

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF NATIONAL PARKS,
BUILDINGS, AND RESERVATIONS

FOREST COVER TYPE MAP SURVEY
OF
PROPOSED MAMMOTH CAVE
NATIONAL PARK

June 1, 1934
by
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GENERAL DESCRIPTION

The area within the minimum boundary of the proposed Mammoth Cave National Park, comprising approximately 47,348 acres, included in the forest cover type survey, is a region of rugged topography and considerable relief, caused by the erosion of an ancient plateau.

This eroded plateau may be divided into three topographic divisions. The "Knob Belt" included the greater portion of the park area and is characterized by gentle slopes above which rise steep sided hills. The "Valley Sink Area" is recognized by its steep or precipitiously walled valleys with uneven bottoms and numerous small sink holes, is well drained, and usually much drier than the adjoining country. A considerable portion of the southeastern part of the park area is included in this division. The "Hilly Country" includes a small portion of the northwestern section of the park area along the watershed of the Nolin and Bylew Rivers.

The valleys are generally deep and narrow and are separated by flat-topped, steep-sloped hills. The present topographic features have arisen almost entirely from erosion, and the resulting configuration has evolved by stream action from a nearly level plain.

With few exceptions, the forests have been removed from the ridges and level valleys, the land being used for agricultural purposes. The majority of the forested land has been logged off ruthlessly, only the best timber being removed. Repeated fires in the slash, left by lumbering operations and windthrow in stands which have been opened up intensely, have seriously damaged the remaining forests. Virgin forests are non-existent here; however, there are divers tracts of limited extent which have not been seriously exploited.

THE SURVEY

The actual field work was accomplished during the period from January 17, 1934 to April 26, 1934. Crews of two, three, and four men were used, depending upon the percentage of wooded area, topography, increased usefulness of helpers, and distance from Mammoth Cave, the focal point of operations. During January and February the survey was confined to the south side of Green River because of periods of unfavorable weather and the poor condition of most of the roads. Progress was slow during this period. Improvement of roads in March expeditited the work somewhat, and in April the survey was pushed to completion with two crews in the field the greater part of the time.

Little difficulty was encountered in charting the boundary lines between types in woodlands of limited extent, but in larger areas more frequent contacts between the mapper and the helpers were necessary. In extensively wooded areas it was found that a circumambulation of each type served as the best method of locating the boundary in reference to the topography.

In the office the field maps were inked for clearness and permanence and placed in the files. Areas of each type were found with a planimeter, recorded, and balanced against the known total acreage within the minimum park boundary. Two maps were made and the various types were depicted in contrasting colors.

FOREST TYPES AND COMPOSITION

The existing forested areas may be included in four major forest types: namely, Northern Hardwoods, Oak Chestnut, Yellow Pine - Hardwoods, and Cove Hardwoods. Dogwood, redbud, sourwood, black haw, persimmon, sassafras, blueberry, and service berry occur generally as an understory, dogwood being the most abundant.

Sixteen cover types have been recognized in working up the final map. Very limited amounts of hemlock, yellow poplar and chestnut were encountered in pure stands; although notes on the locality and extent of these types have been recorded and placed on the field map, their location on the final map was not justified.

The following types are given in order of the relative area embraced by each; the type number, adopted, is that furnished by the Committee on Forest Types of the Society of American Foresters.

Type 49 -- Black Oak - White Oak (Oak-Hickory)

This type occurs thruout the park area, but more especially on the north side of Green River where it is found extensively on dry slopes and ridges in combination with small amounts of scarlet oak, post oak, black gum and hickory. On slopes this type occurs frequently in a narrow zone extending along the slope where outcroppings of sandstone seem to be more favorable for growth. An understory of dogwood is almost always found in this type -- Total Area 4,747 acres.

Type 57 -- Beech - Sugar Maple

This type is found in deep, moist valleys, particularly those valleys draining into Green River. Where moisture is insufficient, this type grades into Type 55, especially near the heads of the valleys. This type is also common to northern slopes. The dogwood understory, which is so prevalent in this locality, is sparse or absent in this type -- Total area 4,655 acres.

Type 55 -- Yellow Poplar - White Oak - Sugar Maple

This combination occurs irregularly on moist northerly slopes and moist coves over much of the park area, particularly on the south side of Green River. In many places the sugar maple (*Acer Saccharum*) is replaced by scattered red oak (*Quercus Borealis*); altho this combination is less common. Where sugar maple is present in this type, it seems to be the replacement species when openings occur in the forest canopy.

In the "Big Woods" section on the north side of Green River, this type exists in stands which are probably as near to virgin forest condition as any in this locality. Associates are white ash, black walnut, slippery elm, hickories, black oak, and ohio buckeye. Total area 3,819 acres.

Type 50 -- White Oak

This type occurs in small stands on the tops of ridges, but is found more often and more extensively on the upper slopes of deep valleys. Some of the finest stands of this type are in the "Big Woods" section on the north side of Green River. Associates are black oak, hickories, yellow poplar and black gum. Total area 2,970 acres.

Type 33 -- Scarlet Oak - Black Oak

In this type each of the predominant species occur frequently in small almost pure stands, altho they are generally found in mixture with the Scarlet Oak more numerous. The major associates are white oak, southern red oak, hickory, black gum, sourwood, and dogwood (understory).

This type is distributed over all parts of the park area, but is only one of the more common types on the south side of Green River. Total area 2,200 acres.

Type 32 -- Black Oak - Post Oak

This type occupies considerable areas on broad ridges and slopes that are dry but moister than soils supporting the Post Oak - Blackjack Oak type. Ridges of sandstone formation seem to be favored situations. This type is found in abundance on the South side of Green River, but occurs very rarely on the north side. Associates are scarlet oak, blackjack oak, white oak, southern red oak, and dogwood (understory).

Type 46 -- Eastern Red Cedar

This type is found pure on most sites, but is often associated with white oak, black oak, blackjack oak, post oak, blue ash, and hop hornbeam. It is typical of southern exposures; altho occasionally found on north slopes on limestone soils. It is a very important species in the natural regeneration of pastures and old fields. Large areas, chiefly old pastures, are coming back to Eastern Red Cedar. Total area 1,600 acres.

Type 36 -- Chestnut Oak

Chestnut oak occurs in rather a spotty manner on thin soil along ridges, usually on the poorer sites on southerly slopes. On better sites, it is an important replacement species when it existed in the stand previous to fire or lumbering. Associates are white oak, black oak, scarlet oak, post oak, sourwood, and hickory. Total area 1,377 acres.

Type 34 -- Southern Red Oak - Scarlet Oak

Southern Red Oak--Scarlet Oak occurs on broad uplands and ridges on dry sites. On areas where fires have seriously and repeatedly swept, the percentage of southern red oak is greater. On some soils this type is important in natural regeneration in old fields. On the park area, it is found extensively on Mammoth Cave Ridge. Common associates are black oak, white oak, post oak, black gum, and hickory. An understory of dogwood is nearly always present. Total area 692 acres.

Type 44 -- Virginia Pine

In some sections of the park area, usually on the drier sites on gravelly soils, virginia pine is an important species in the regeneration of old fields and pastures. It usually occurs pure or in mixture with small amounts of eastern red cedar, southern red oak, or shingle oak. In this locality, it does not seem to have any preference of exposure, growing equally well on north and south slopes on very dry sites. The most extensive stand is in Eaton Valley near Mammoth Cave Post Office. Total area 518 acres.

Type 59 -- River Birch - Sycamore

Type 59 is found almost exclusively along the banks of the Green River. The sycamore frequently reaches a height of one hundred feet and a diameter of six feet. Common associates are slippery elm, blue beech (hornbeam), black willow, hackberry, box elder, and cottonwood. In addition to the presence of this type on the deep alluvial soil of the Green River bottomlands, it is also common in very limited stands in the bottoms of valley sinks in which the drainage is poor. In some instances sycamore and black willow, growing in sinks, have been covered to a depth of three or four feet by soil washing from adjacent hillsides. Total area 495 acres.

Type 31 -- Post Oak - Blackjack Oak

This type occurs on very dry ridges and rocky southern and western slopes. Post oak is more abundant in the combination and the associates are black oak, white oak, hickory, sourwood, and hop hornbeam. It is found in stands of limited extent on the south side of Green River. Only occasionally do either of these species occur on the north side of Green River. Total area 417 acres.

Type 58 -- American Beech

Beech is found in almost pure stands on moist easterly slopes with occasional sugar maple, yellow poplar, white ash, white oak, and hickories. It is very limited in extent in this locality which is no doubt due to varying methods of treatment of woodlands. Type 57, Beech with greater quantities of sugar maple is found more frequently. Dense shade under the canopy of this type precludes the usual dogwood understory. Total area 354 acres.

Type 30 -- Post Oak

Found principally on dry sites along ridges and where the soil is thin with limestone outcroppings. Associates are black oak, blackjack oak, scarlet oak, southern red oak, white oak, and hickories in small quantities, the post oak composing from 70% to 80% of the stand. In some places this type is important in regeneration of old fields; however the rate of replacement is very slow. Total area 320 acres.

Type 14 -- Sugar Maple

Limited in extent in this locality; it is generally found in deep, moist valleys near the river. Northern exposures are favored and in such situations this type may ascend nearly to the top of the slope. Common associates are yellow poplar, beech and white oak. Altho sugar maple is

a common species north of Green River, it could not be classified in this type but was included in Type 57, Beech-Sugar Maple, since it was in combination. The only pure stands of sugar maple are south of Green River. Total area 223 acres.

Type 53 -- Yellow Poplar

On moist situations on abandoned fields and on lower slopes and flats, yellow poplar is found as the dominant species in combination with dogwood, sassafras, sumach, persimmon, hickory and redbud. It is not important in area or occurrence in this locality. Total area 52 acres.

Type 56 -- Chestnut

On steep slopes and crests of hills, small stands of pure Chestnut still exist or occur in mixture with black and white oak. It is usually found in stands of from one to three acres. Nearly all of the trees show advanced stages of infection; altho individuals in pure stands appear to have the greatest resistance to the chestnut blight. Scattered trees are either dead or barely alive.

Hickories seem to be abundant in the replacement of dead chestnut in this locality. Associates: Black oak, white oak, hickory and black gum. Total area 42 acres.

Type 47 -- Black Locust

Where this type occurs over any considerable area, it has been planted, usually in combination with black walnut. Several such plantations occur, and of these, only one is of any great extent. This area has been shown on the accompanying map. Total area 21 acres.

Type 11 -- Hemlock

Altho not shown upon the accompanying map, this type occurs in several very small areas, the largest being about four acres. It grows in moist cool glades in an almost pure state with occasional yellow poplar, holly, and umbrella magnolia. It prefers north slopes; on such situations it reaches its best development. Some of the trees found were about twelve inches in diameter. Mountain laurel and burning bush are plentiful in this type. Total area 10 acres.

N. R. -- Not Restocking

A total of 14,360 acres is at the present time being cultivated and pastured, or has been abandoned so recently that natural regeneration has not had sufficient time to recapture it.

R. -- Restocking

A total of 6,800 acres, formerly cultivated or pastured, on which natural regeneration, either from sprouts or from seedlings, has definitely captured the area and it is in the process of passing back to woodland. In most cases the reproduction is very dense, but the percentage of desirable species is low. Species found on these areas, in order of their relative abundance, are as follows: Sassafras, persimmon, dogwood, red

cedar, sumach, hickory, black gum, yellow poplar, virginia pine, winged elm, post oak, and southern red oak. On these areas growth is slow among the desirables until a litter is formed. Eastern red cedar and virginia pine are coming back in old fields and pastures in an almost pure state, especially on dry slopes and in dry valleys.

PAST TREATMENT

The forest cover, existing at the present time over the whole area inside the minimum park boundary, has been greatly influenced by fires, lumbering, and grazing.

On some areas where it has been the practice to burn the woods over each year, the predominant species to be found are thick barked and have been able to survive the numerous fires, and to reproduce themselves if the practice was discontinued before all the trees had been killed.

Some woodlots, which have been used strictly as such, have had the most valuable lumber species left for future sale, while the species which would not bring as good prices were removed for firewood. Other woodlands have had only the best timber removed for ties and lumber. Whether these tracts were grazed subsequently to the timber removal depended the quantity of desirable replacement species. If considerable time elapsed after timber removal and the nature of the soil complex was changed by grazing or by fire, weed species came in because the altered condition of the forest floor was not favorable to germination of the more desirable species. In some instances where grazing followed timber removal, all following reproduction was destroyed. Natural regeneration has occurred in old pastures with species which were not palatable to the cattle; these species are those which are capable of germination in desicated soils.

GRAZING

Grazing of forest land is almost universally practiced by landowners in this vicinity. The resulting damage in the hardwood type of forest present here is very great. The physical condition of the soil is injured and erosion is sometimes started. Reproduction and young thin barked trees are injured and often killed by hogs and goats. The belief has prevailed and still does to a certain extent, that annual burning by keeping down the brush improved the grazing. Numerous areas within the park boundary, which have been burned over each year, are now nothing more than briar patches and unsatisfactory for grazing purposes.

Numerous stands of timber, which are grazed the year round in this vicinity, are gradually being destroyed by the combination of grazing and timber removal. Since there is no reproduction to fill the openings made in the forest canopy by the removal or death of mature trees, the conversion of these woodlands into parklike or open pastureland is inevitable.

Herbaceous vegetation and many grasses, which are very palatable to cattle, are found in ungrazed woods. Grazing reduces and sometimes eliminates a number of these species altogether, and their places are taken by weed species, which, if treelike and fairly unpalatable to the cattle, will eventually capture the site, especially if the removal of the mature timber is fairly rapid.

In one heavily grazed stand of black oak and scarlet oak, the owner asked what was making large numbers of the trees die. The stand was not heavily stocked and the cause was evidently not competition but more the effect of con-

tinuous intensive grazing which was destroying the litter and humus layers. The removal of the litter and humus layers was lowering the soil fertility, decreasing the soil moisture and soil porosity, and increasing the range of fluctuation of soil temperature. Reproduction was entirely absent, and the only ground cover was shrubby species unpalatable to the cattle. The seeds, which are stored in normal litter over winter, suffer a lowering of their viability when exposed.

DEVELOPMENT CLASSES

In almost every type, particularly those of extensive area, stands of every development class exist because of the wide variety of treatment which each landowner has applied. Even aged stands occur as a result of fire or lumbering; altho the majority of the forest land is composed of individuals of all ages.

In this region the combination of site factors in all types seem favorable for reproduction, and dense stands of seedlings occur to fill in where openings have been made in the forest canopy. Many of the more recent burns are at the present time in the sapling stage with large numbers of undersirables in the association. Sprouts from the stumps of more desirable species, which formerly occupied the site, are rapidly subordinating the less desirable.

A large percentage of the trees in the polewood stage and the young timber stage bear fire-scars, and quantities of windfalls are the result of every period of high wind.

Trees in the old timber stage are culls, poorly formed, with heart or butrot, or of a species undesirable for lumber, left after the exploitation of the forest. Many are stag-headed and it will be only a few years in most cases until the various agencies now at work will bring about death.

EROSION

Erosion in excess of that taking place under average natural conditions is found quite generally over the park area; but only over a limited area is it of serious proportions.

SUMMARY

The names or combinations of name of only eighteen tree species make up the descriptive designation of the nineteen forest cover types, composing the wooded area of the Proposed Mammoth Cave National Park. The remaining sixty-four tree species subsequently mentioned, with the exception of cultivated fruit trees, are found as associates in the various types or in groups in peculiarly suitable situations within the confines of a certain type. The nineteen forest cover types are included in four major groups which are Cove Hardwoods, Oak-Chestnut, Northern Hardwoods, and Yellow Pine-Hardwoods.

The location of the various forest cover types depends upon a complexity of agencies known as site factors. Those climatic site factors influencing environment are rainfall, light, temperature, wind, and relative humidity. Other site influences are physiographic, edaphic, and biotic agencies, which in varying combinations with the climatic conditions, determine the forest cover association as do fire and human activities. The growth, form, and structure of individuals is also dependent upon site factors.

SPECIES

The most abundant species are white oak, black oak, american beech, sugar maple, yellow poplar, scarlet oak, post oak, eastern red cedar, chestnut oak, southern red oak, virginia pine, river birch, sycamore, hickories, and blackjack oak. The remaining species given in the following list are either of minor importance as type species, or are found as associates in the various recognized forest cover types:

1. Black Willow	<i>Salix nigra</i>
2. White Poplar	<i>Populus alba</i>
3. Swamp Cottonwood	<i>Populus heterophylla</i>
4. Balm of Gilead	<i>Populus candicans</i>
5. Butternut	<i>Juglans cinerea</i>
6. Black Walnut	<i>Juglans nigra</i>
7. Pecan	<i>Carya pecan</i>
8. Bitternut Hickory	<i>Carya cordiformis</i>
9. Shagbark Hickory	<i>Carya ovata</i>
10. Bigleaf Hickory	<i>Carya laciniosa</i>
11. Mockernut Hickory	<i>Carya alba</i>
12. Pignut Hickory	<i>Carya glabra</i>
13. Hop Hornbeam	<i>Ostrya virginiana</i>
14. Blue Beech	<i>Carpinus caroliniana</i>
15. Black Birch	<i>Betula lenta</i>
16. River Birch	<i>Betula nigra</i>
17. American Beech	<i>Fagus grandifolia</i>
18. Chestnut	<i>Castanea dentata</i>
19. White Oak	<i>Quercus alba</i>
20. Post Oak	<i>Quercus stellata</i>
21. Bur Oak	<i>Quercus macrocarpa</i>
22. Swamp White Oak	<i>Quercus bicolor</i>
23. Chinquapin Oak	<i>Quercus Muhlenbergii</i>
24. Chestnut Oak	<i>Quercus montana</i>
25. Red Oak	<i>Quercus borealis</i>
26. Pin Oak	<i>Quercus palustris</i>
27. Black Oak	<i>Quercus velutina</i>
28. Scarlet Oak	<i>Quercus coccinea</i>
29. Willow Oak	<i>Quercus Phellos</i>
30. Shingle Oak	<i>Quercus imbricaria</i>
31. Southern Red Oak	<i>Quercus rubra</i>
32. Blackjack Oak	<i>Quercus Marilandica</i>
33. American Elm	<i>Ulmus americana</i>
34. Slippery Elm	<i>Ulmus fulva</i>
35. Winged Elm	<i>Ulmus alata</i>
36. Hackberry	<i>Celtis Occidentalis</i>
37. Red Mulberry	<i>Morus rubra</i>
38. Osage Orange	<i>Maclura pomifera</i>
39. Umbrella Tree	<i>Magnolia tripetala</i>
40. Cucumber Magnolia	<i>Magnolia acuminata</i>
41. Tulip Poplar	<i>Liriodendron tulipifera</i>
42. Pawpaw	<i>Asimina triloba</i>
43. Sassafras	<i>Sassafras officinale</i>

44. Sweet Gum
45. Sycamore
46. Service Berry
47. Hawthorne
48. Apple
49. Black Cherry
50. Wild Plum
51. Peach
52. Pear
53. Redbud
54. Kentucky Coffee Tree
55. Honey Locust
56. Black Locust
57. Ailanthus
58. Staghorn sumach
59. American Holly
60. Sugar Maple
61. Black Maple
62. Red Maple
63. Silver Maple
64. Box Elder
65. Ohio Buckeye
66. Black Gum
67. Flowering Dogwood
68. Alternate Leaved Dogwood
69. Sourwood
70. Persimmon
71. White Ash
72. Black Ash
73. Red Ash
74. Green Ash
75. Blue Ash
76. Biltmore Ash
77. Hardy Catalpa
78. Black Haw
79. White Pine
80. Virginia Pine
81. Eastern Hemlock
82. Eastern Red Cedar

Liquidambar styraciflua
Platanus occidentalis
Amelanchier canadensis
Crataegus sp.
Malus *Malus*
Prunus serotina
Prunus americana
Prunus Persica
Pyrus communis
Cercis canadensis
Gymnocladus dioica
Gleditsia triacanthos
Robinia Pseudoacacia
Ailanthus glandulosa
Rhus typhina
Ilex opaca
Acer saccharum
Acer nigrum
Acer rubrum
Acer saccharinum
Acer negundo
Aesculus glabra
Nyssa sylvatica
Cornus florida
Cornus alternifolia
Oxydendrum arboreum
Diospyros virginiana
Fraxinus americana
Fraxinus nigra
Fraxinus pennsylvanica
Fraxinus pennsylvanica
 var. *lanceolata*
Fraxinus quadrangulata
Fraxinus biltmoreana
Catalpa speciosa
Viburnum prunifolium
Pinus Strobus
Pinus virginiana
Tsuga canadensis
Juniperus virginiana

IJE:MJ

Respectfully Submitted,

Ivan J. Ellsworth

Ivan J. Ellsworth,
Assistant Forester.



Typical scene in a lightly culled stand of White Oak (type 50). Representative of the best standing timber on the park area.



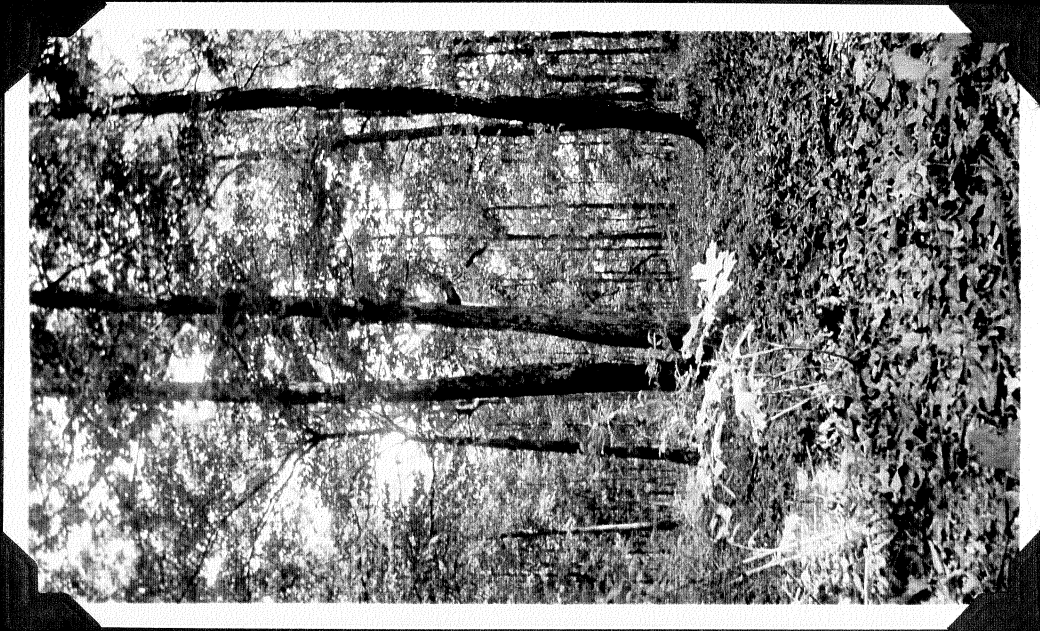
Eastern Red Cedar (type 46), gradually encroaching upon an adjacent pasture. Occasional hardwoods attain a dominant position in the stand.



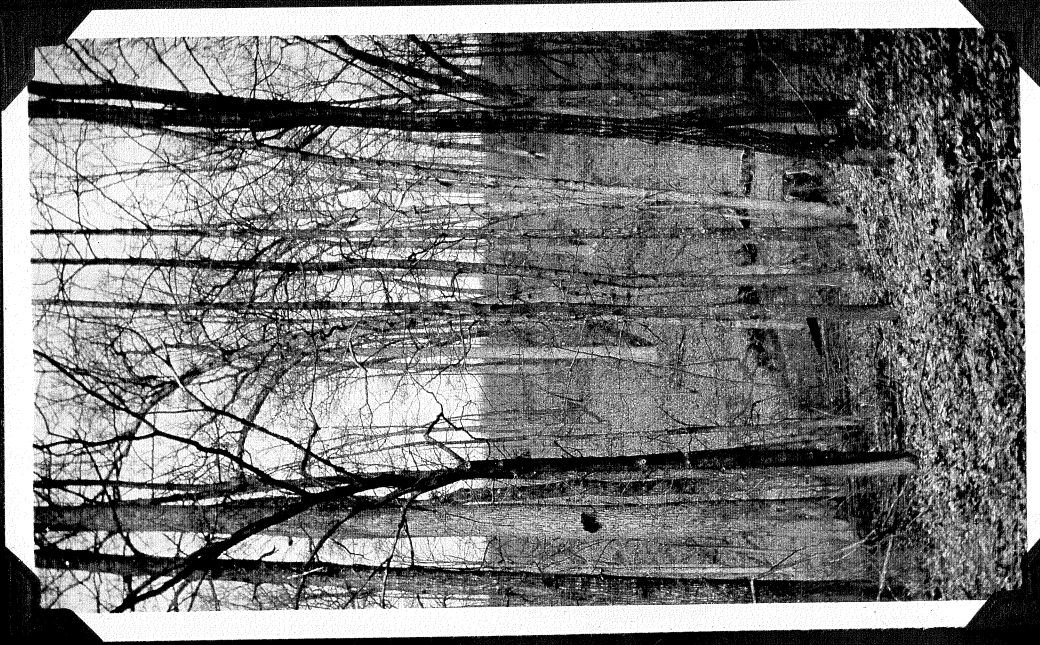
Scene in one of the better stands of Post Oak (type 30). Reproduction is plentiful.



Black Oak--Post Oak (type 32). The Merchantable Black Oak has been cut off. Reproduction of Black Oak is especially good.



Stand of Scarlet Oak and Black Oak
(type 33) which has been consistently
grazed. Note scarcity of reproduction.



Typical stand of moist site hardwoods
(type 55), lightly cut over.



A lightly grazed hillside pasture with a scattered reproduction of Hickory.



Dense stand of Virginia Pine (type 44), composed of individuals averaging 25 years of age, restocking and old pasture.



Natural reproduction of Virginia Pine growing
on gravelly subsoil in an actively eroding gully.



Natural reproduction of Sassafras and other undesir-
able species rapidly taking possession of a cornfield
only recently abandoned for agricultural purposes.