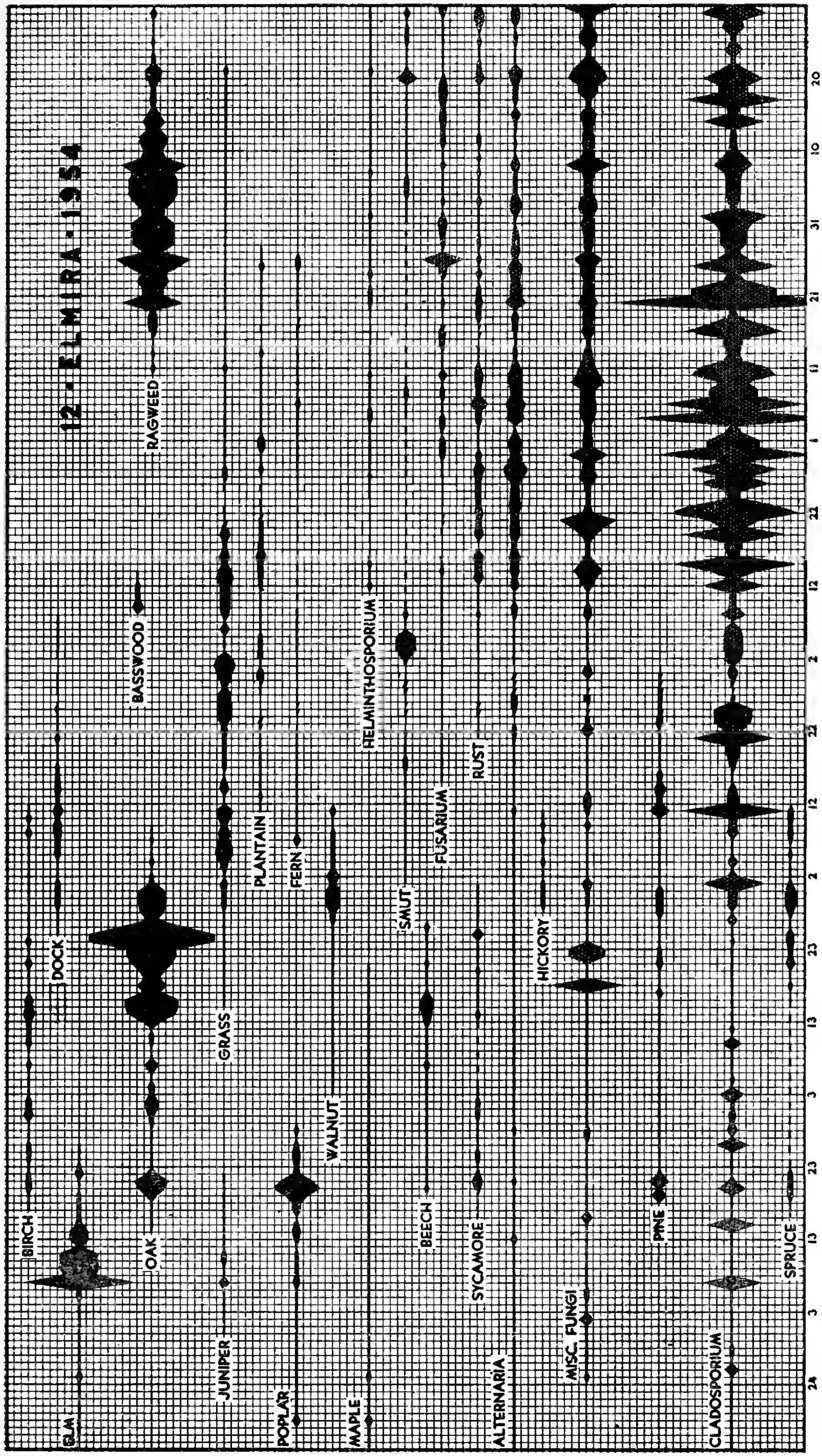

12 · ELMIRA · 1954
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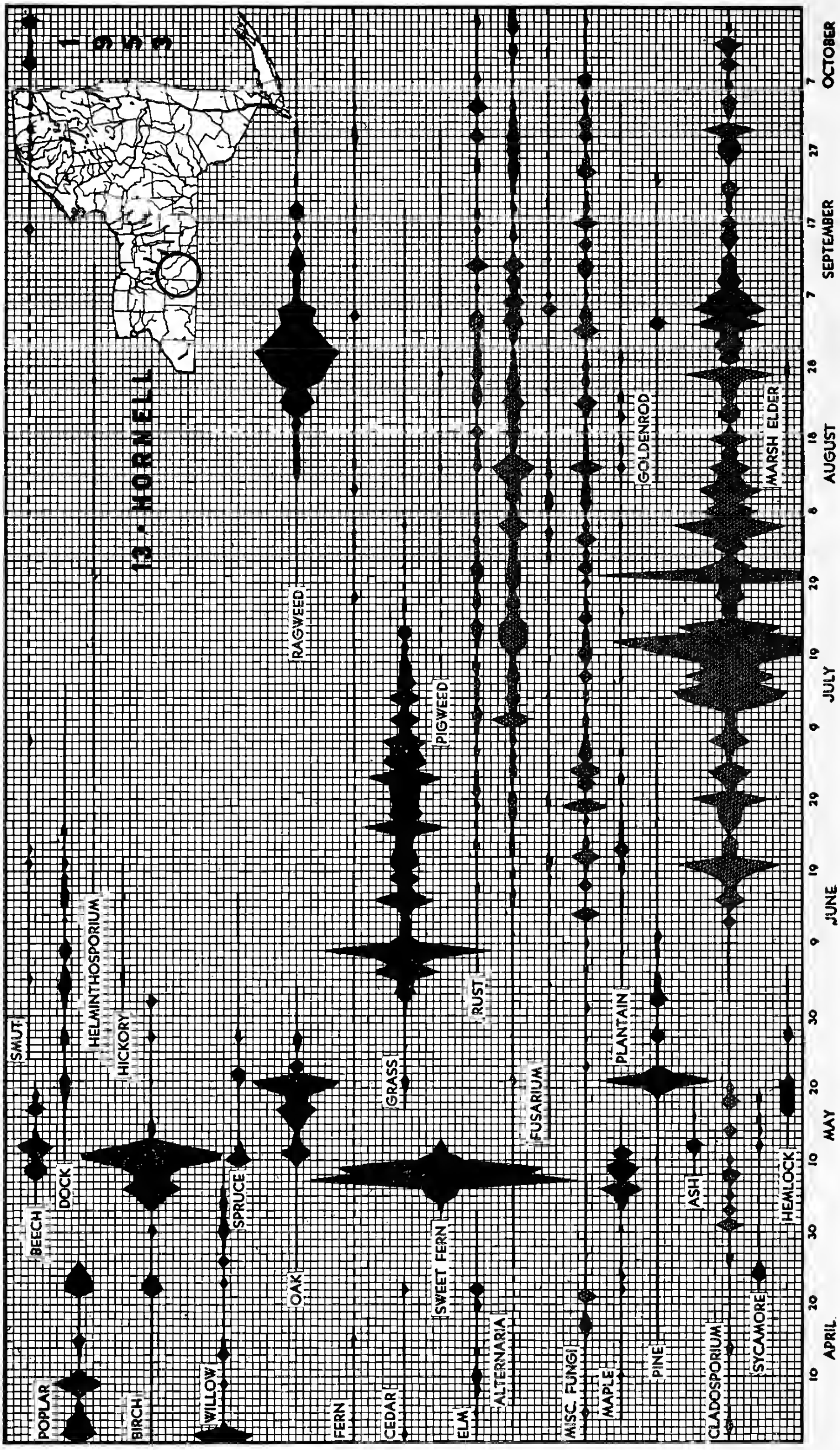
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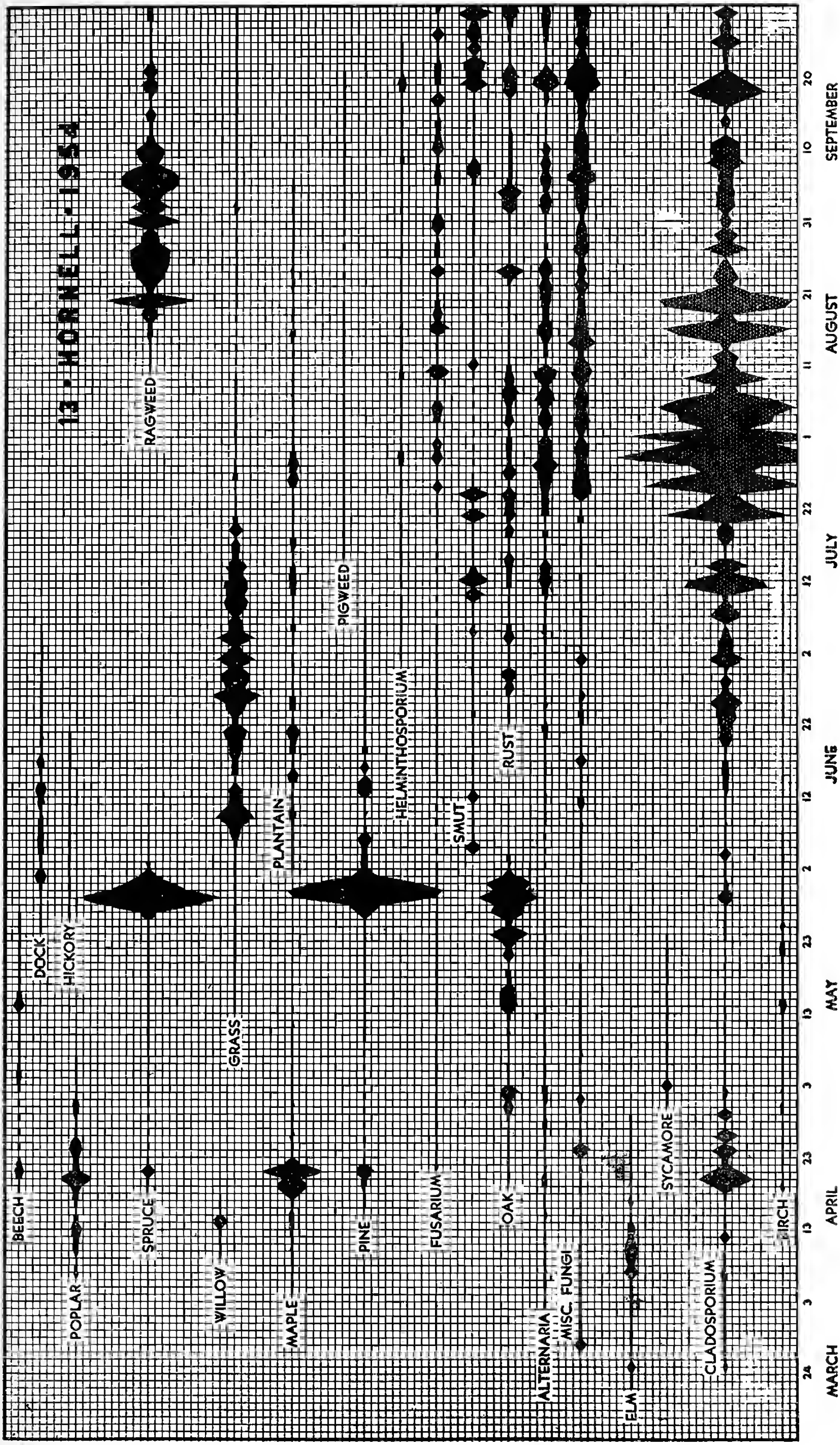
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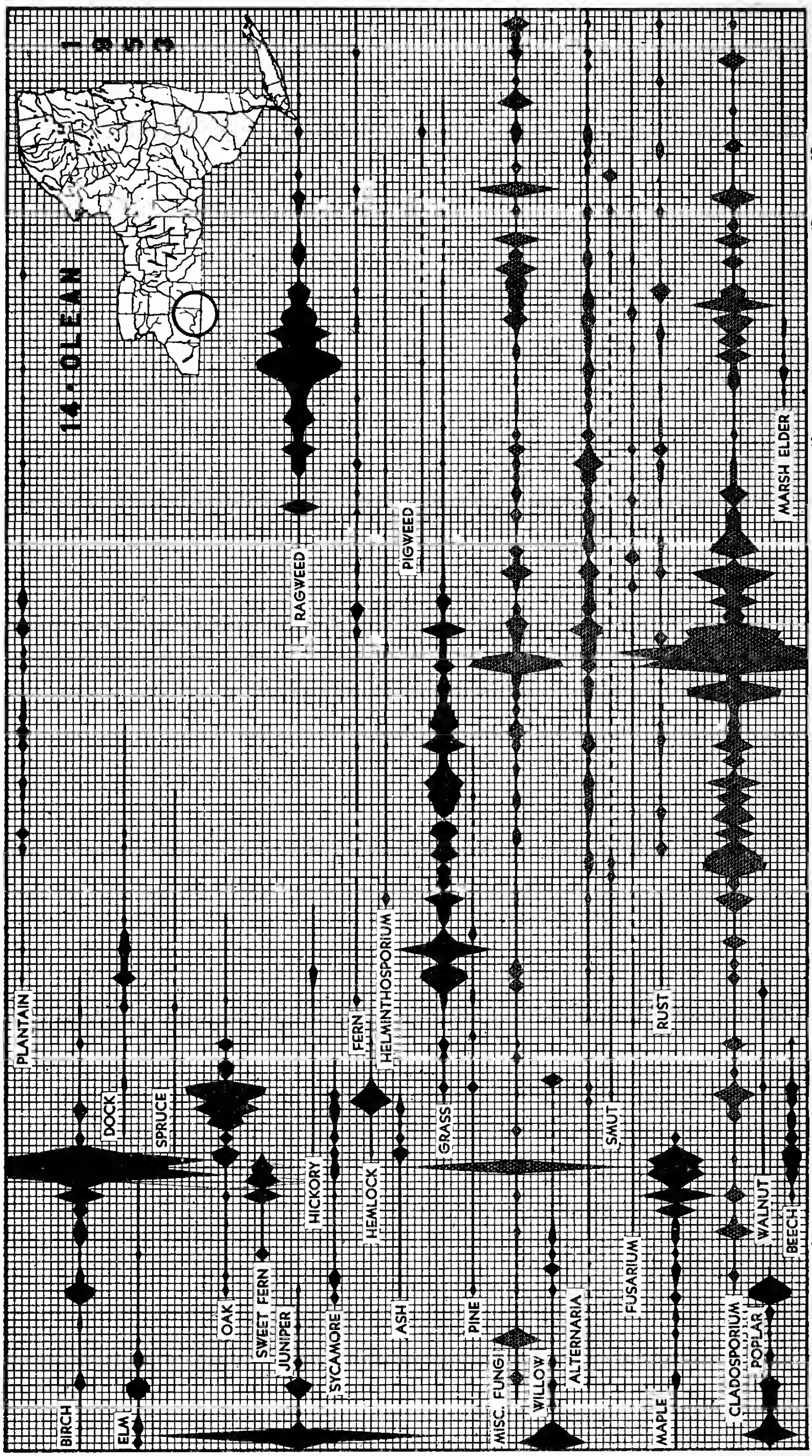
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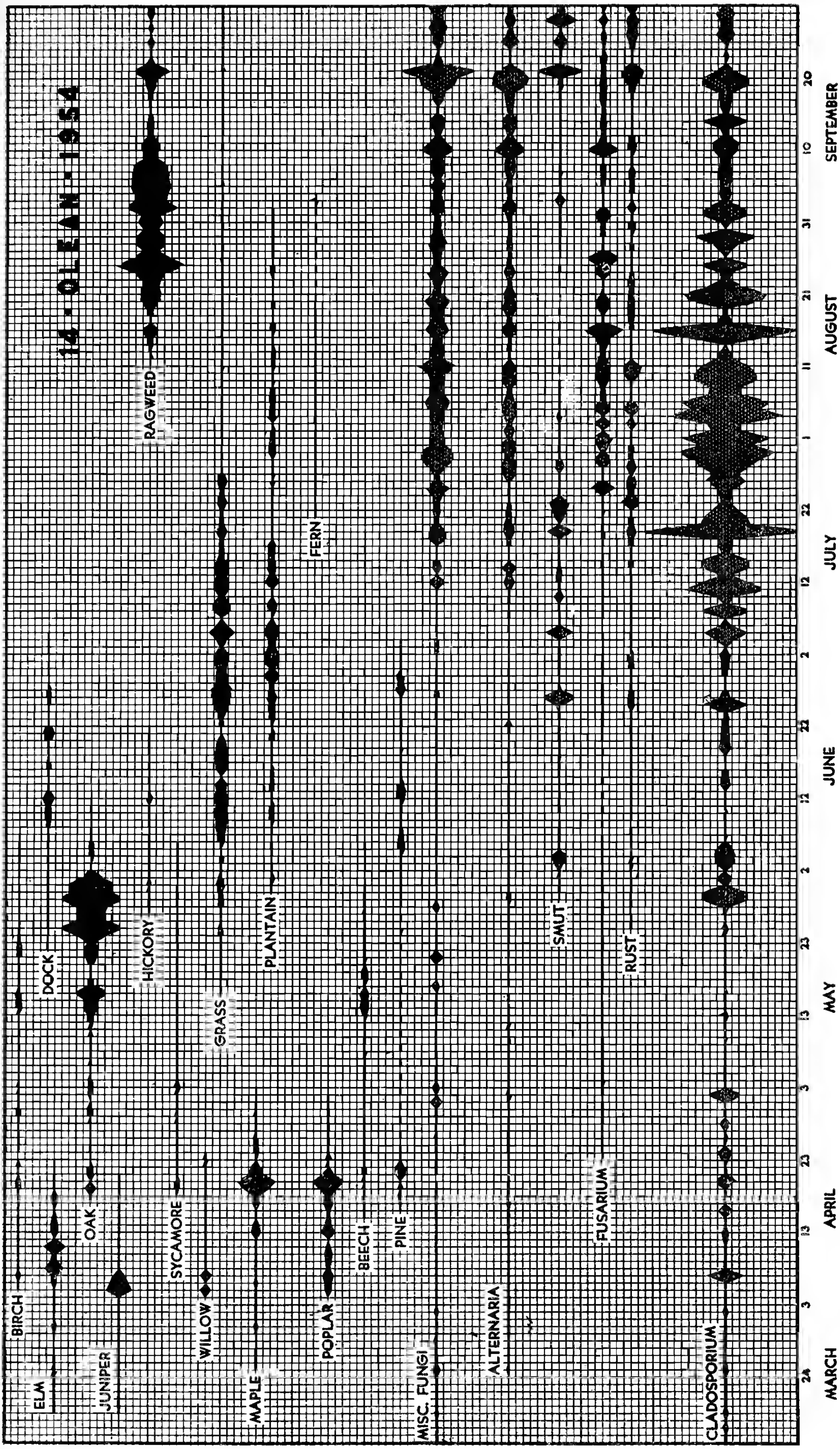

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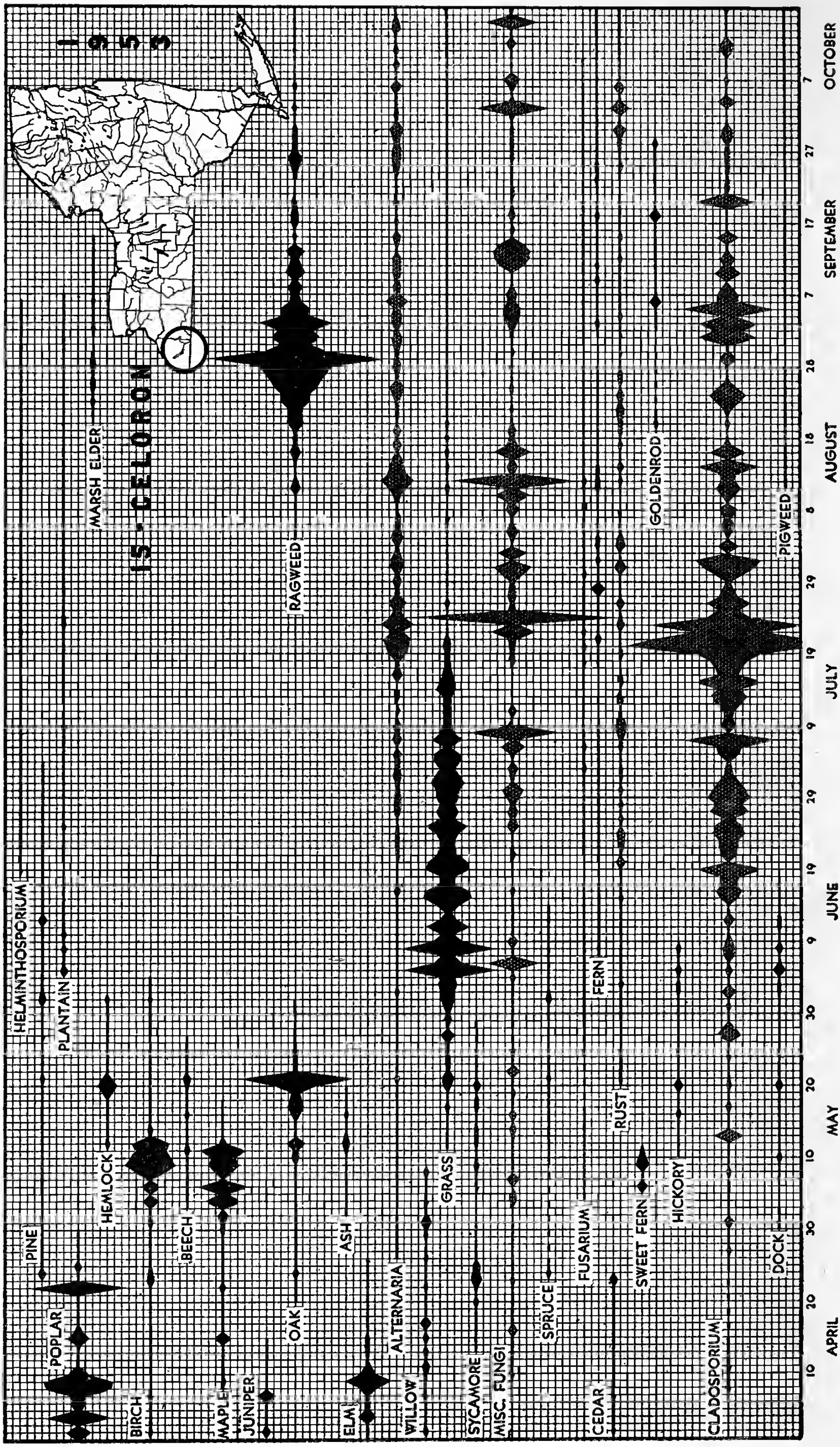
1953
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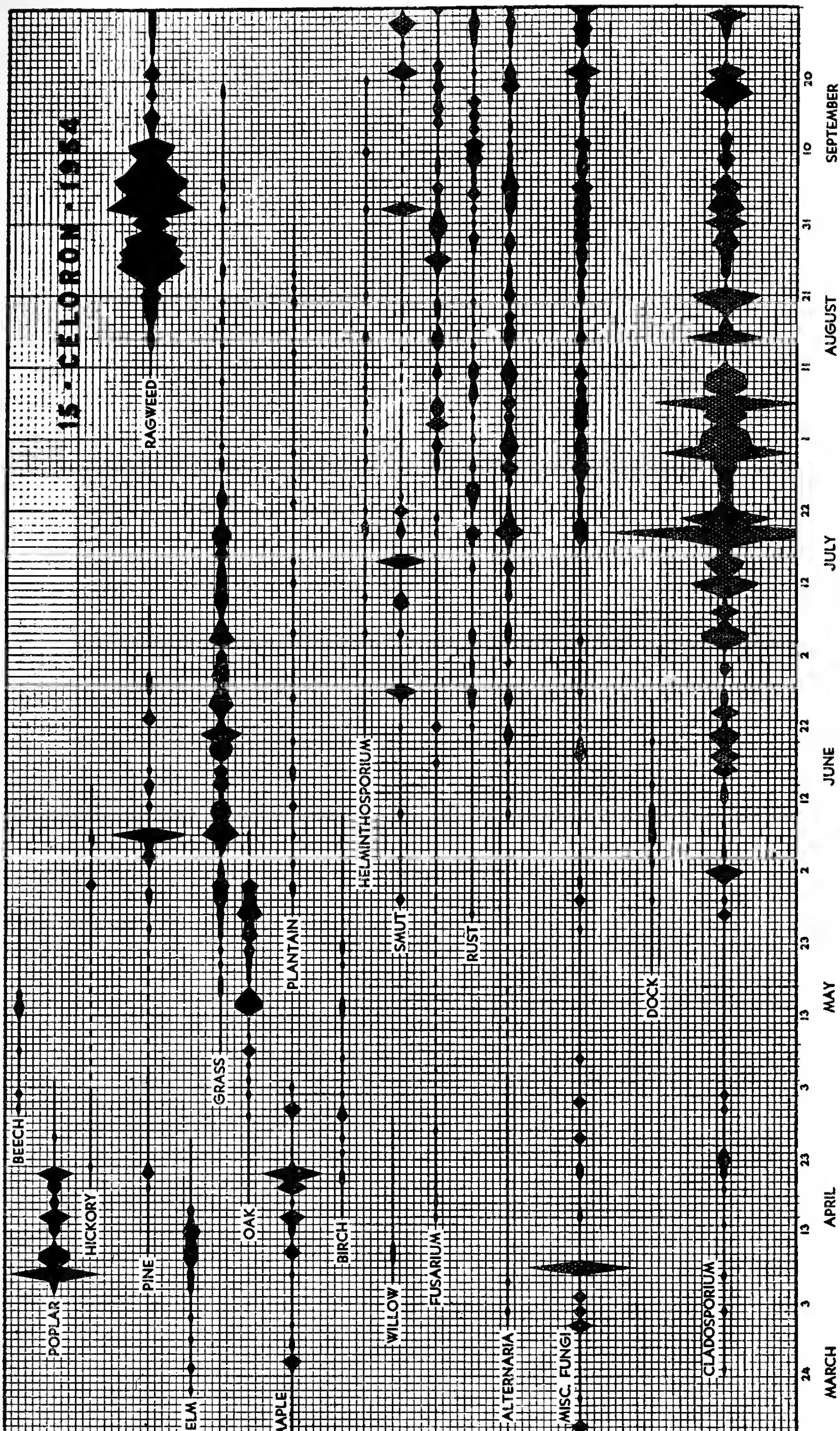
15 - CELORON - 1954
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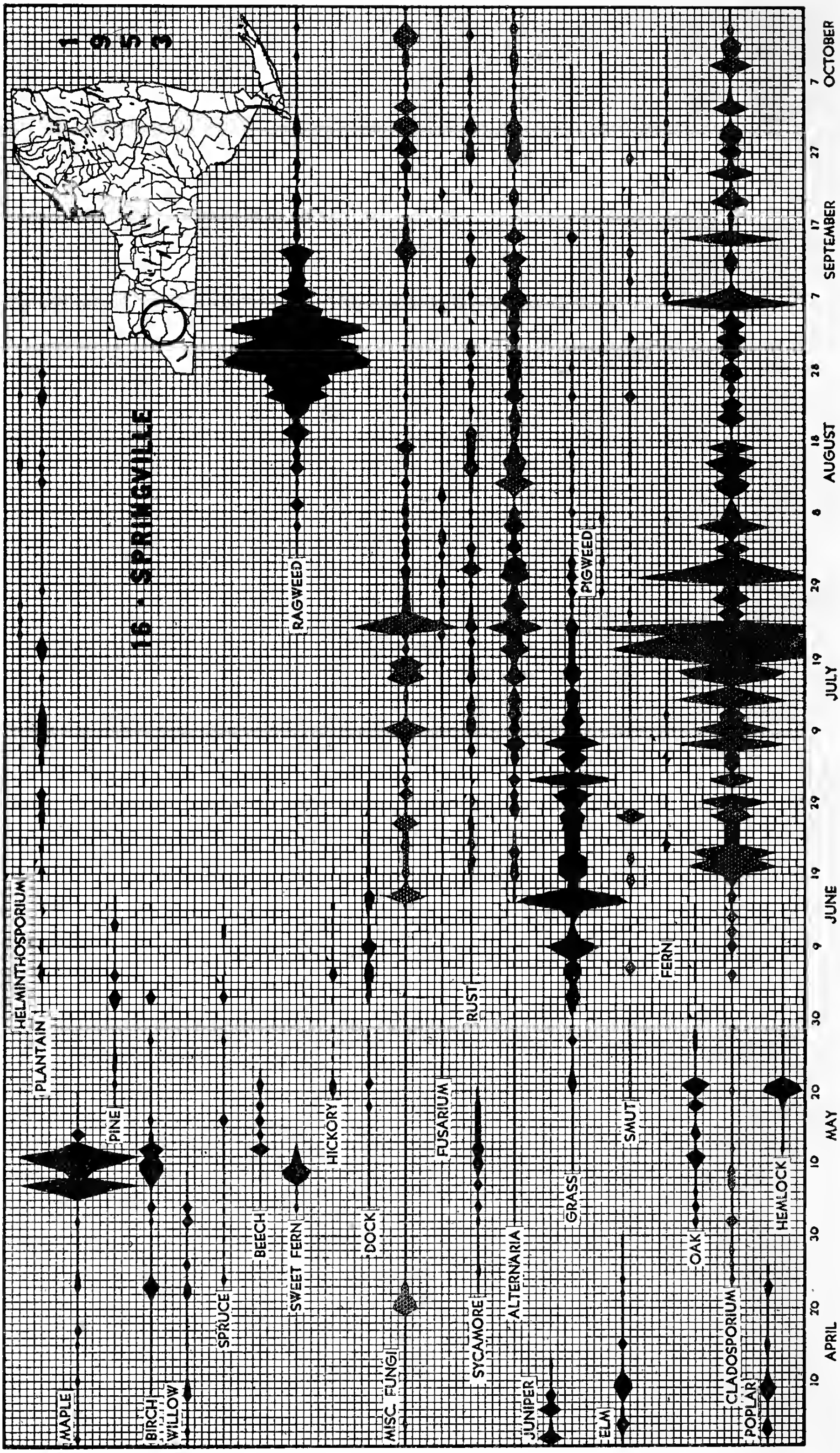

16 · SPRINGVILLE
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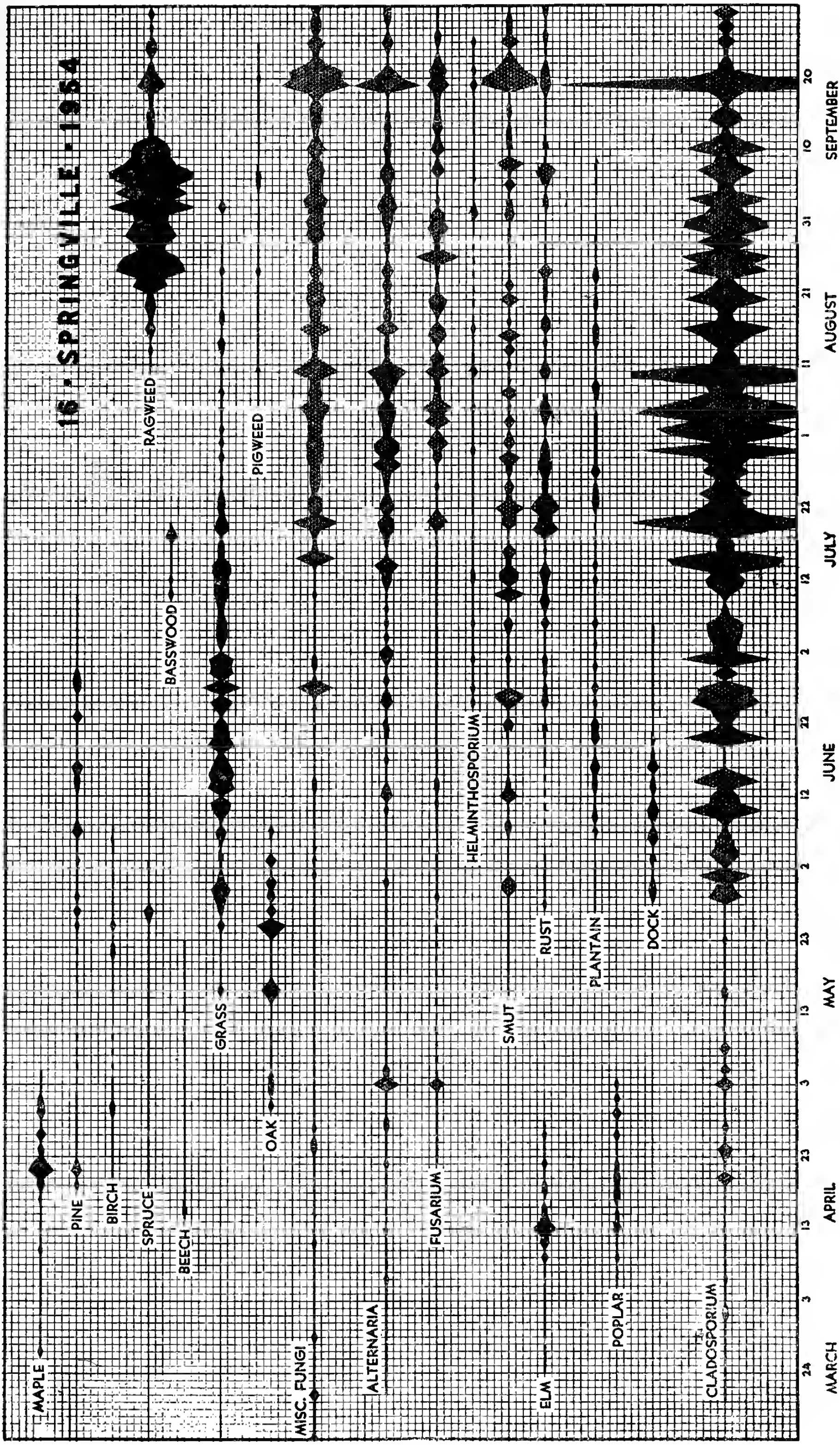
16 · SPRINGVILLE · 1954
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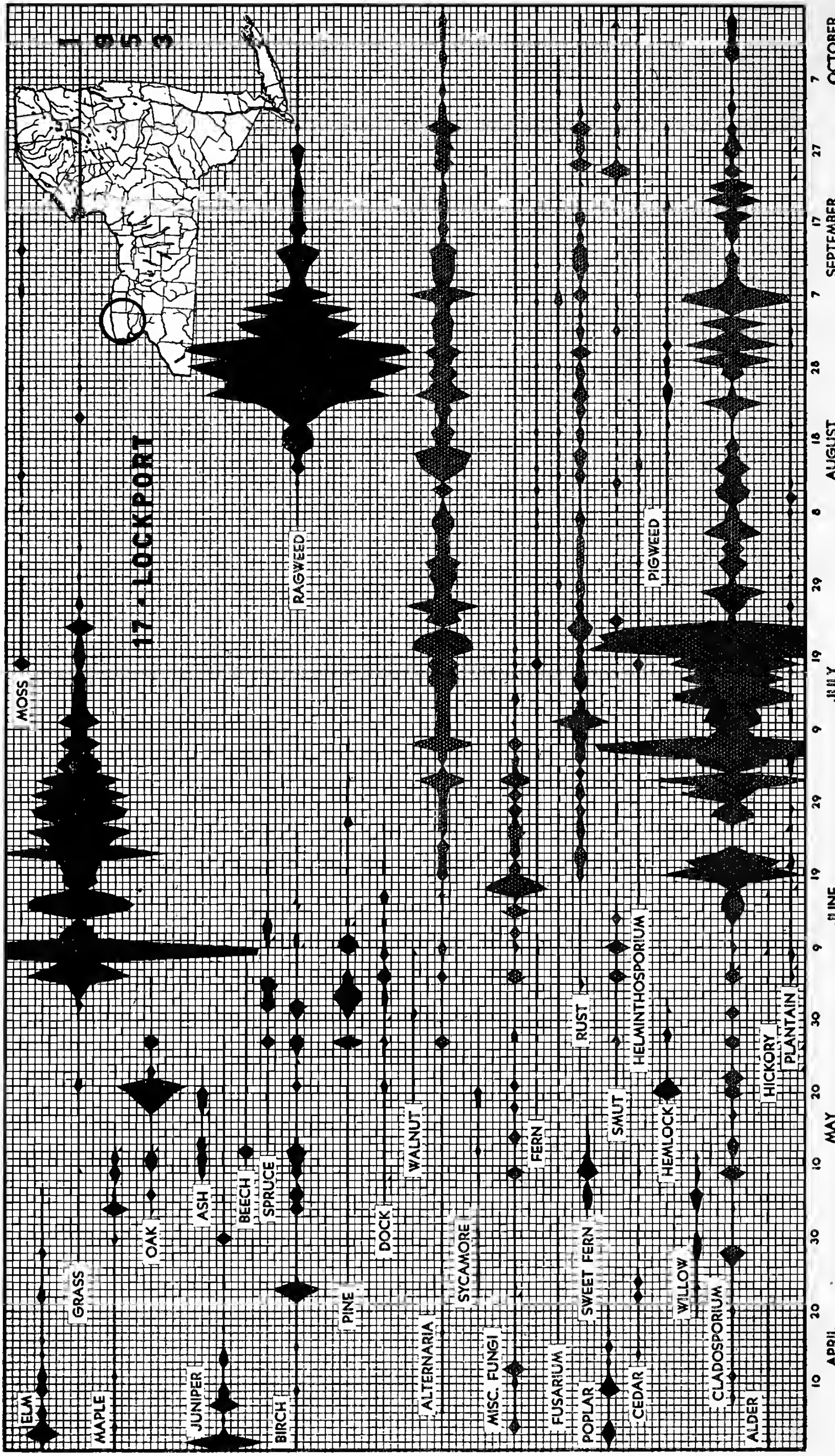

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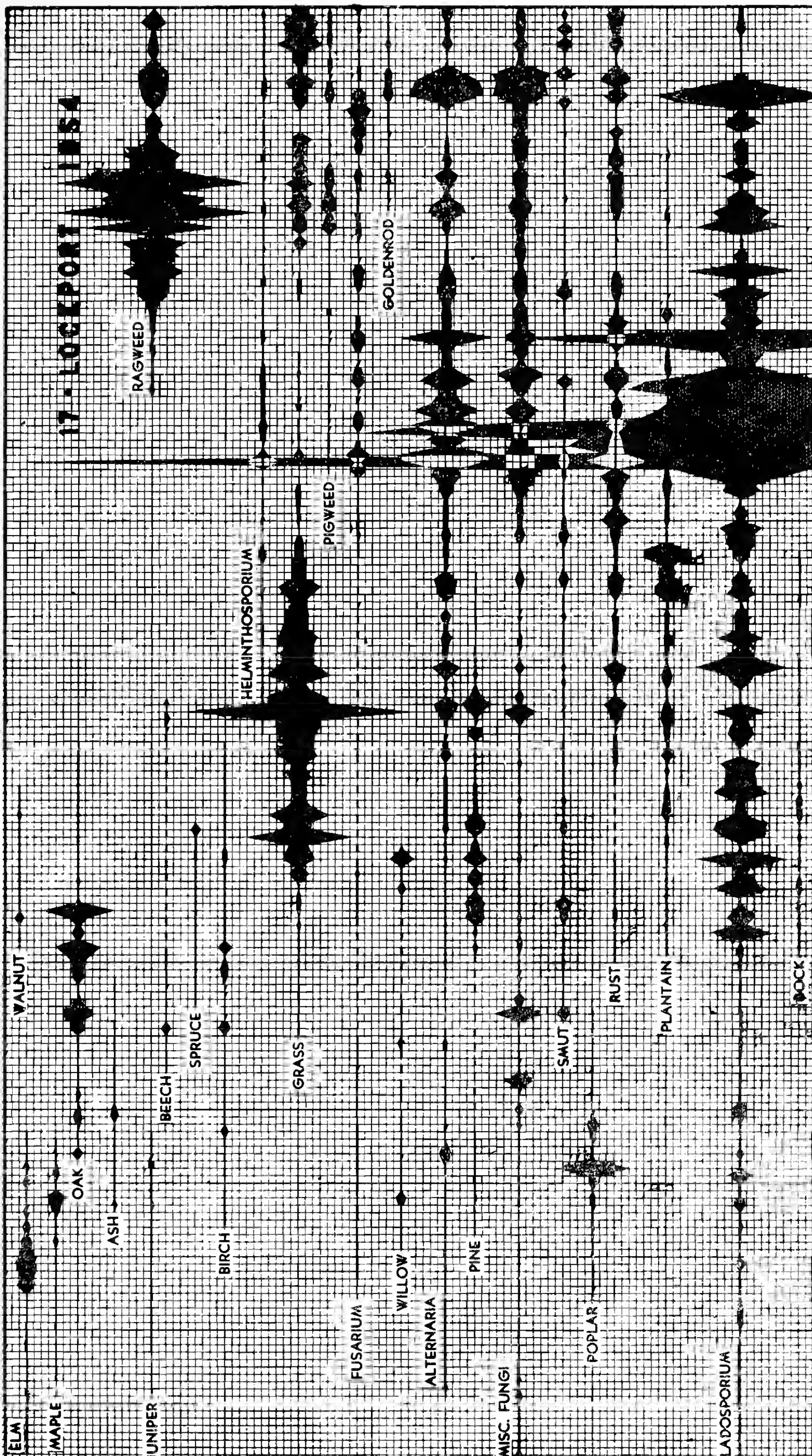
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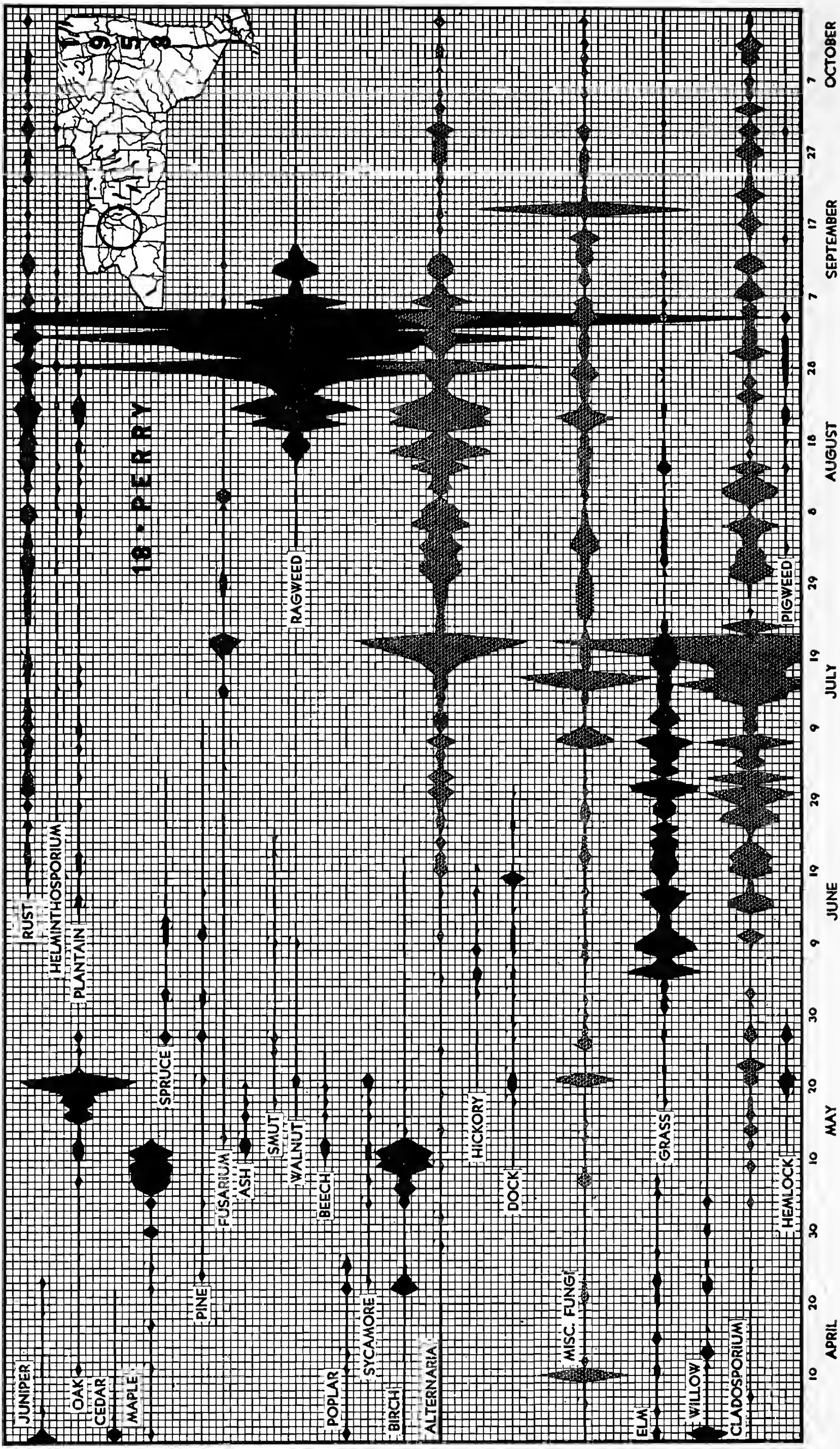

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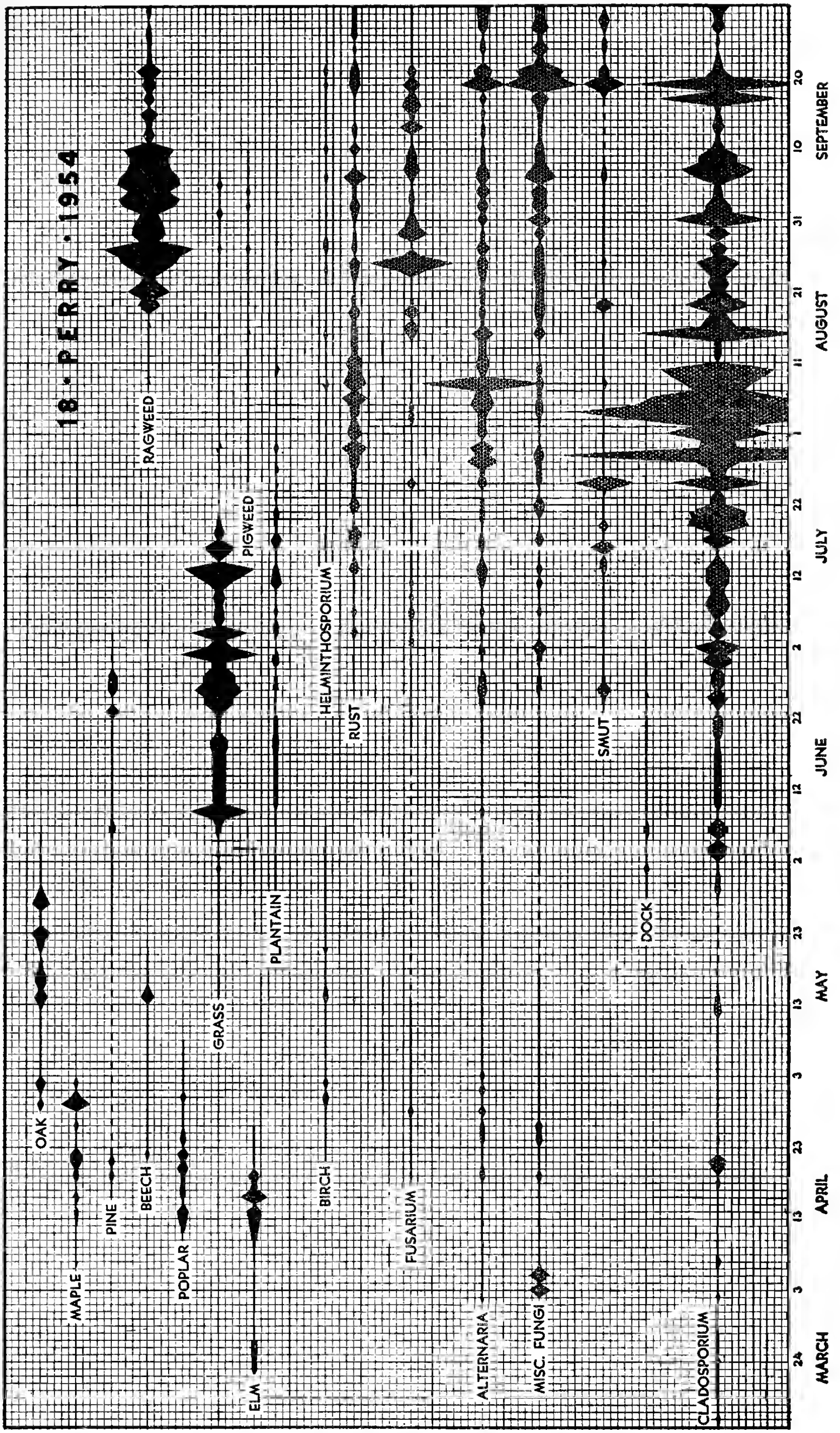

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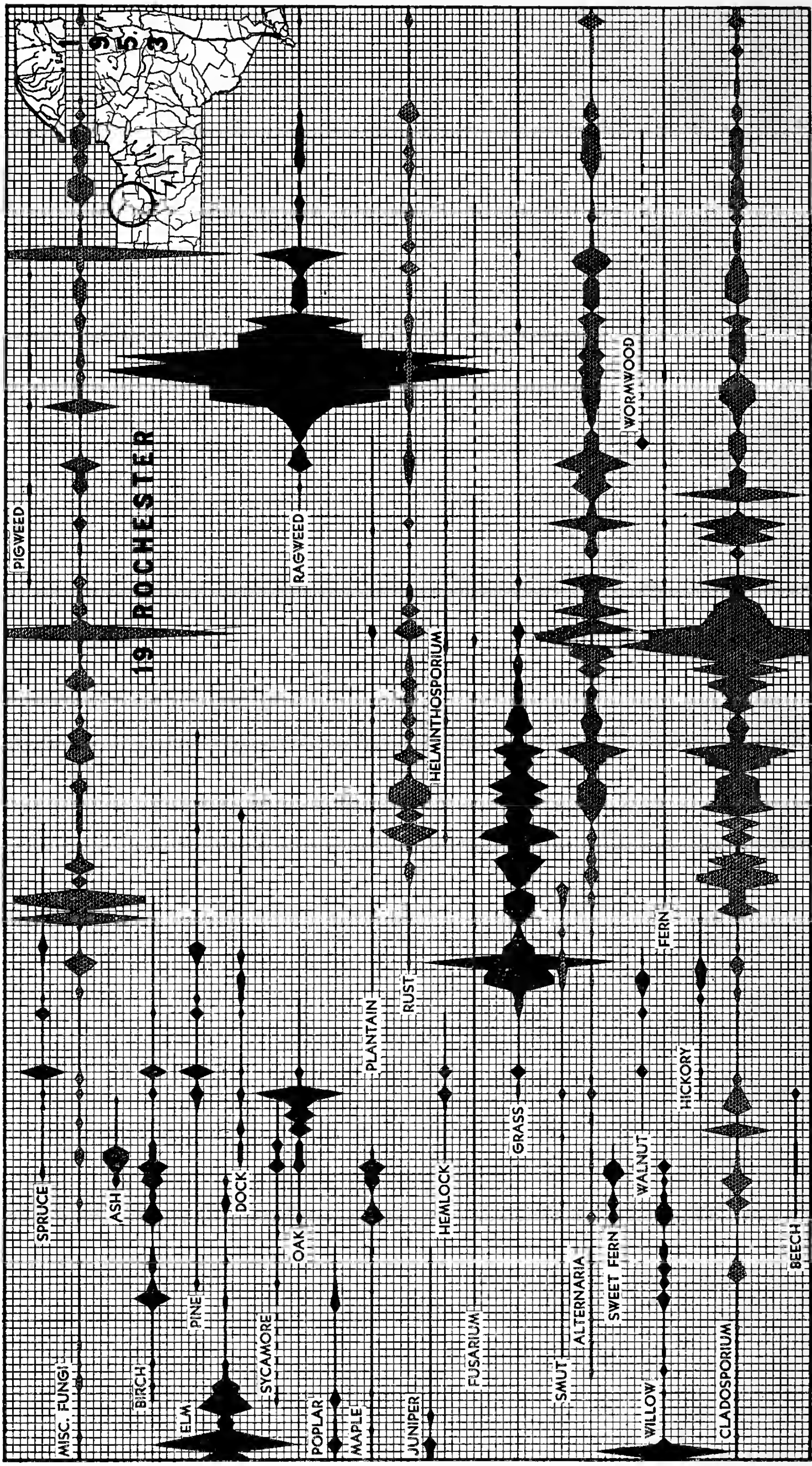
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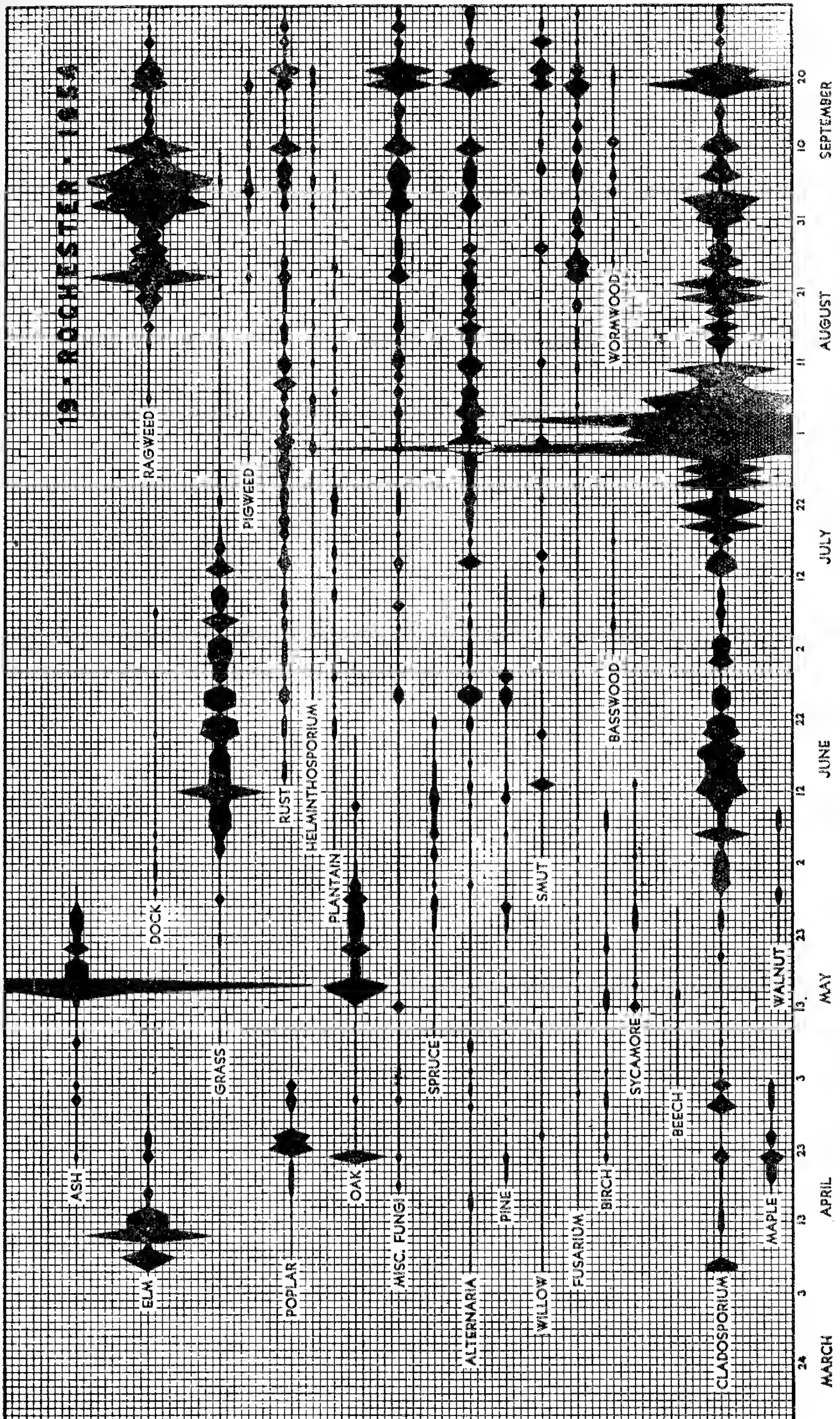
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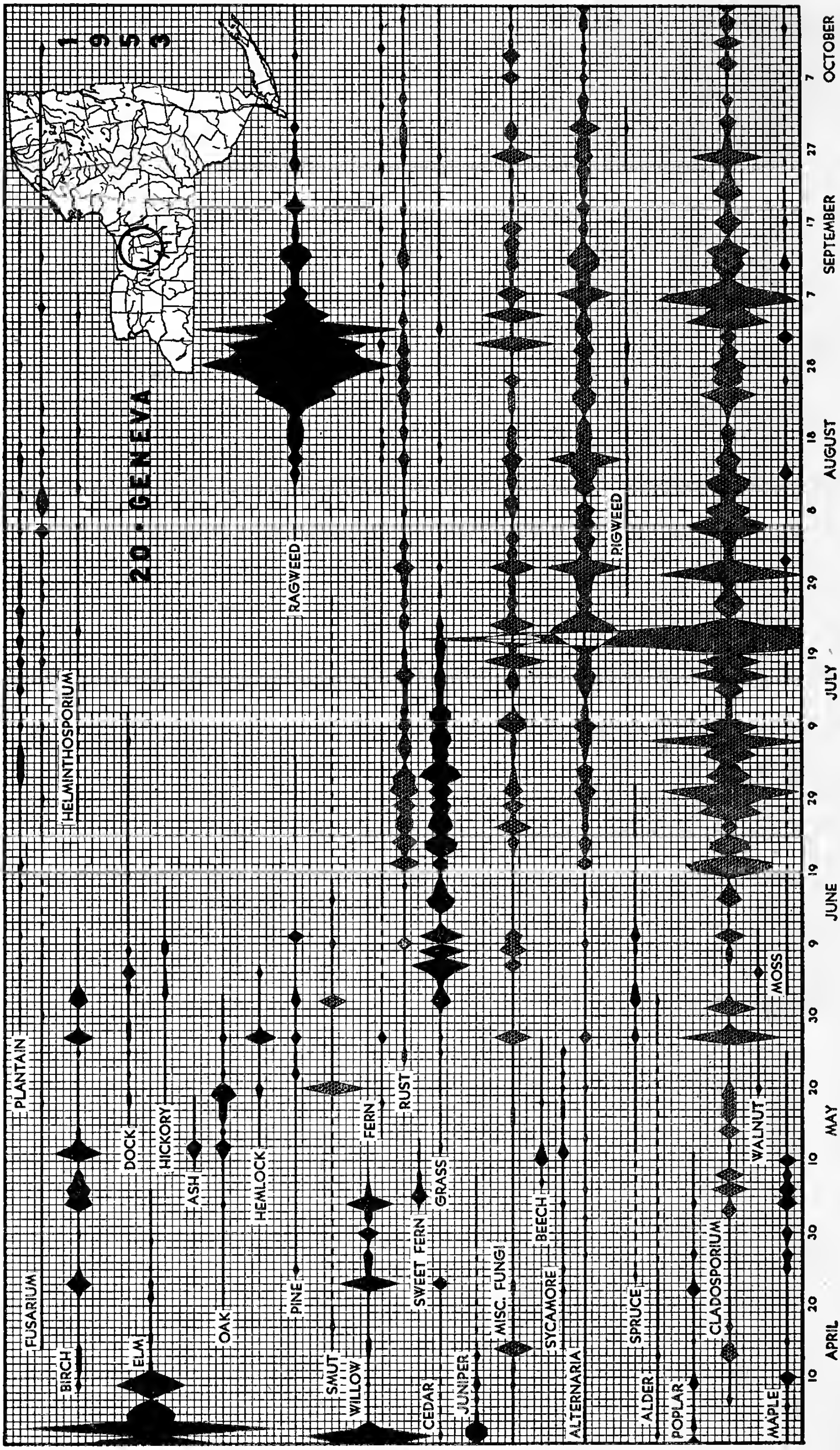
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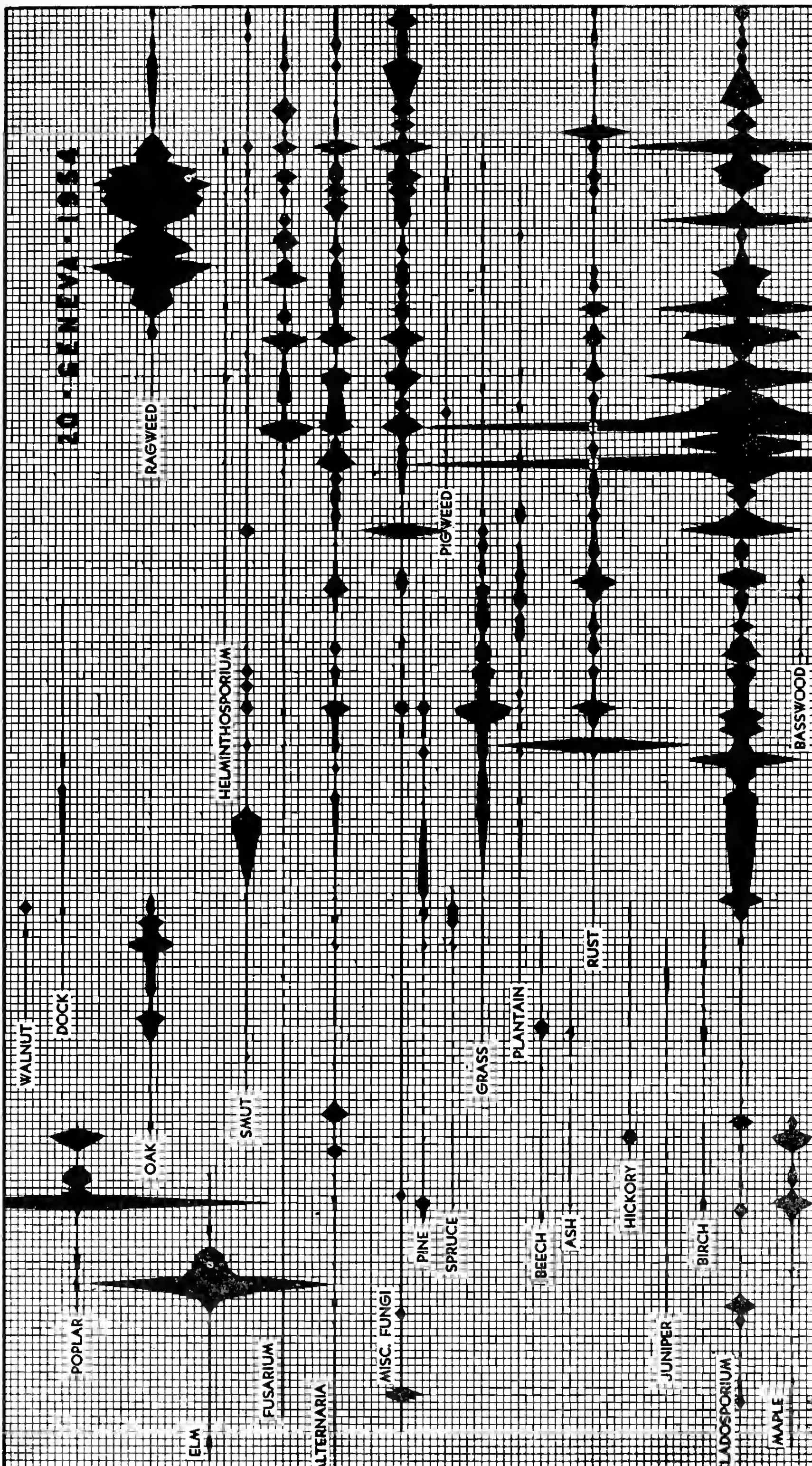
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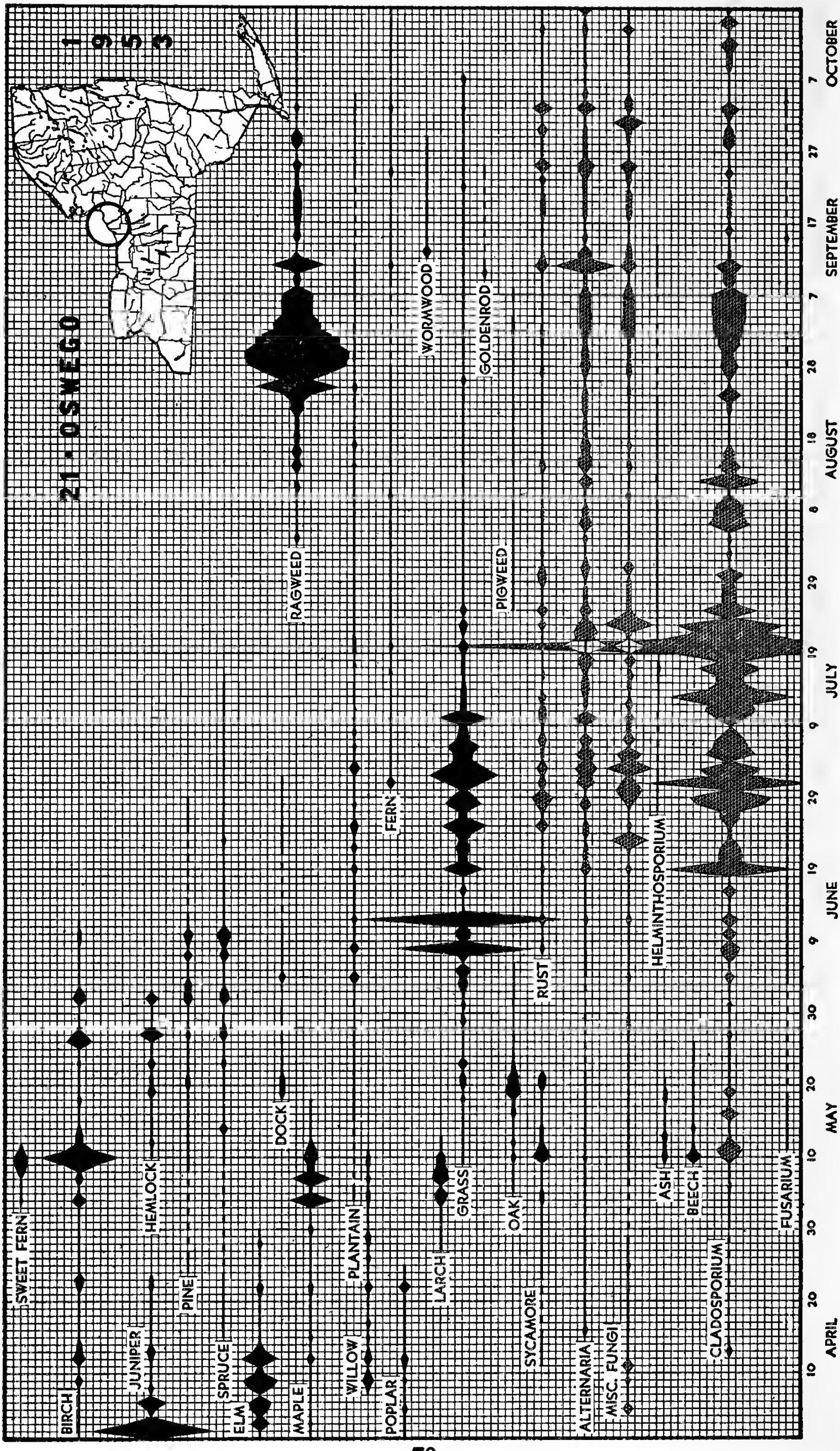
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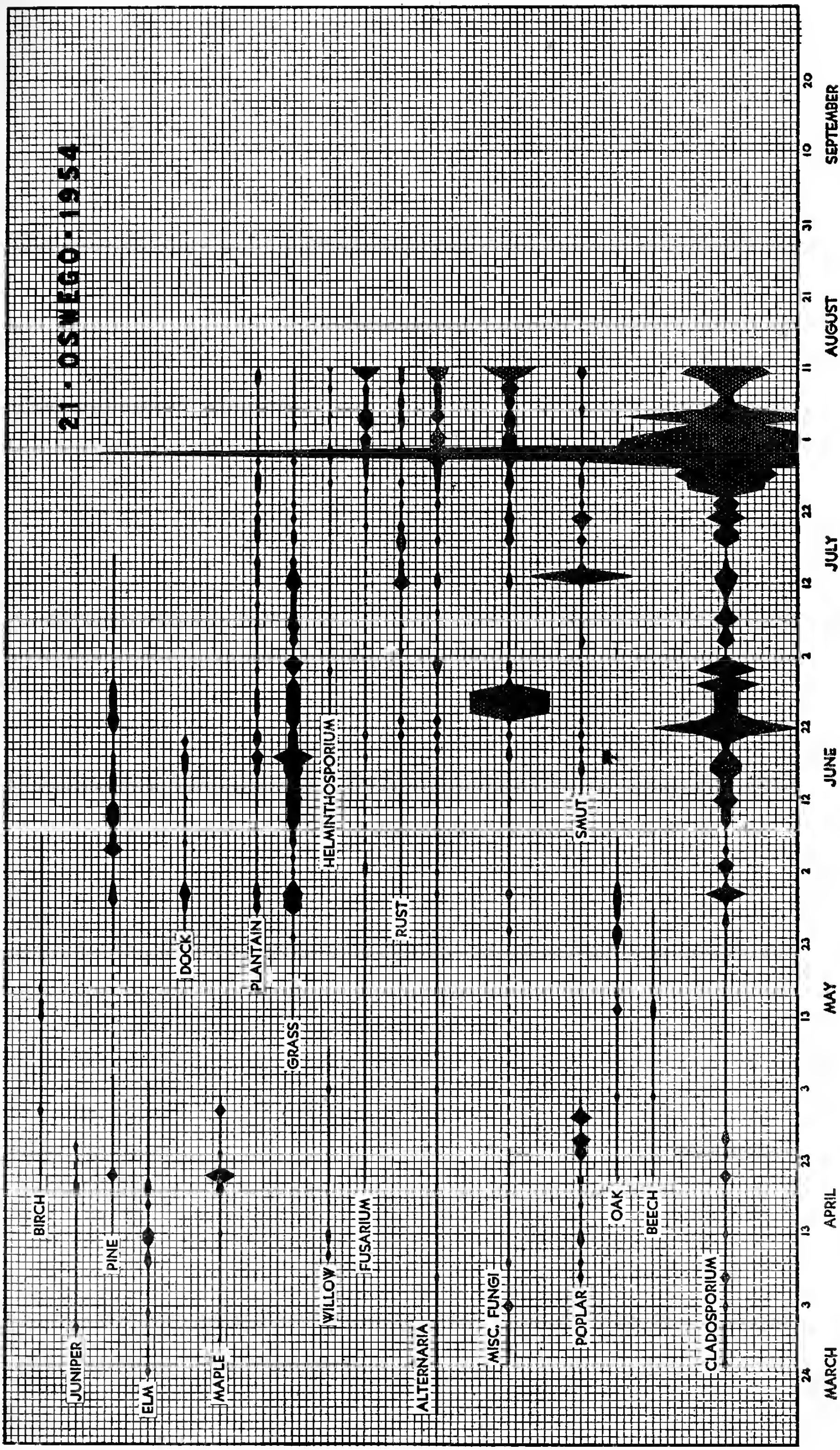
21 · OSWEGO · 1954
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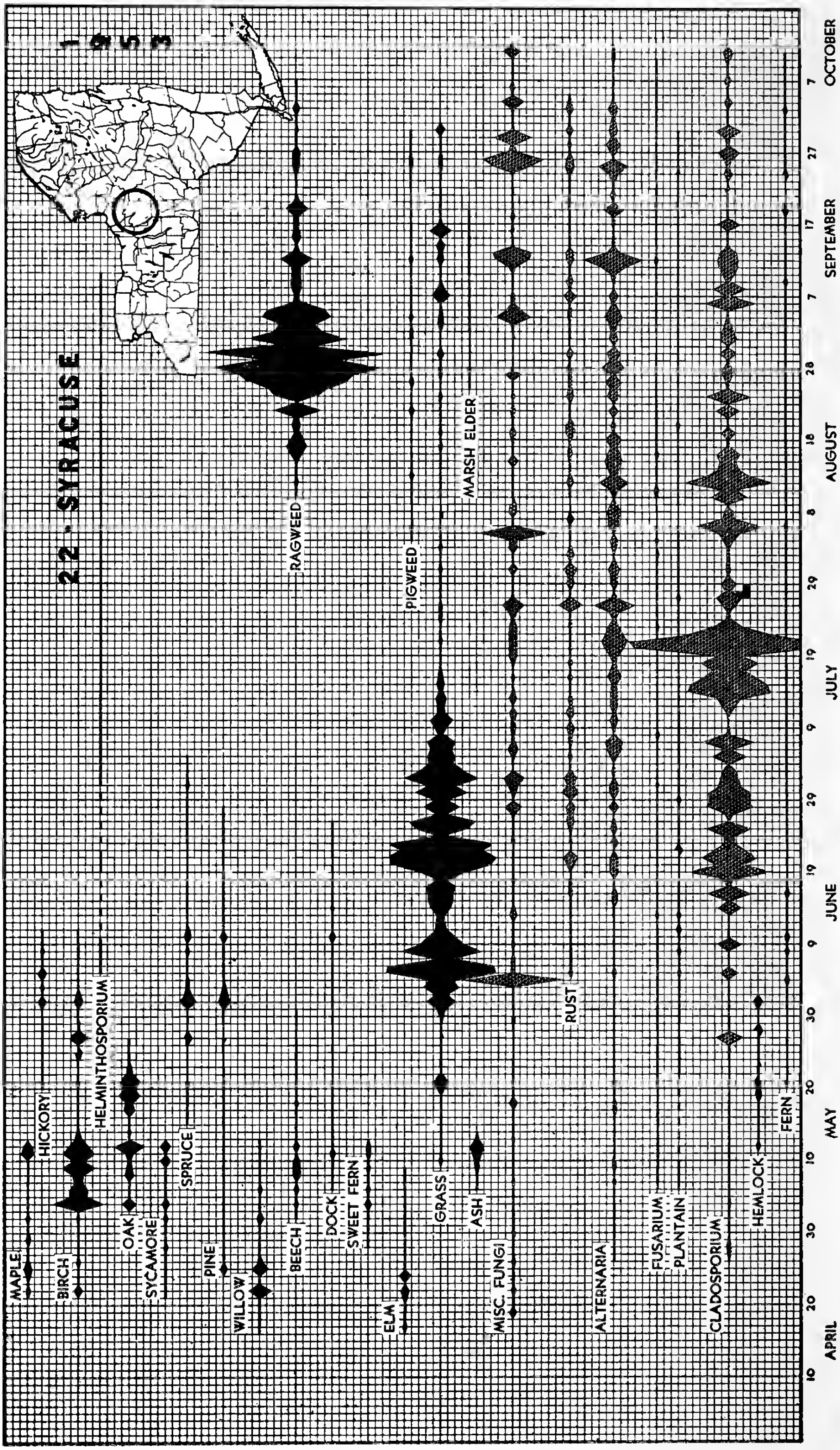
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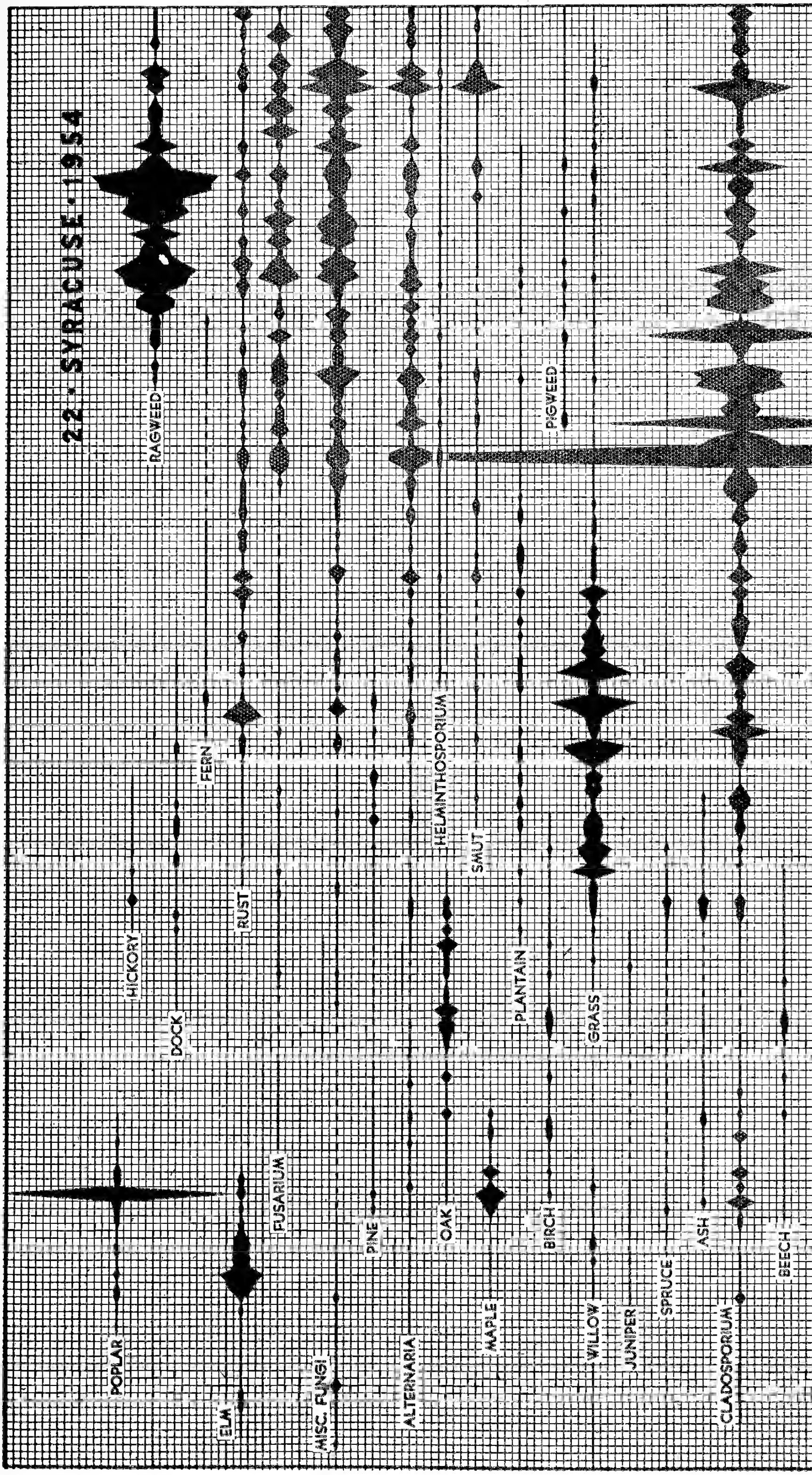

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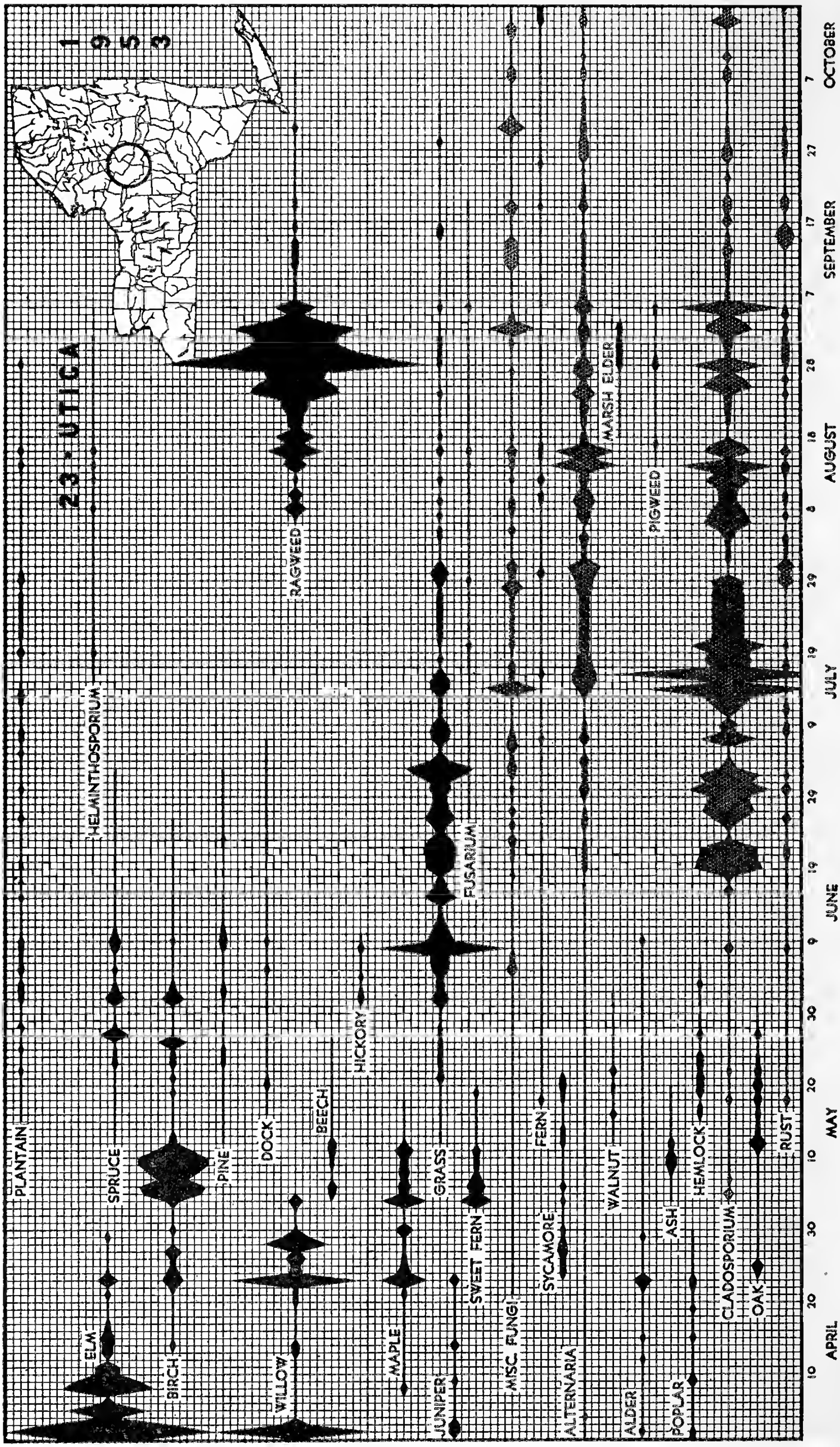
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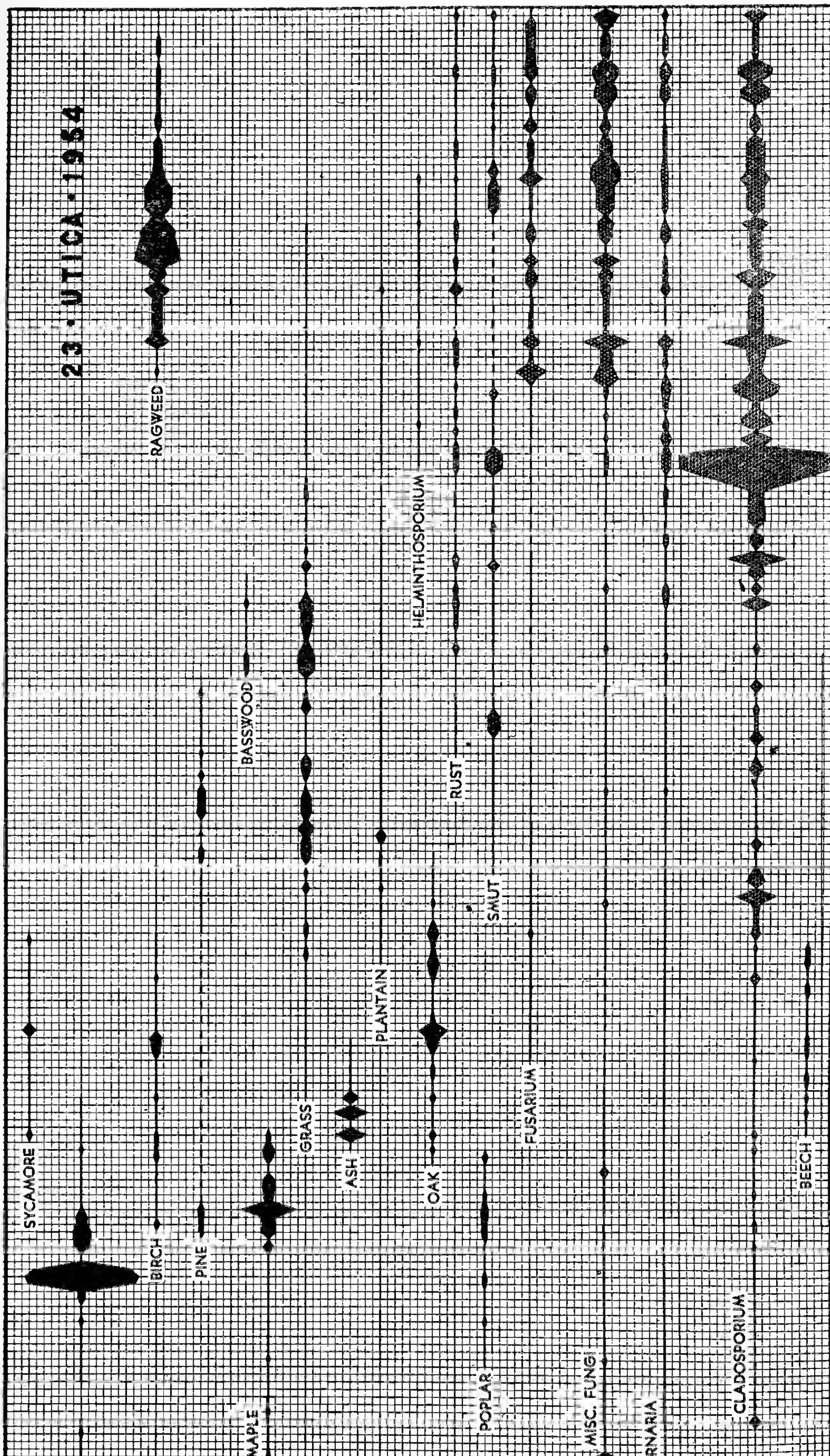

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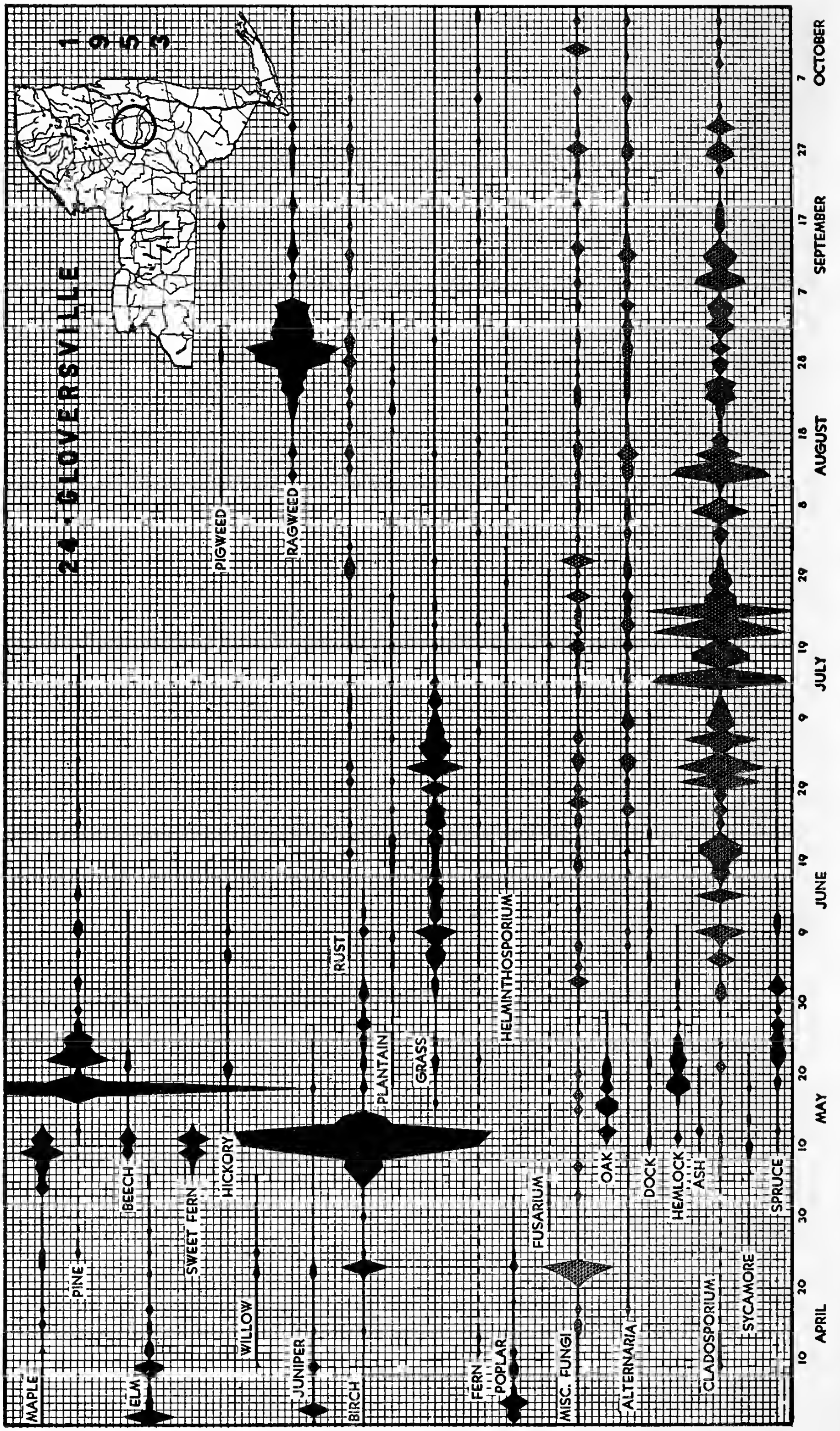

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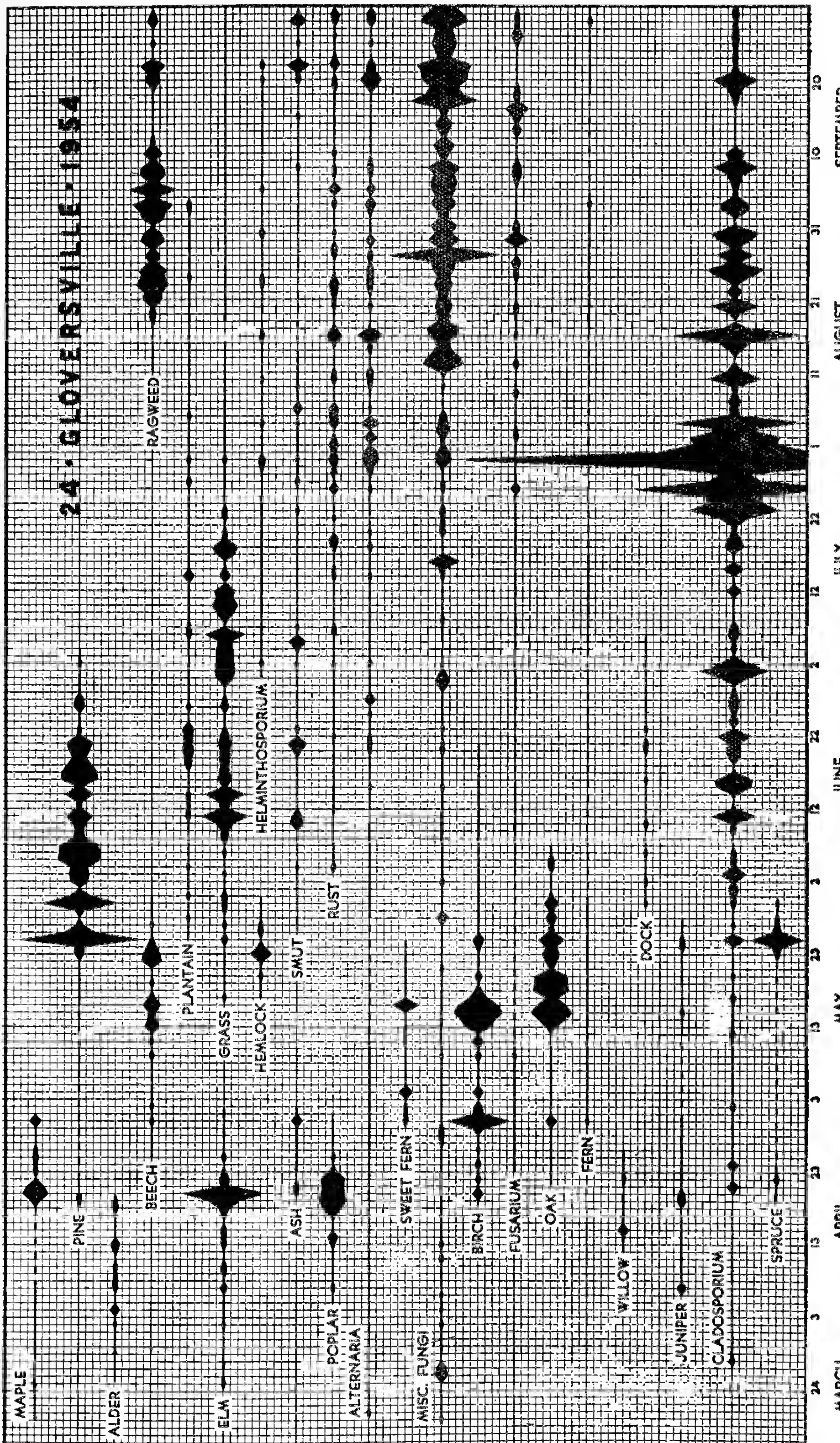
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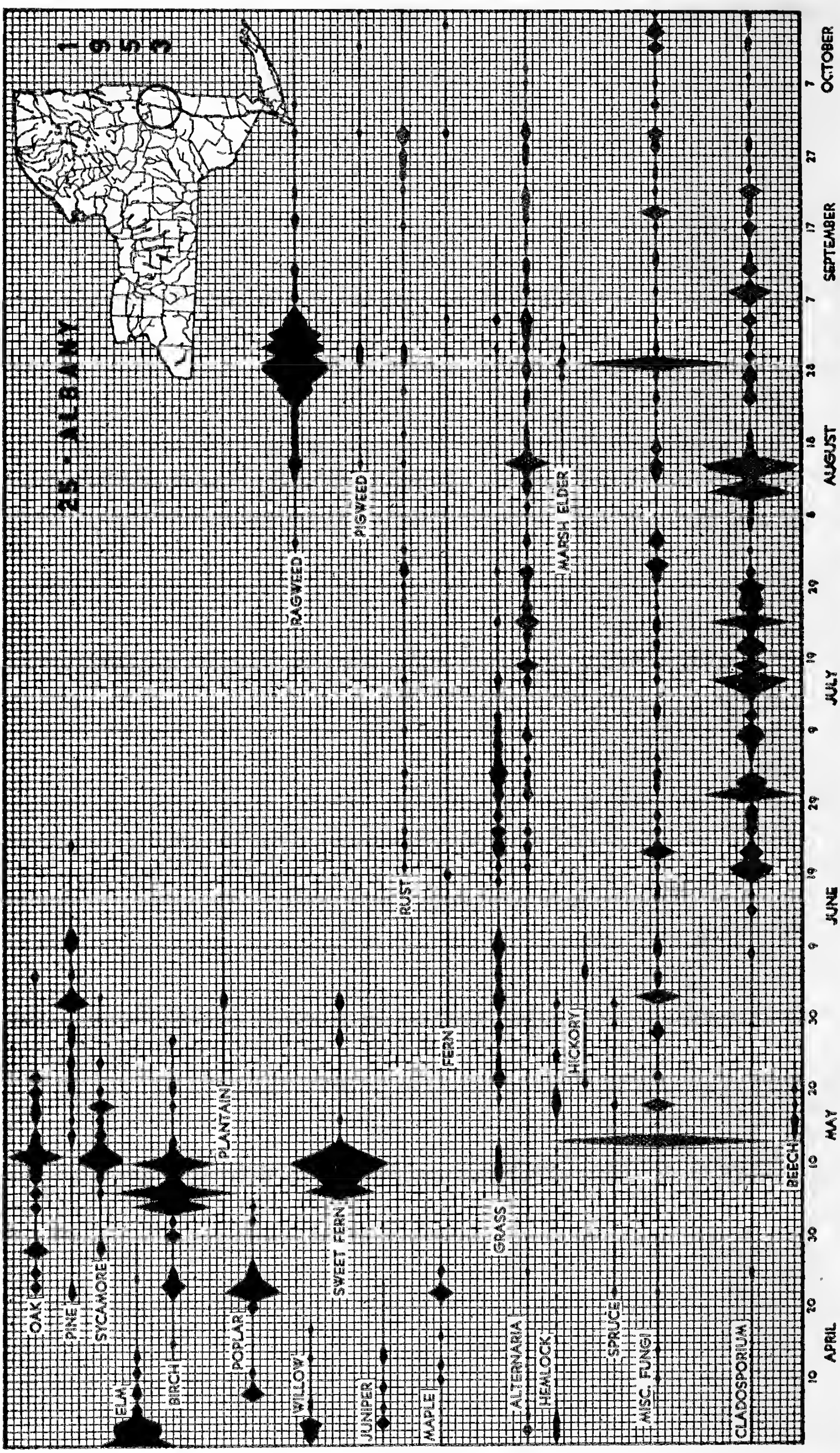

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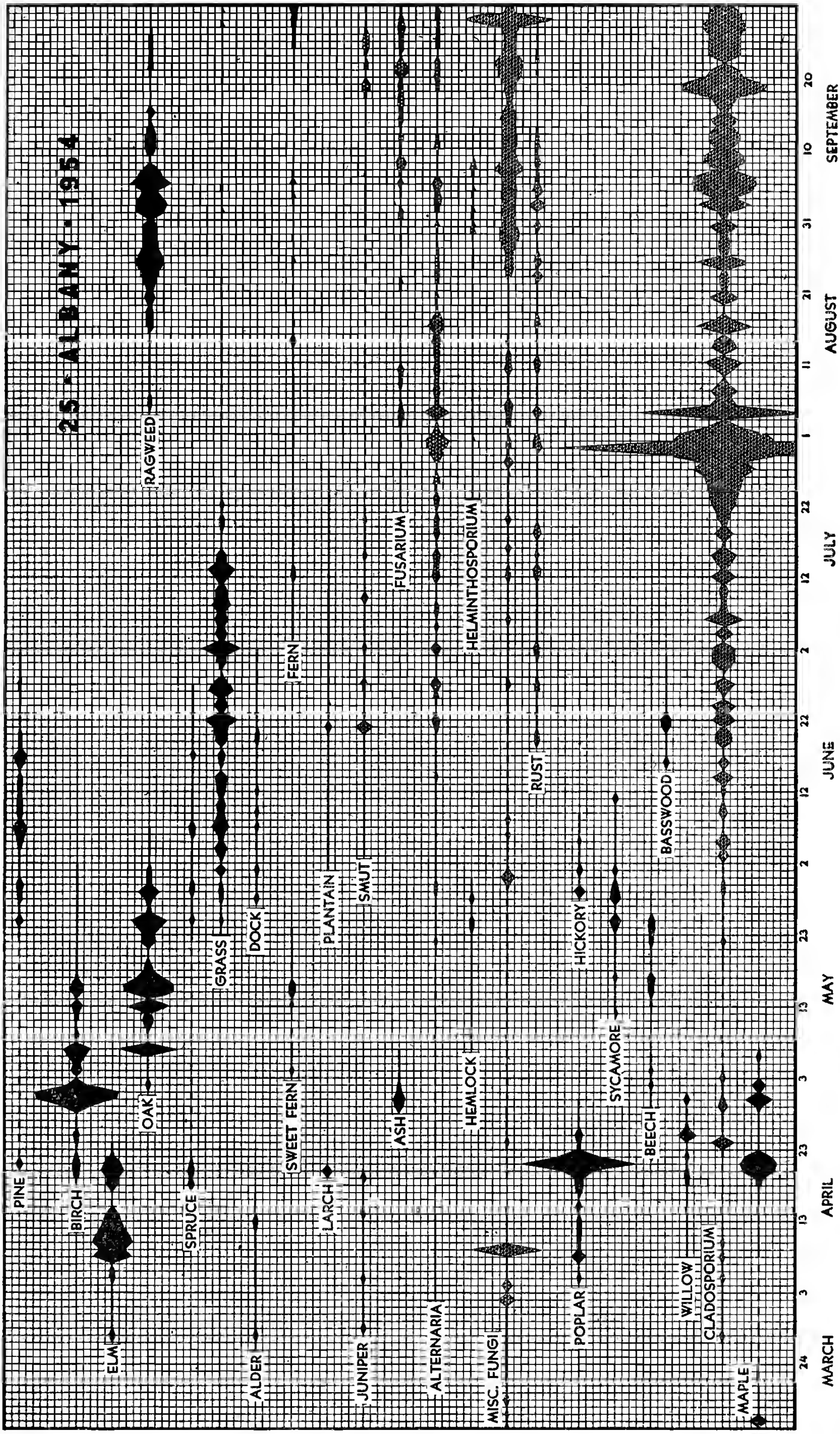
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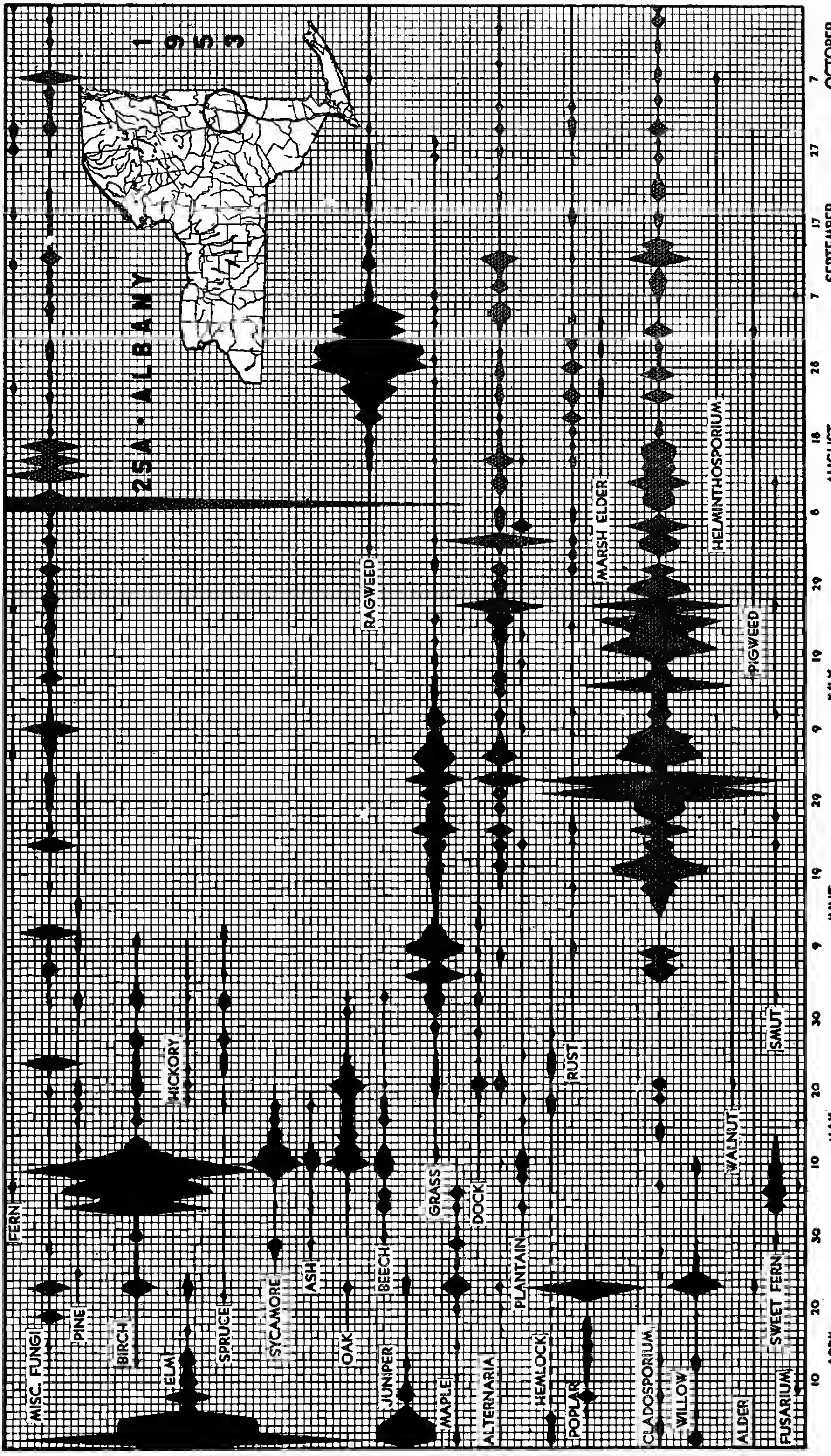
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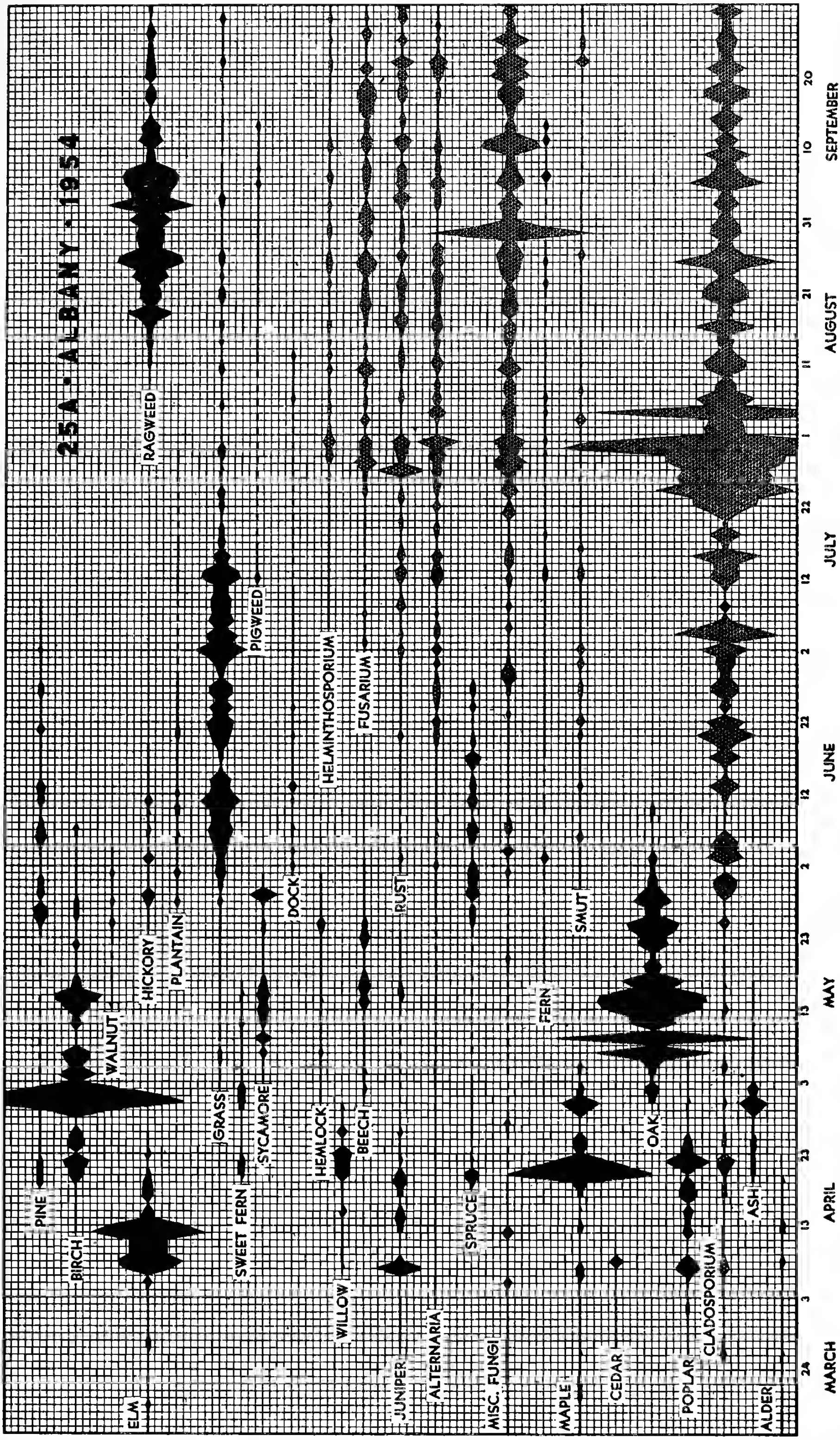
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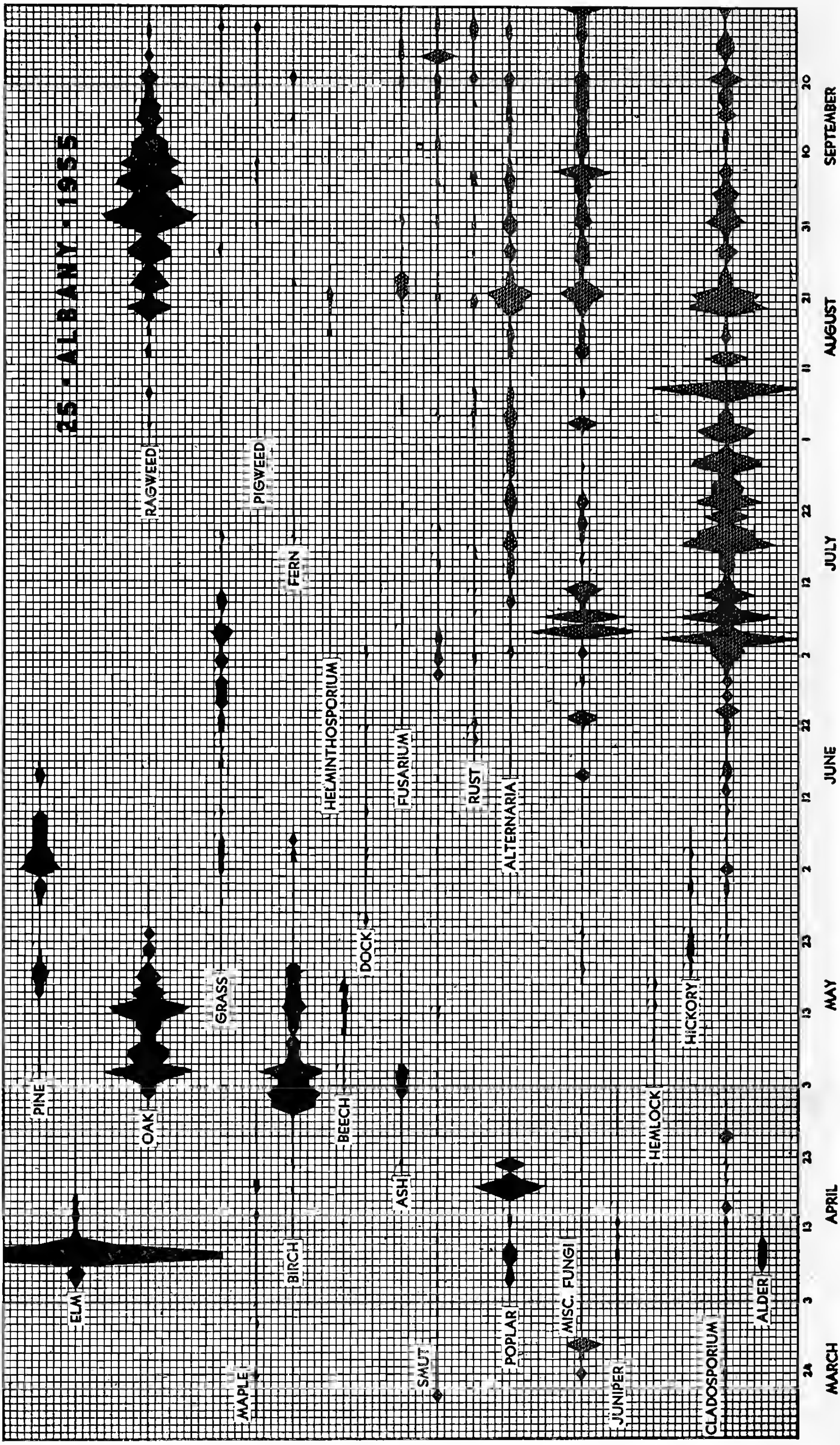
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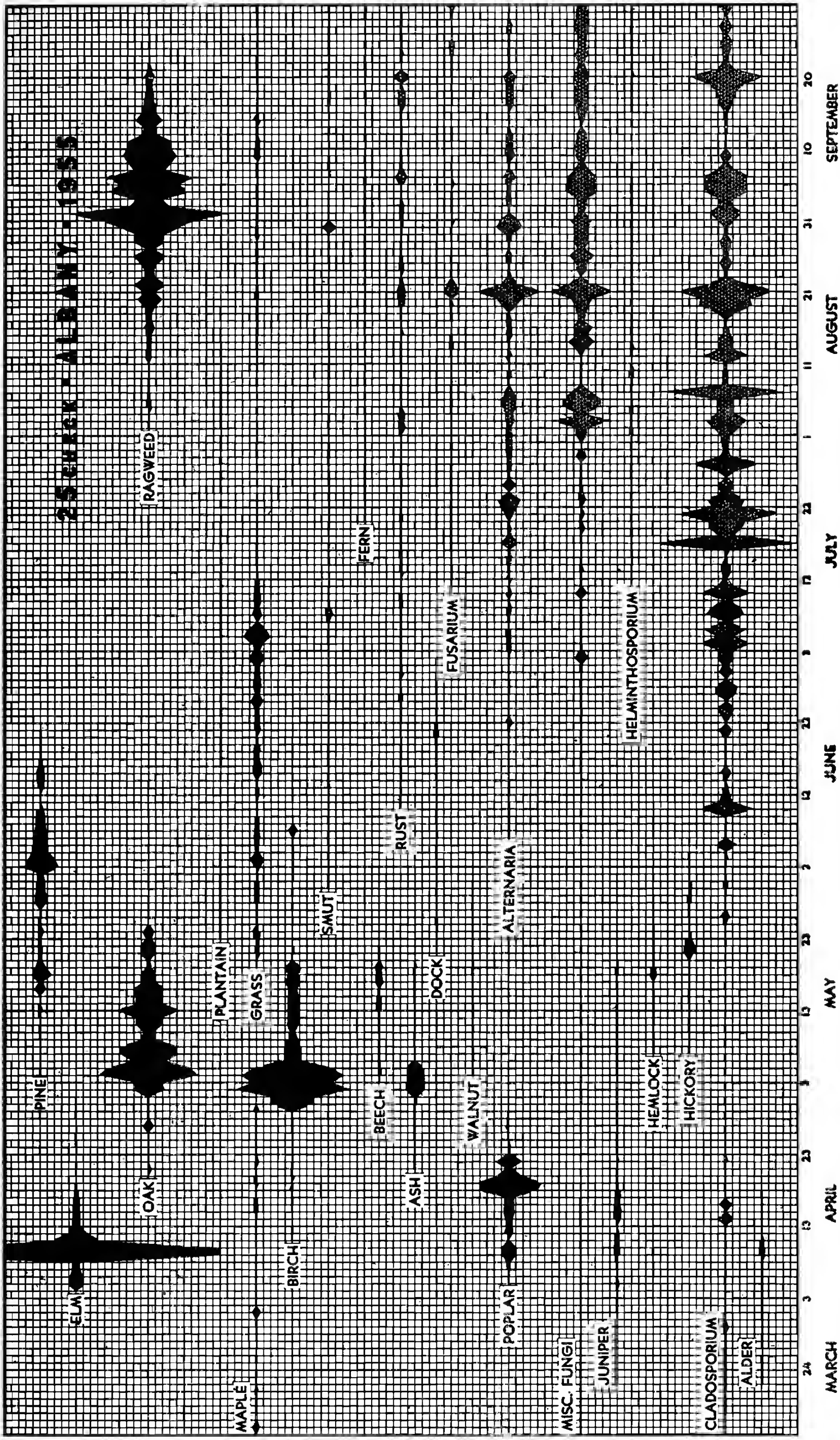
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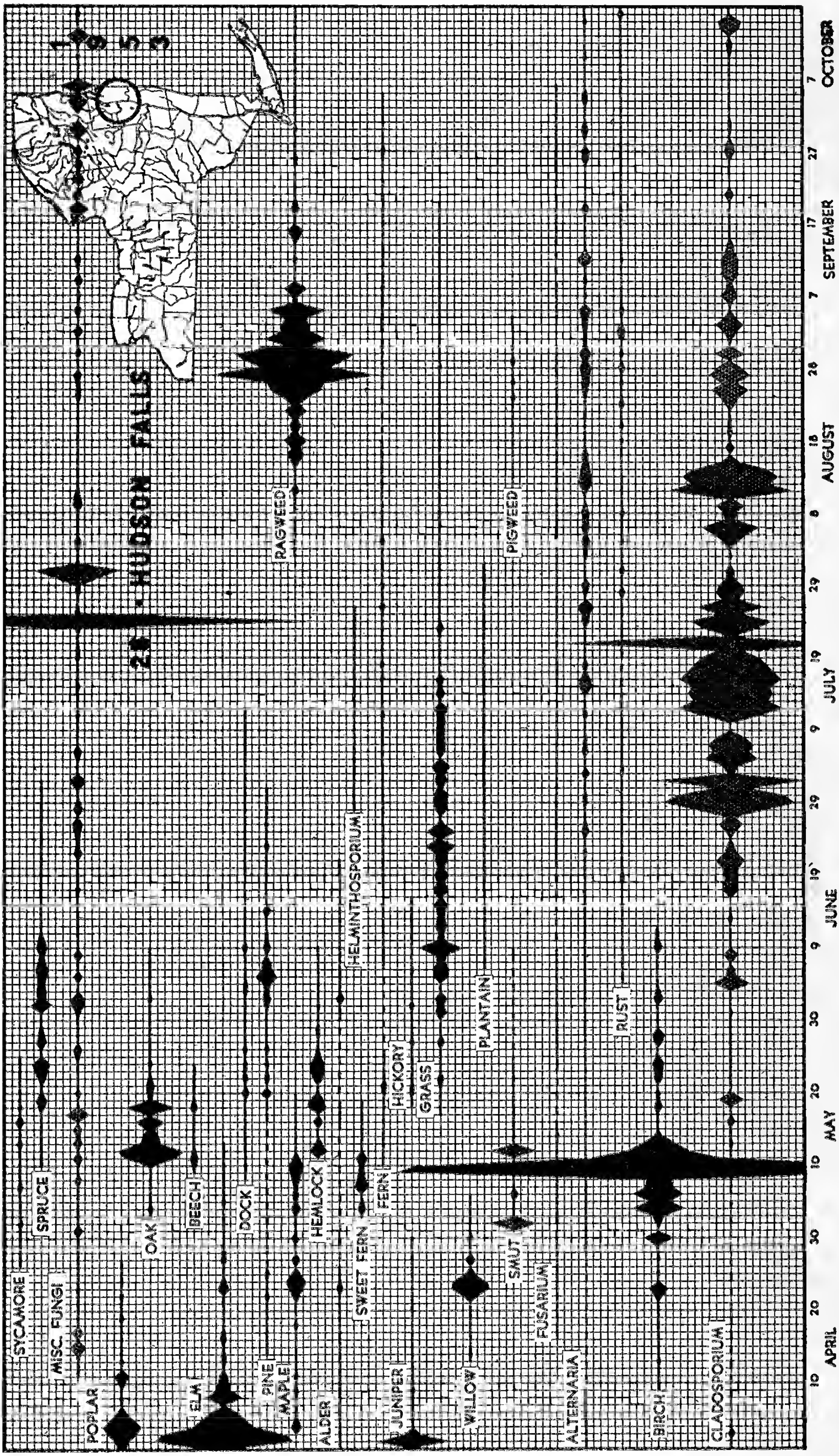
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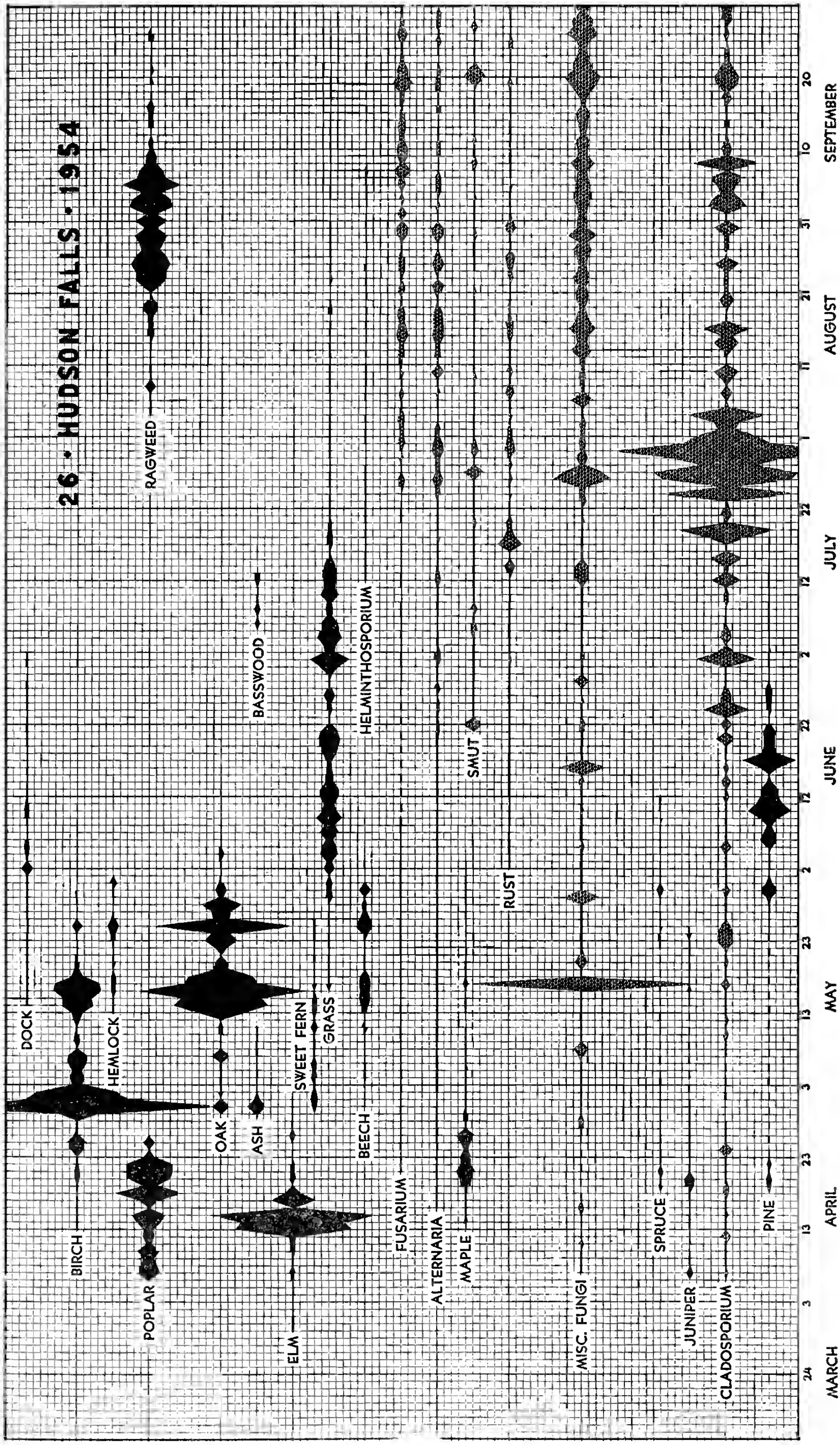
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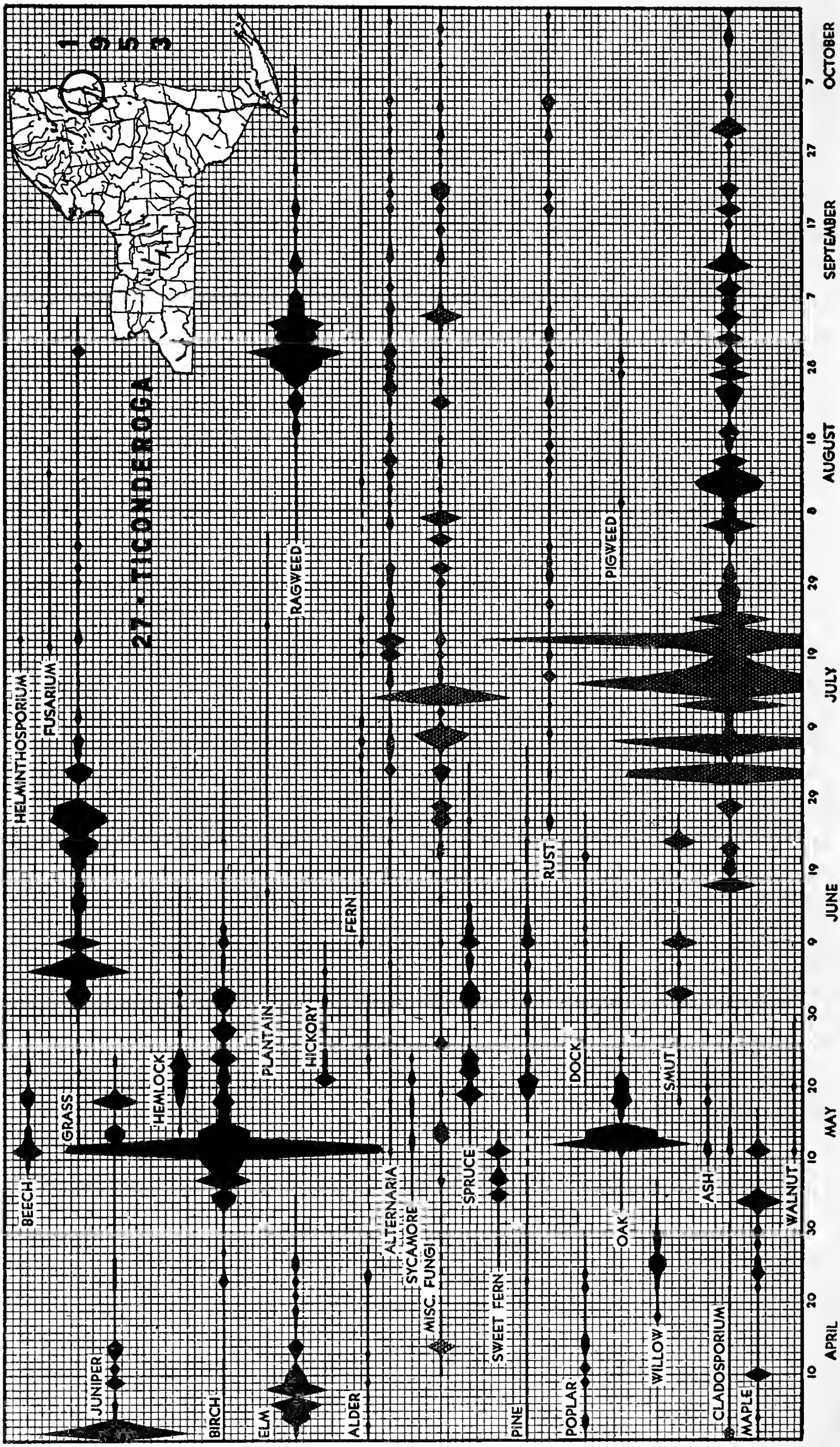
27 · TICONDEROGA
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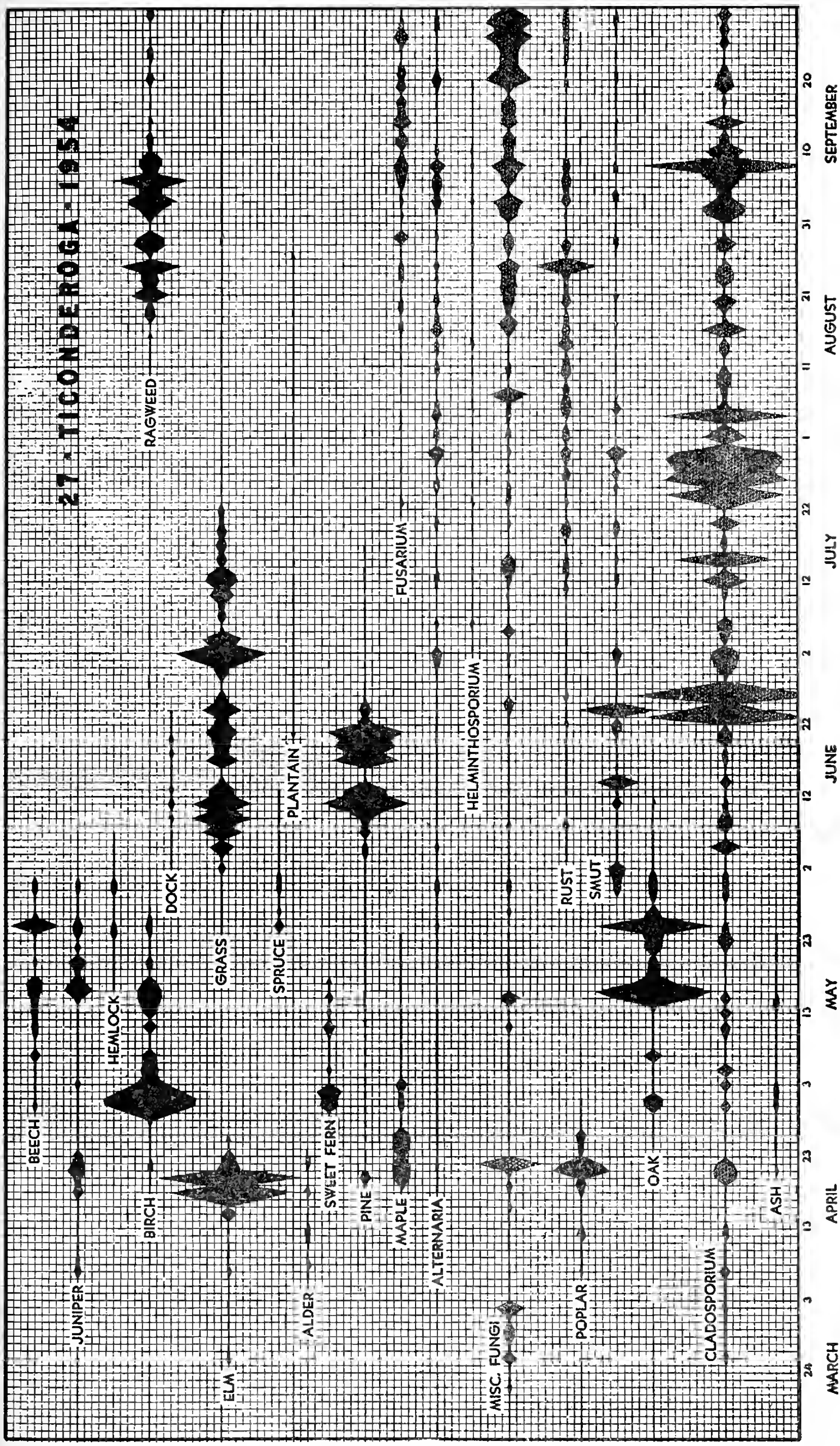
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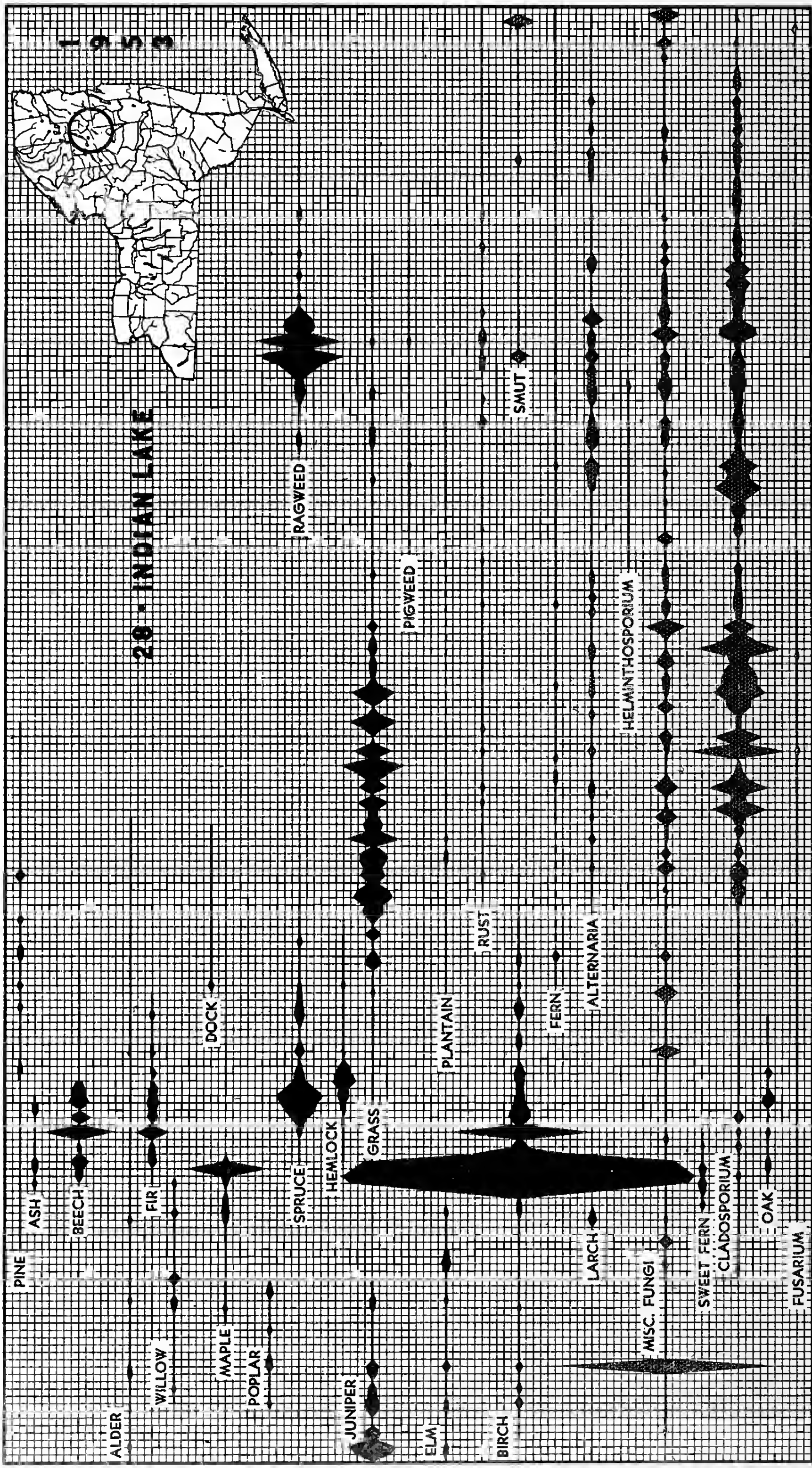

28 • INDIAN LAKE
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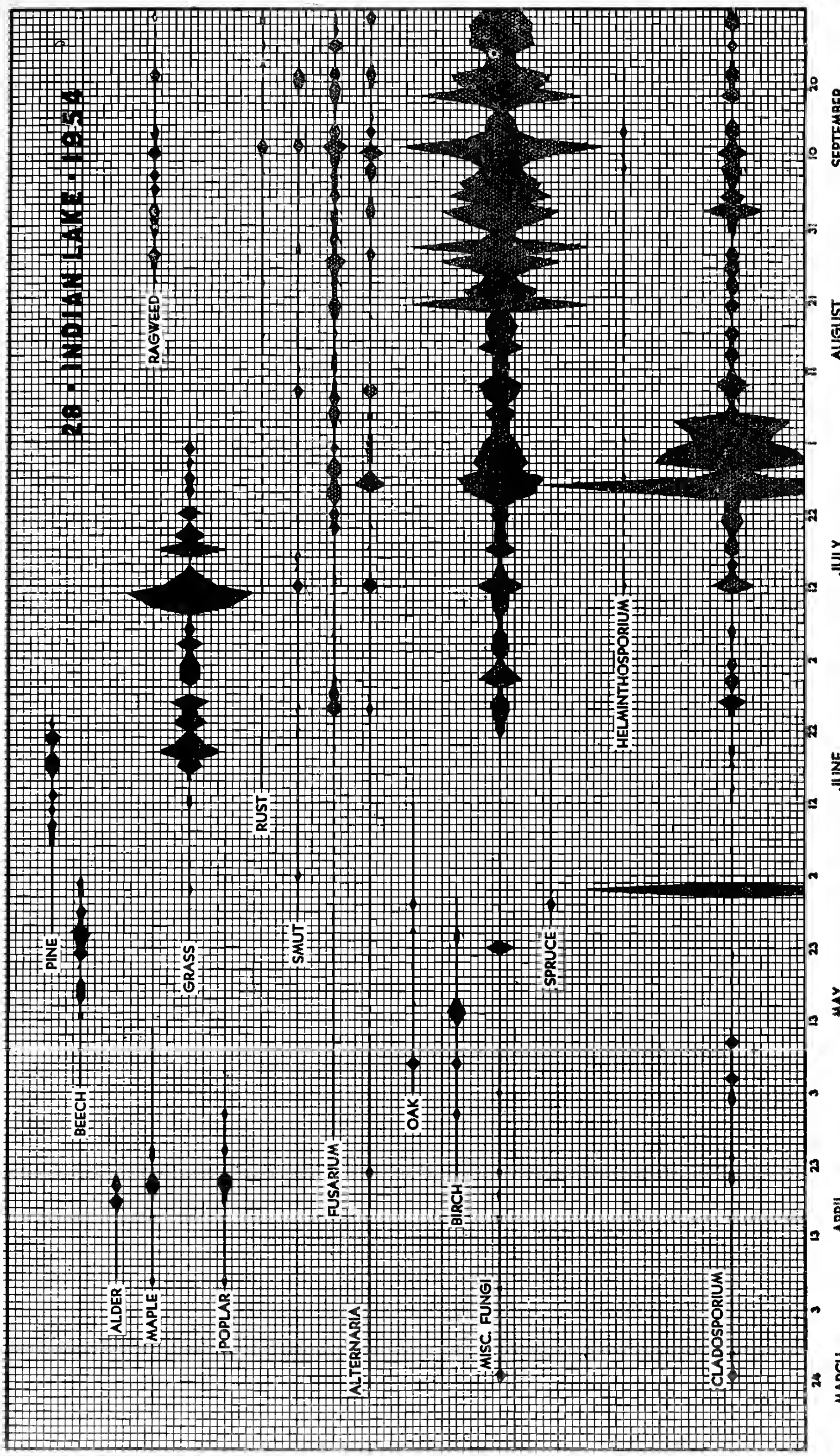

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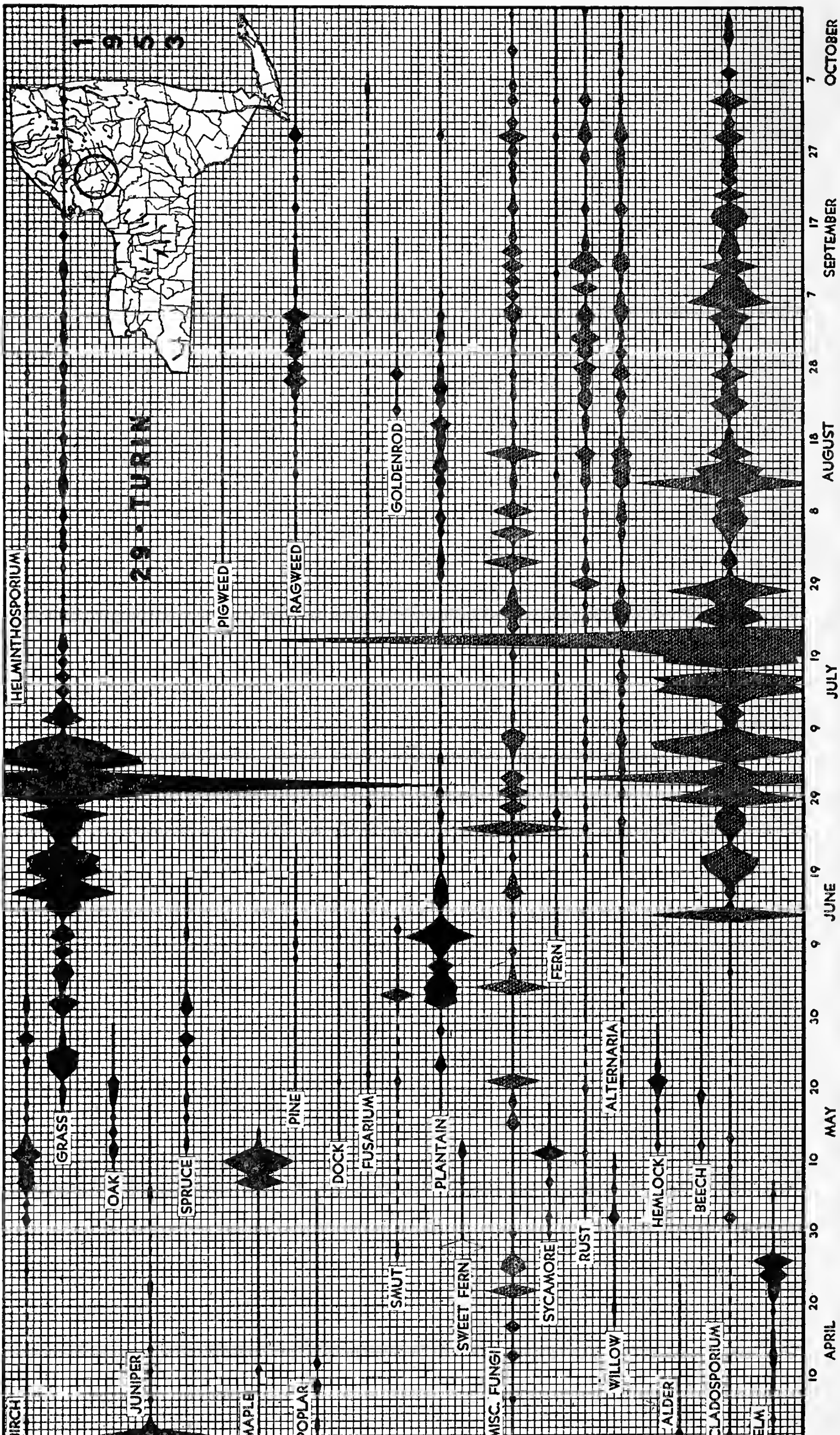
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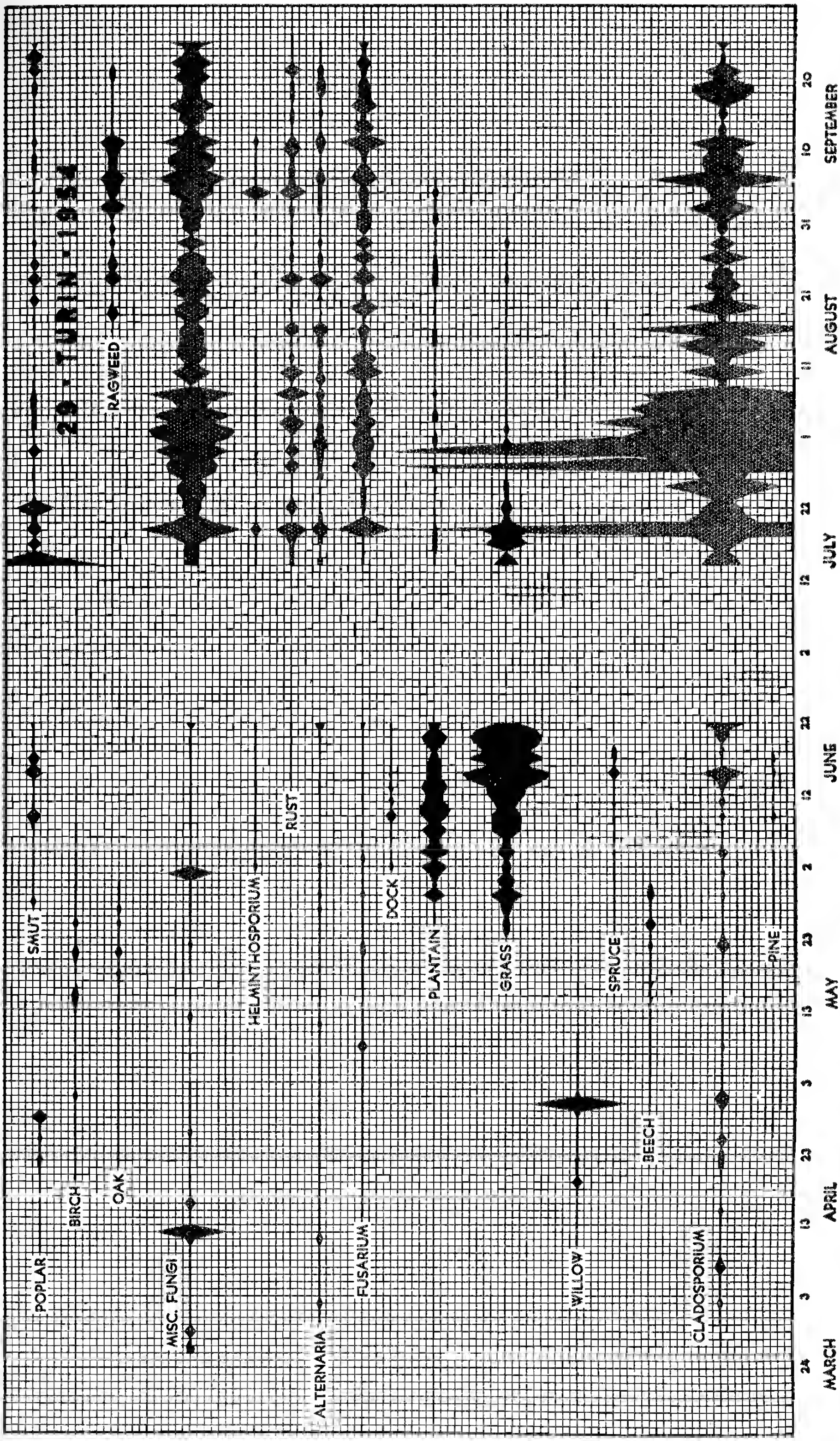
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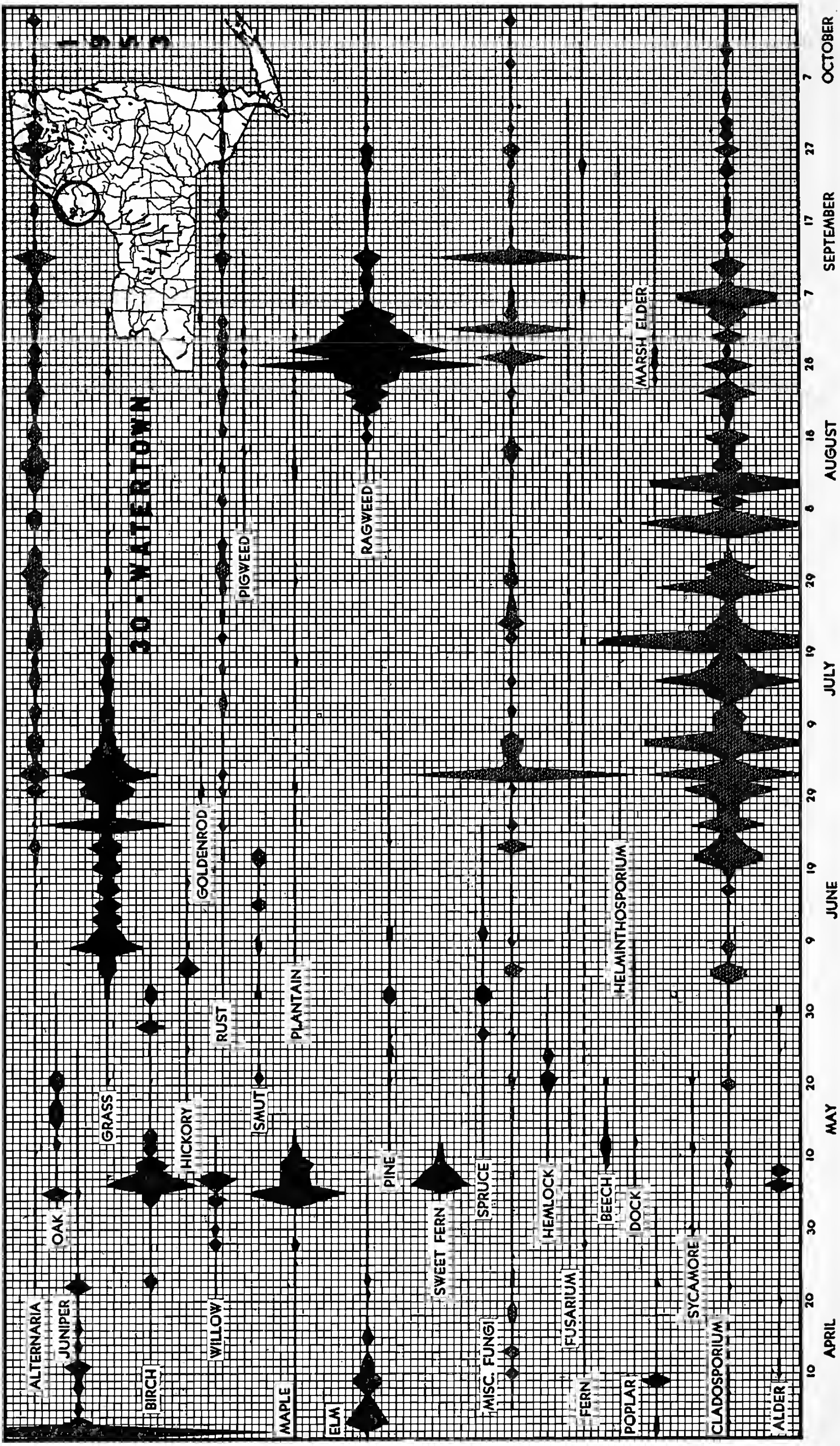
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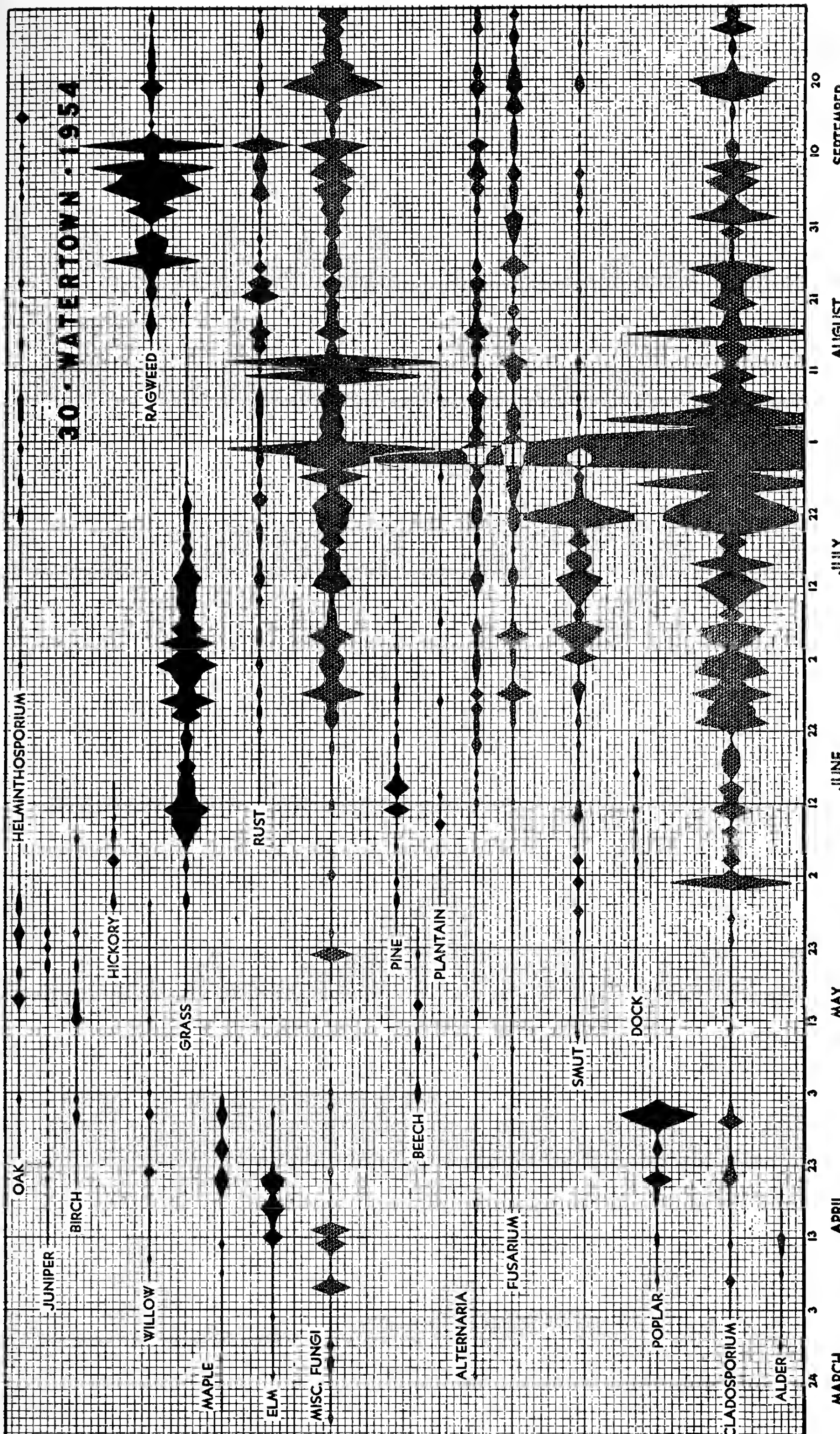

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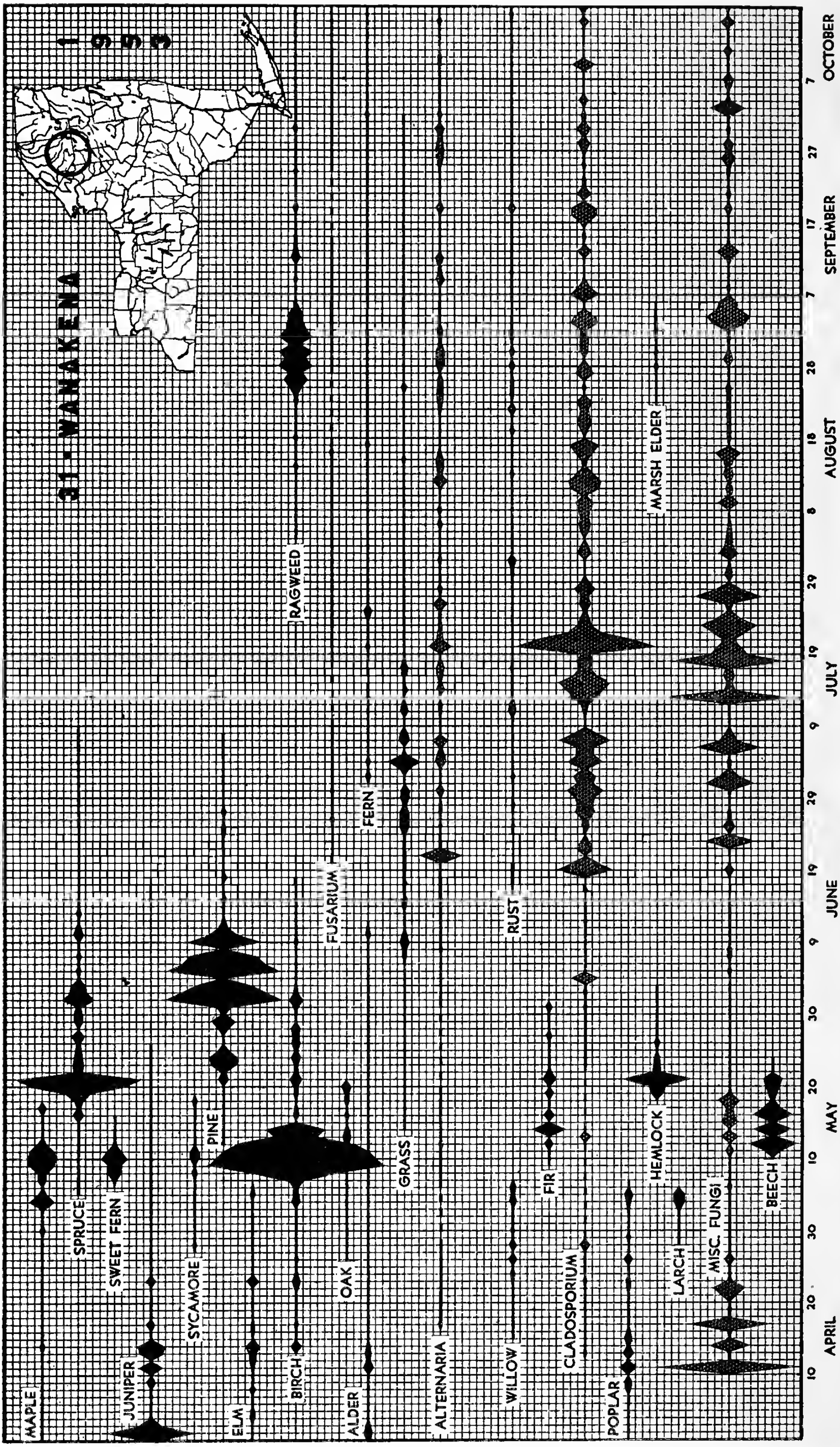

31 • WANAKENA
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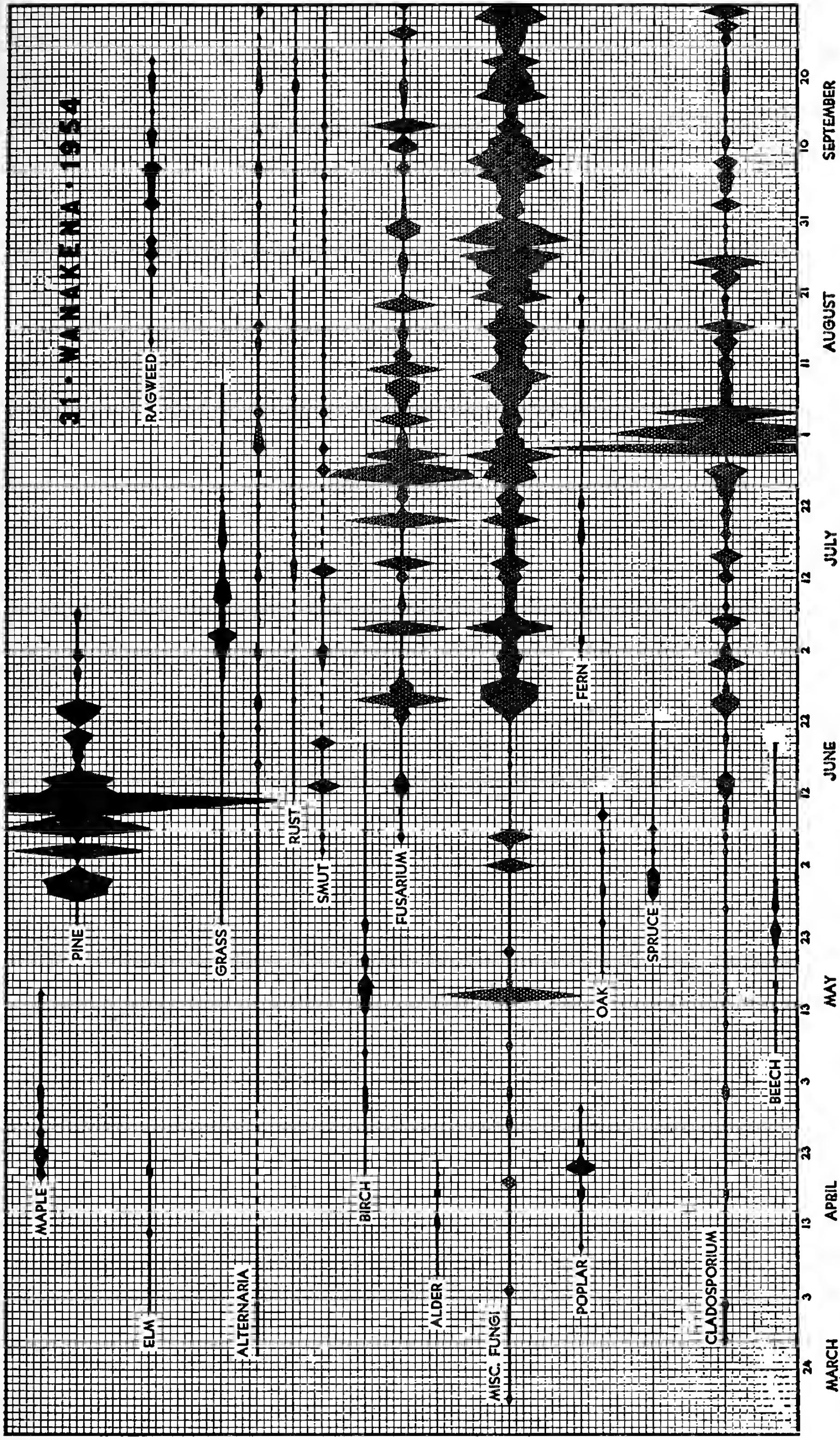
31 · WANAKENA · 1954
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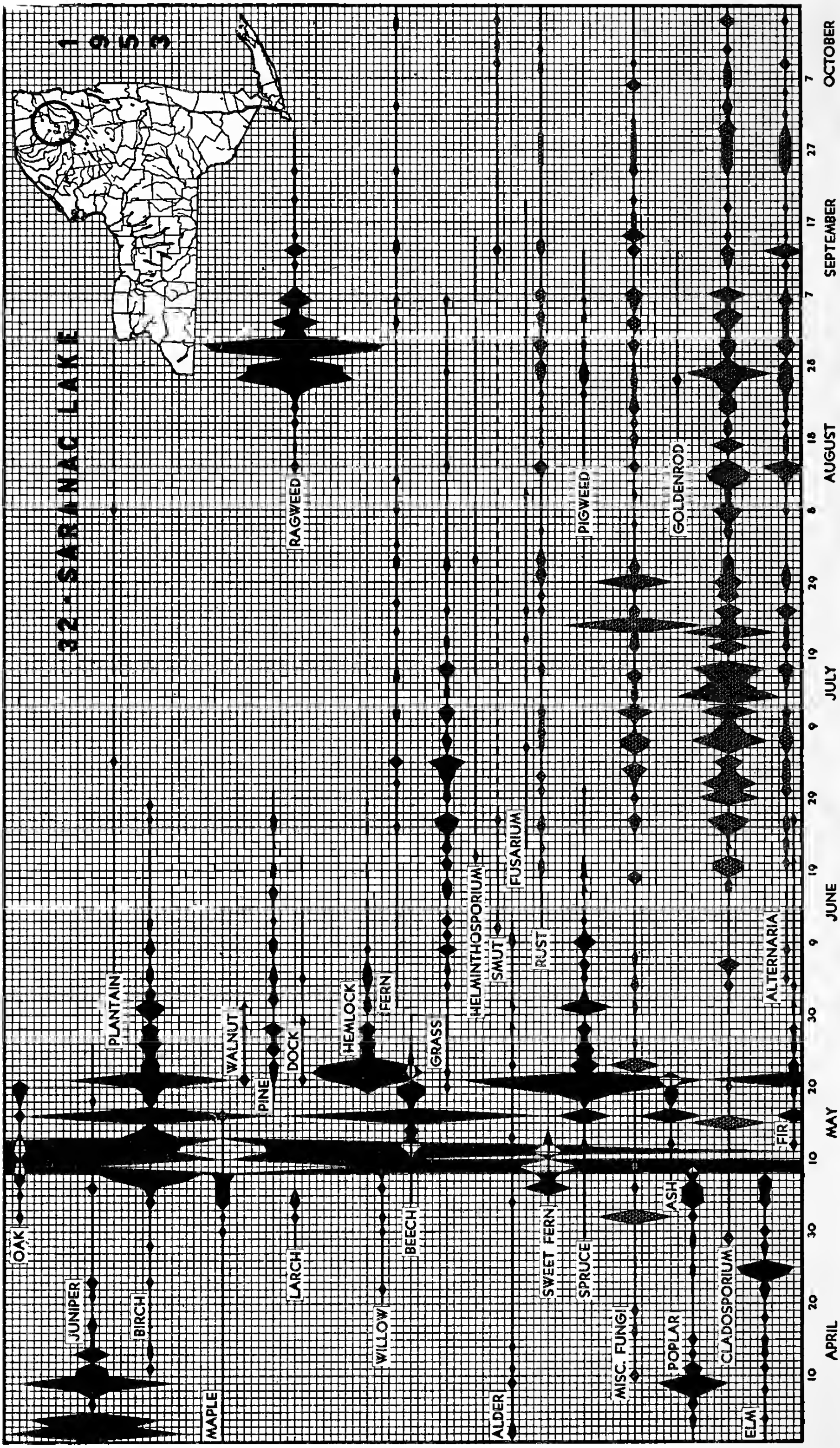
32 · SARANAC LAKE
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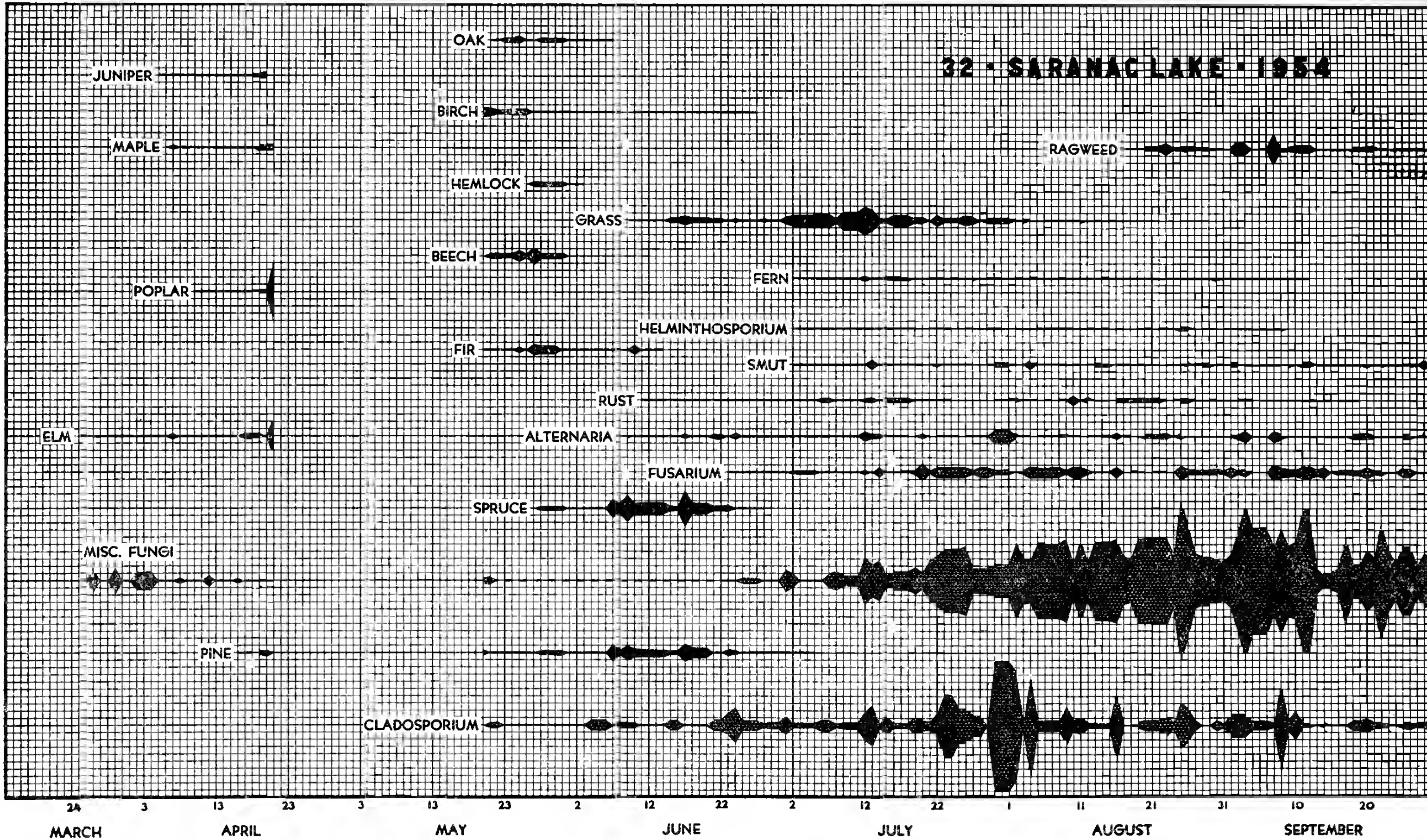
32 · SARANAC LAKE · 1954
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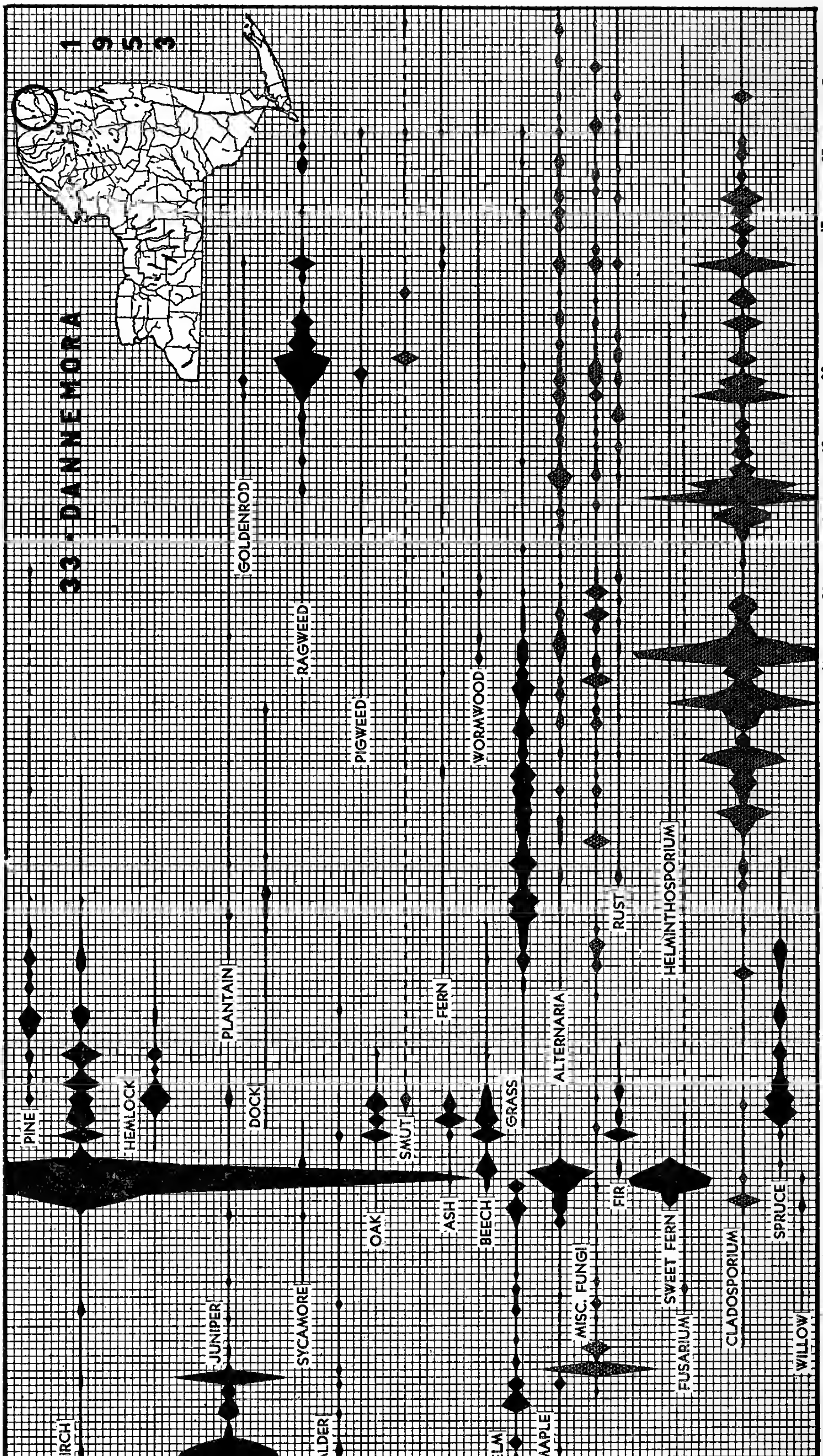
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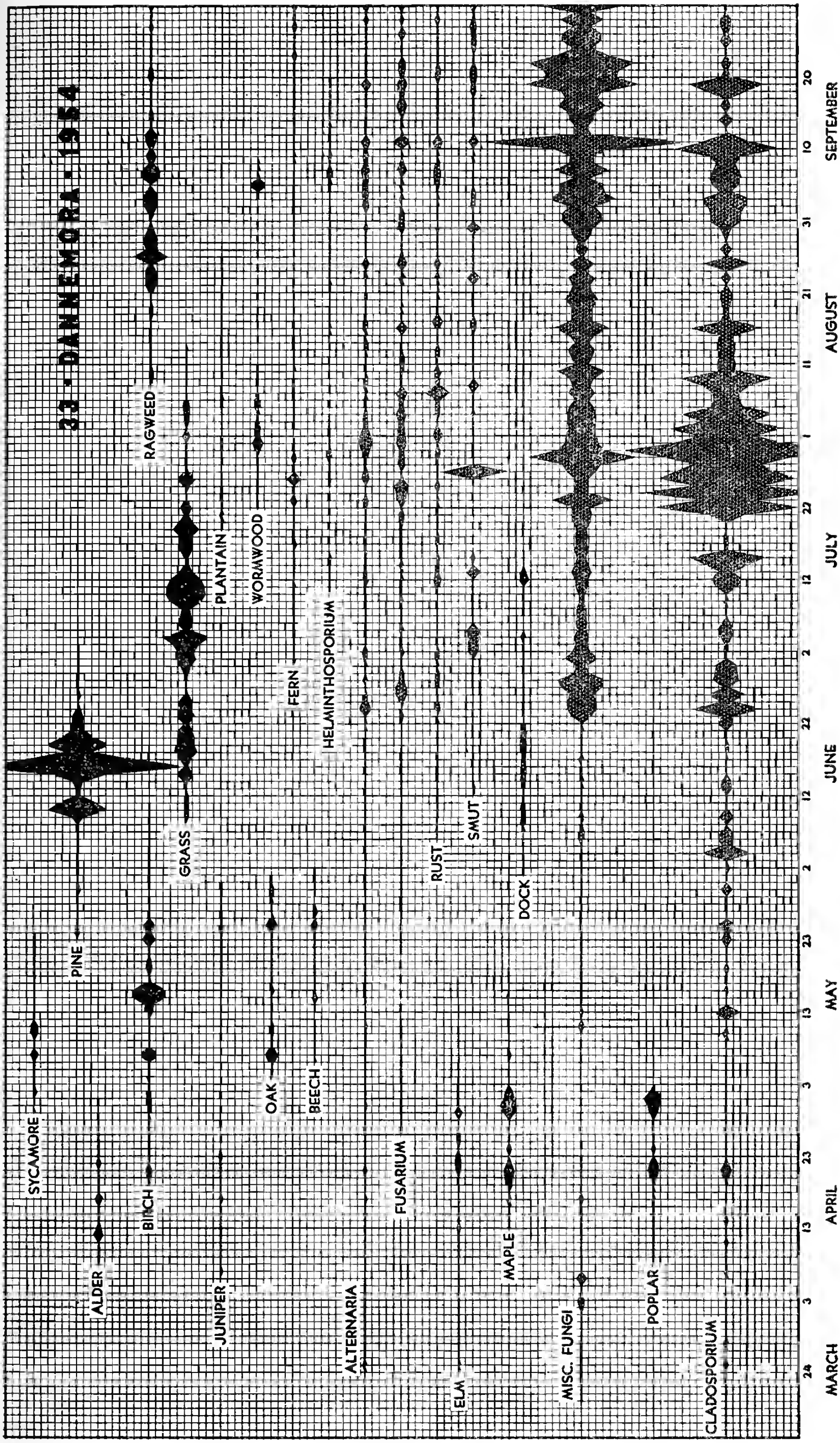
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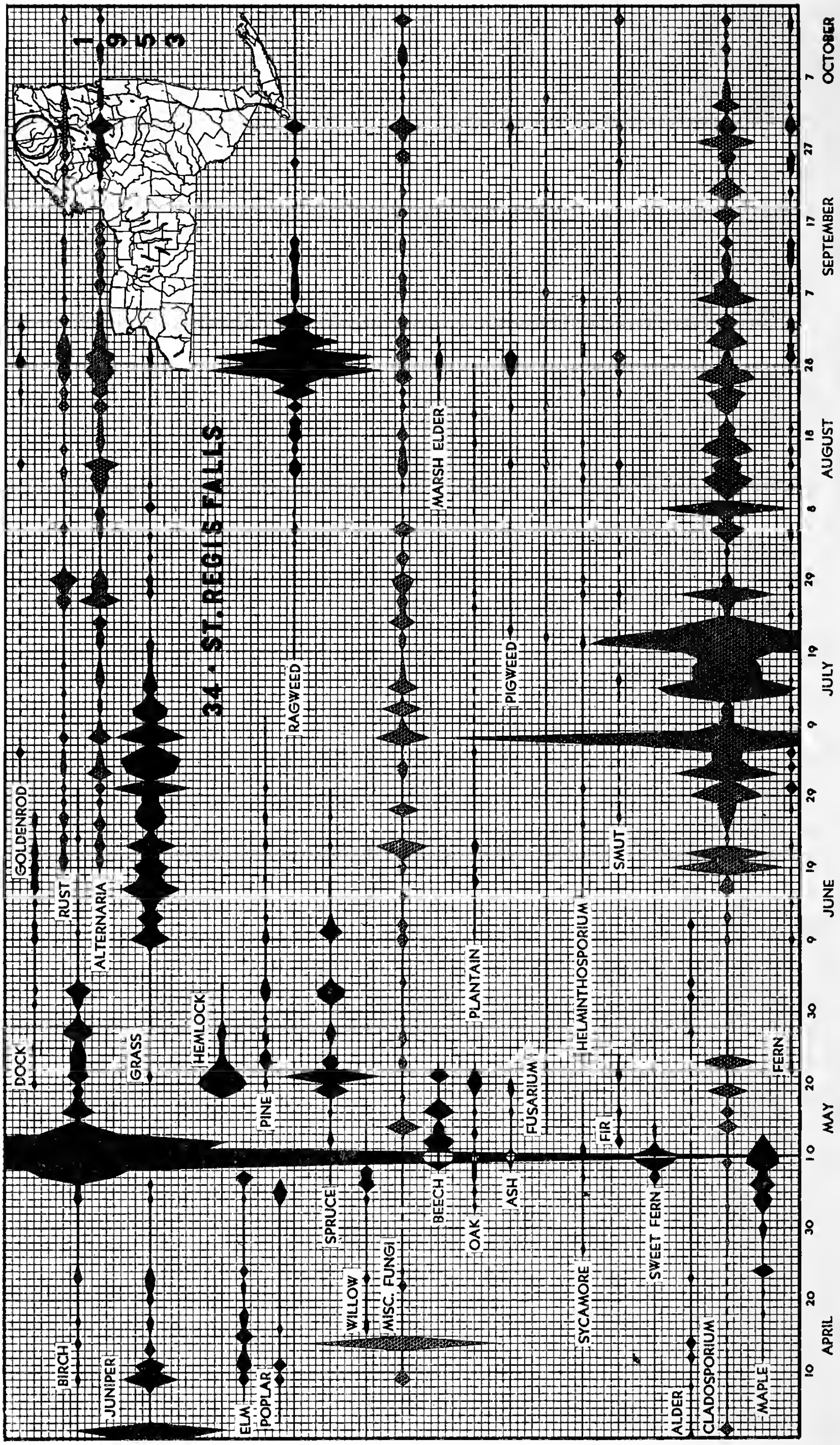
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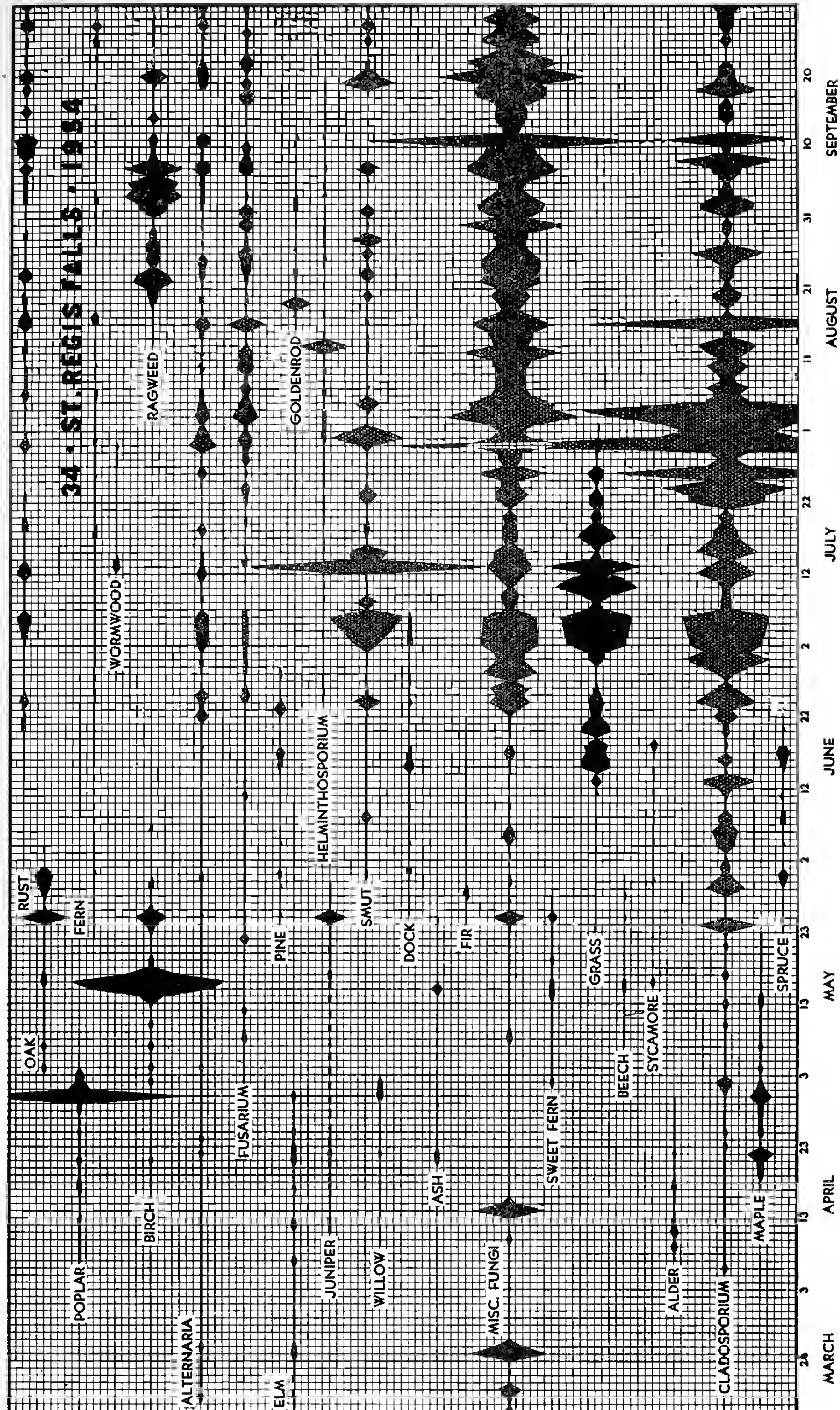
34 · ST. REGIS FALLS · 1954
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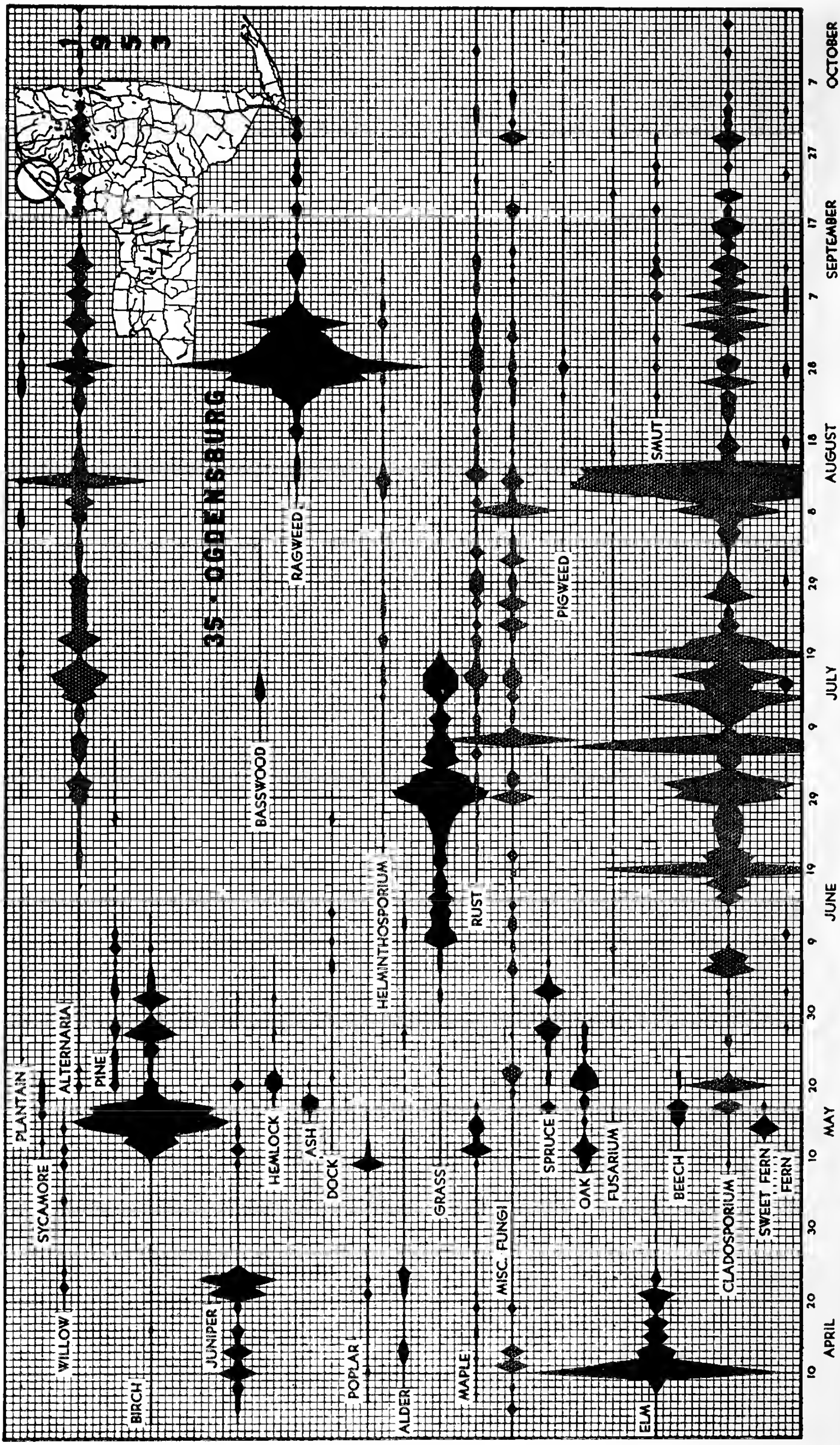
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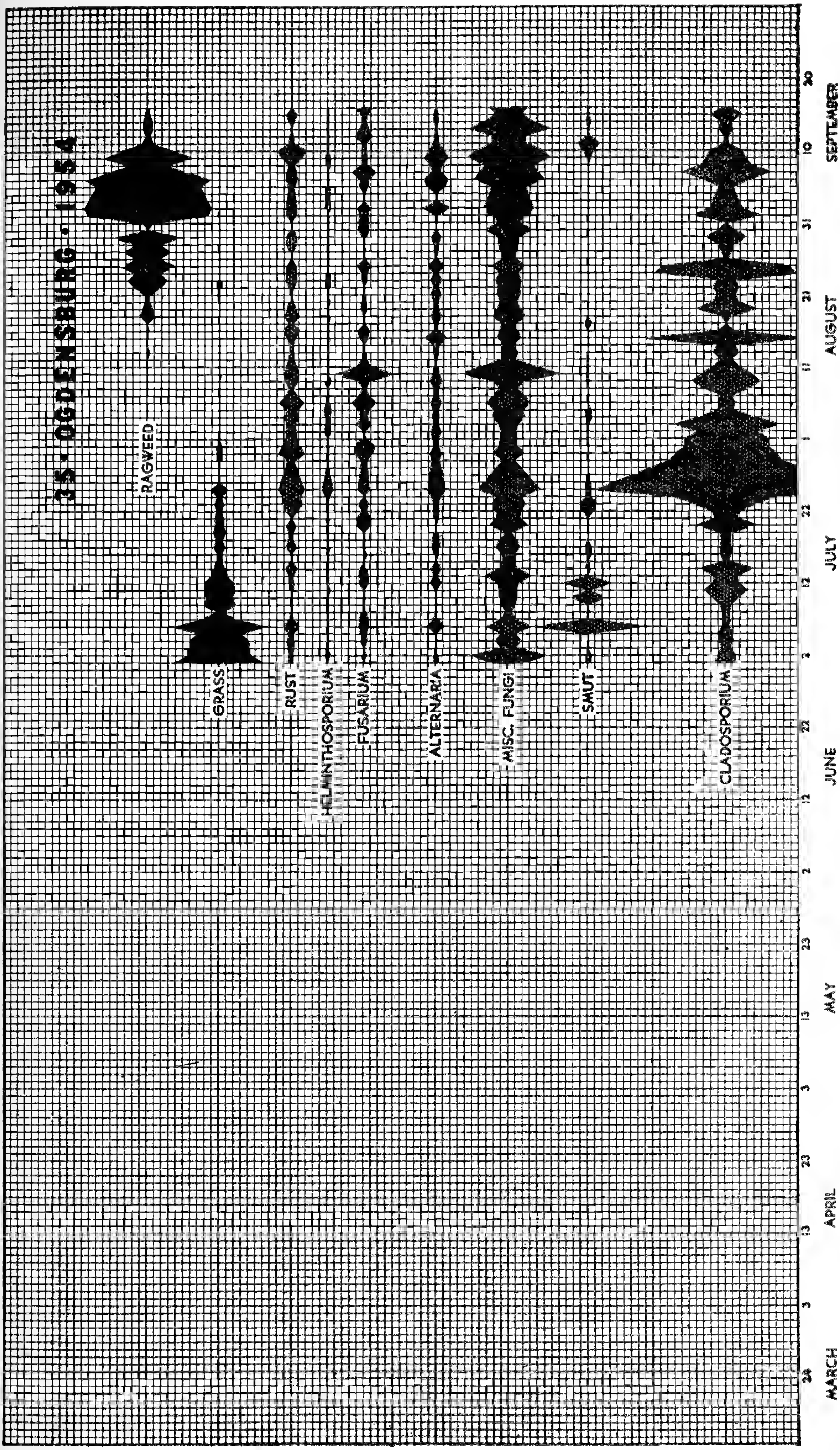
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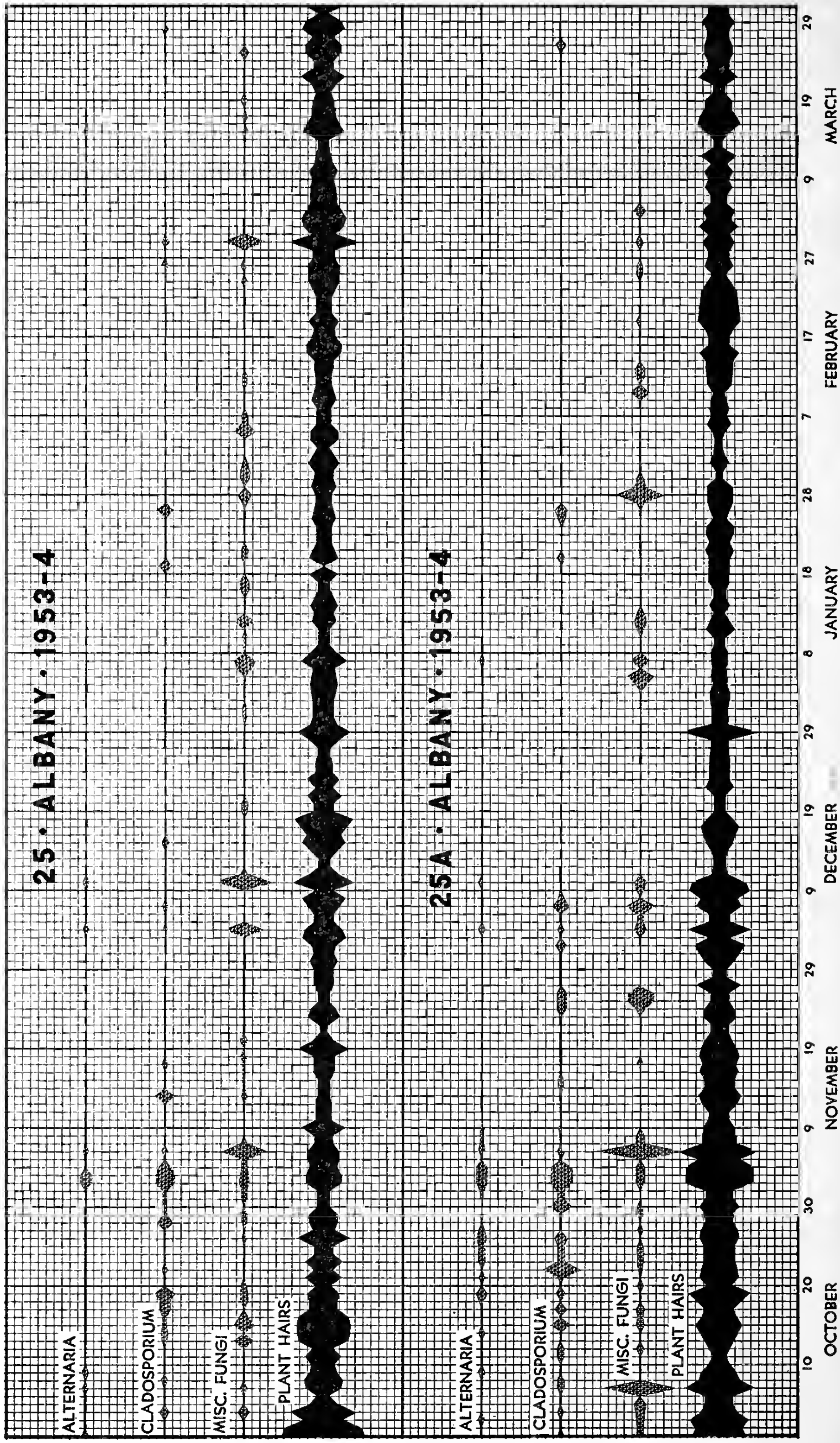
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