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Forest Vegetation in Maryland

Maryland Department of State Planning

technical series
GENERALIZED LAND USE PLAN

november 1974

ERRATA

- p. ii Include *P. Danko in the list of Research Analysts
- p. iii In line three of the Abstract, the word should be cover, not covers
- p. vii In line two of the third paragraph, the words "so as" should be omitted
- p. 1 The footnote should read "is synonymous," not "in synonymous"
- p. 3 In the first paragraph, the footnote symbol ¹ should occur at the end of the first sentence, not after "land"
- Figure 1 should show Carroll and Talbot counties, rather than Carroll and Kent counties, with less than thirty percent of their areas forested
- p. 4 In line four of the last paragraph, the word should be changed, not changes
- p. 10 In line eight of the last paragraph, the word should be inventory, not inventor

FOREST VEGETATION IN MARYLAND

PUBLICATION

Maryland, Department of State Planning

TECHNICAL SERIES NOVEMBER 1974
GENERALIZED LAND USE PLAN

HONORABLE MARVIN MANDEL
GOVERNOR OF THE STATE OF MARYLAND

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ABSTRACT

This publication, prepared as part of the land capability analysis of the Generalized State Land Use Plan, is designed to be used with a set of county maps depicting vegetation covers in the State. The manual lists the types of vegetation in the State and briefly explains the importance of vegetation as a variable in land use decisions. It also describes the sources, manipulation and interpretation of vegetation data as it was computer encoded, as well as the production of the companion vegetation maps.

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Preface

The legislation creating the Maryland Department of State Planning (Articles 41 and 88C, Annotated Code of Maryland) assigns to the Department the responsibility of preparing and updating "a plan or plans for the development of the State, which plan or plans collectively shall be known as the State Development Plan."

Numerous special studies and projects have been or are being completed by the Department of State Planning, including a study of the Chesapeake Bay, a study of State Wetlands, an Outdoor Recreation and Open Space Plan, and a Historic Preservation Plan.

In addition to the above studies, the Department of State Planning is currently preparing a State Development Plan; this plan seeks so as to guide the development of the State to assure the general welfare and prosperity of the people of Maryland. Studies of social, economic, and physical conditions and trends in the State are the basis of the plan. The plan has two major elements, the Land Use Plan and the Human Services Planning and Coordination Project; the State's physical resources and the well-being of its citizens are emphasized equally.

The Land Use Plan will describe desirable general patterns for the development of land related facilities and services, as well as suggest policies for the management of the State's natural resources. It will include:

1. a statement of the goals, policies, standards and criteria upon which the plan is based;
2. recommendations for the most desirable general pattern of land use in the State;
3. recommendations for major transportation facilities and services in the State;
4. recommendations for major public facilities and services;
5. recommendations for actions to implement the plan.

The methodology utilized for the development of the land use plan was based upon four assumptions:

1. the plan sets the state policy for land resources, facilities, and services;

2. the plan is based upon an evaluation of the state's characteristics, land resources, and citizens' needs and aspirations;
3. the plan selects priorities;
4. the plan process can have a substantial impact upon the quality of life and growth in the state.

Several phases are necessary to prepare the Generalized Land Use Plan:

1. preliminary research and analysis
2. capability analysis
3. suitability analysis
4. goal and policy formulation
5. preliminary formulation of land use plan alternatives
6. review of alternatives and final plan selection

The capability/suitability phases form the heart of the plan. Within the context of the Land Use Plan, capability refers to the ability of land to support particular uses based upon the relevant physical characteristics of the land. Capability analysis selects the most important factors for specific land uses, then identifies areas of the State which can best support the various types of land use. Capability factors studied are:

1. topography
2. floodplain delineation
3. soil characteristics
4. wildlife and fish habitats
5. forests by type
6. geological setting
7. aquifers
8. mineral resources
9. unique natural features and scenic areas
10. surface water quality

The desirability of particular land use is also determined by existing and proposed land-related services and facilities. Suitability analysis considers capability factors, as well as:

1. existing and proposed land use
2. existing and proposed sewer and water service
3. existing State and Federally owned lands
4. existing and proposed transportation facilities
5. existing local and regional plans
6. historical structures or areas

Only a limited amount of new data was gathered in the preparation of these capability/suitability analyses. Existing information was converted into suitable formats, and every effort was made to correlate the diverse data sources.

This manual is part of a series produced in conjunction with the preparation of the capability and suitability analyses of the Land Use Plan. These manuals have been prepared so that the major assumptions and techniques utilized in the development of the data base are available to those not directly responsible for its production in the hopes that they will be able to determine if the data base may be of use to them, to understand the limitations and qualifications of the data, and to suggest improvements. Through the publication of this manual, the Department hopes to share existing information with those who may have interest in the use of it.

I. Introduction

1

Forests affect the capability of land to support particular uses. The location and specific qualities of forests are important in establishing balanced ecological systems, as well as in determining the economic and recreational potentials of an area. Forests have obvious economic value; they supply timber, provide jobs, and increase land values. Wooded areas also provide the opportunity for recreation such as hunting and hiking. Of prime importance is the relationship between forests and the environment. This relationship affects the economic and recreational potentials of forest areas. Environmental conditions (such as light, temperature, moisture, soil, slope, altitude, wind, pollution, etc.) originally determine the location, as well as the composition and quality, of forests. Forests, in turn, exert strong influences on the immediate environment and ecological systems, as noted below.

Atmospheric Influences of Forests

- a. reduce the force of wind
- b. increase humidity
- c. moderate temperatures
- d. produce oxygen
- e. filter the air of pollutants and dirt
- f. serve as sound barriers

Soil Influences of Forests

- g. generate humus
- h. stabilize the soil, thereby reducing water and wind erosion
- i. increase porosity of the soil, thus increasing water storage capabilities.
- j. function as a filter system to insure water quality

1

In this manual, the term forests is synonymous with vegetation; forest data was the only vegetation data mapped and encoded.

Water Influences of Forests

- k. protect aquifer re-charge areas
- l. reduce flood peaks and damages
- m. eliminate excess erosion and sedimentation

Additionally, Maryland's wildlife depends on the food and cover provided by over story and ground cover. For example, the fruit - or mast - producing trees such as the oaks, pines, hickory, beech, cherry, dogwood, hackberry, and gum are important sources of fall and winter food for some wildlife. Ruffed grouse and wild turkey live in the mixed hardwood and hardwood-conifer forests of the four westernmost counties of Maryland. Other species prefer the older, second-growth mixed hardwood stands where there exists a variety of cover material and dens. Areas covered by scrub or light crown cover are integral part of support systems for extensive biologic activity.

II. Forest Land in Maryland

1

Maryland's commercial forest land area of 2,885,000 acres represents 46 percent of the land area in the State. This proportion varies considerably among counties, from 30 percent in two predominantly farm counties, Carroll and Talbot, to 70 percent in the two most western counties, Allegany and Garrett. The counties with the densest population in the State - Baltimore County and the two-county area (Montgomery and Prince George's) surrounding Washington, D. C. - still have 35 to 40 percent of their land area in commercial forest land. (See Figure 1).

Figure 1: Forest Cover in Maryland in 1964

FOREST COVER IN MARYLAND, 1964

3

1 The following six pages are reprinted from The Timber Resources of Maryland by Roland H. Ferguson, U.S. Forest Service Bulletin NE-7, 1967. It is based on the 1964 survey of timber resources in the State and compared with data from the initial timber survey in 1950.

Commercial forest land in the State differs from the initial (1950 forest) survey estimate by 12,000 acres, less than $\frac{1}{2}$ percent. Three of the four geographic areas recognized in this survey had insignificant changes in the acreage of commercial forest land. The Southern (Maryland) unit had the largest change, a decrease of 28,600 acres (a 6-percent change). Individual counties showed considerably more variation in percentage of change, but most of the changes can be attributed to accuracy levels obtained in sampling. Counties in the Western (Maryland) unit, Southern (Maryland) unit, and Worcester County of the Southern Eastern Shore unit are the most heavily forested; more than 60 percent of their land areas is classified as commercial forest land.

A small amount of forest land (only 1 percent of the total) is classified as noncommercial. About 24,000 acres of this noncommercial forest land are unproductive because of adverse site conditions; another 19,000 acres are unproductive because of experimental ammunition contamination; and the remaining 35,000 acres are withdrawn from timber utilization. About 18,000 acres of this withdrawn productive forest land are in state parks, and the rest is owned by federal agencies, principally the National Park Service.

A. Ownership Patterns

Farmers, or operators of farms, own about one-fourth of the commercial forest land in Maryland - 767,000 acres. Forest industries own about 3.5 percent, or about 101,000 acres. Public agencies own 6 percent of the commercial forest land (189,000 acres), of which the State owns 144,000 acres. Municipalities own 31,000 acres, and federal agencies own 14,000 acres.

Many other types of owners such as business men and wage earners, professional people and sales clerks own almost two-thirds of the commercial forest land (1,828,000 acres). Their individual holdings are not large; most of them are less than 100 acres.

Some changes took place in the pattern of ownership. The acreage of federally-owned commercial forest land in 1950 was 54,000 acres, but now the total is 13,900 acres. Several thousand acres changes from federal to private ownerships and state ownership. However, most of the change in federal ownership was due to the reclassification of some of the commercial forest land into the unproductive and reserved-productive forest land category.

State-owned commercial forest land increased from 128,000 acres to 144,000 acres from 1950-1964 primarily through the acquisition of the Wicomico State Forest, and some wildlife management areas such as Dans Mountain and Warrior Mountain in Allegany County.

Farm woodland acreage decreased by about 400,000 acres in 14 years. The 1959 U.S. Census of Agriculture showed a similar trend in the farm woodland acreage in Maryland - a decrease of 19 percent for the 9-year period between 1950 and 1959. If the present trend of farmer-owned woodland continues, farmers soon will own less than one-fourth of the commercial forest land, and miscellaneous private ownerships will make up more than two-thirds of the total.

B. Forest Types

The southern-pine forest type occupies about 600,000 acres (21 percent of the commercial forest-land area) and is made up chiefly of two species--loblolly pine and Virginia pine. The type also includes small amounts of pond pine, pitch pine, and shortleaf pine. Loblolly pine is particularly common in the southern counties of the Eastern Shore and extends northward to beyond the Bay Bridge. It also occurs in the lower counties of southern Maryland. Virginia pine often forms nearly pure stands on drier sites of the Eastern Shore and on abandoned fields.

In the southern Eastern Shore, the southern-pine type makes up almost one-half of the forest area (260,000 acres). The southern (Maryland) unit has more than one-third of its forest area in this type (157,000 acres). Although one-eighth (181,000 acres) of the forest area in the north-central area of the State is also in the southern-pine type, it is concentrated mostly in the six southern counties, where Virginia pine is the principal species.

The oak-hickory forest type makes up the largest acreage of any forest type in the State. It covers 1,416,000 acres (49 percent of the commercial forest-land area of the State). Included in this type are about 350,000 acres upon which yellow-poplar is the principal species.

In the Western (Maryland) unit, the oak-hickory forest type makes up 75 percent of the total; in the north-central area of the State, this type makes up 58 percent; and in the southern areas it makes up only 23 percent of the commercial forest land.

The oak-gum forest type ranks third largest (12 percent or 340,000 acres), in the State. This broad type is made up of several minor types in which sweetgum, blackgum, river birch, green ash, or swamp-oak species make up the plurality of stocking.

Oak-pine types have a 25 - to 49 - percent stocking of southern pines. They make up one-tenth (299,000 acres) of the forest area in Maryland. All other forest types make up only 8 percent of the area - 232,000 acres.

Maryland's forests are predominantly hardwood, making up nearly four-fifths of the growing-stock volume. Oaks found throughout the State are the principal species; they make up 46 percent of the hardwood volume. Select oak species (mostly white oak and northern red oak) make up almost one-half the volume of all oaks.

Softwood species make up only one-fifth of the growing-stock volume in the State. The proportion of softwood volume to the total growing-stock volume varies considerably for various areas in the State: from 8 percent of the total volume in Western Maryland to 50 percent in the southern Eastern Shore.

Figure 2 depicts the above information graphically.

Figure 2

C. Uses of Timber

Forest industries in 1963 produced 70 million cubic feet of timber products from the timber resources in Maryland. Nine-tenths of the output came from roundwood, and the other tenth came from plant byproducts. Sixty percent of the total production was from hardwood species, a larger proportion of hardwoods than in 1952.

The output of industrial products, which includes all timber products except fuelwood (has increased from) 53 million cubic feet in 1952 (to) 62 million cubic feet in 1963.

Sawlogs continued to be the major product in the 14 years between the two inventories, accounting for 52 percent of the total cubic-foot output. Pulpwood ranked second in the volume of output in 1963, exchanging places with fuelwood, which ranged second in 1952. Pulpwood output doubled between surveys, and fuelwood output decreased about 60 percent. Mine timbers, which ranged fourth (3 percent of the total) in 1952, accounted for negligible volume in 1963. The output of veneer logs and bolts, cooperage logs and bolts, and piling has more than doubled since 1952. Now they make up about 14 percent of the timber-products outputs. Figure 3 depicts the 1963 production levels of major timber products in Maryland.

Figure 3

Production Levels of Timber Products in Maryland, 1963

D. Projections for Forest Land

The general outlook is for little change in the total area of commercial forest land in Maryland upon which timber can be grown. Forest areas that have been removed from timber production for urban development, rights of way, or other nonforest use have been offset by areas of abandoned farmland and pastures that have reverted back to forest use.

The availability of inventory volume data from two forest surveys in Maryland (1950 and 1963) has provided an opportunity for analyzing the timber situation and the trends suggested by the real changes between inventories. Furthermore, with the trend information as a guide, projections of the timber situation to specified years are possible.

In Maryland, the estimates based upon remeasured plots reveal that softwood cut exceeds growth and that hardwood cut was only about 60 percent of the growth. Other data also reveal that the annual hardwood cut has been increasing.

Based on the past trend of hardwood cutting and indications that this situation would not materially change, the 1963 hardwood inventory was projected for 30 years, using a given cut per acre per year. The cut per acre for the projection period was increased at the same rate as it had been increasing in the past.

Softwoods presented a different situation. Although the present annual cut exceeds growth, timber owners and users in the State hope to modify this situation to prevent further drastic reduction of the softwood inventory. On this basis, the 1963 softwood inventory was projected, using the timber cut option that would bring cut and growth into balance by the end of the 30-year projection period.

What do the trend analysis and the projections indicate for Maryland forests?

Looking ahead 30 years, it is expected that the growing-stock inventory volume will be 3,290 million cubic feet, an increase of about 11 percent. In 1964 softwoods made up 21 percent of the total cubic-foot volume, but by 1994 softwoods will make up only 11 percent. By 1994 the assumed cut and net annual growth for softwoods will be about in balance at 13 million cubic feet a year, and the annual cut for hardwoods will be about 30 percent less than the net annual growth.

Sawtimber volume will have a similar trend over the same period of time. Board-foot volume will increase about 10 percent, to about 8,110 million board feet in 1994. At that time the annual growth and timber cut of softwoods will be about equal - approximately 30 million board feet. If we assume that there will be no decrease in commercial forestland area and no increase in acreage under forest management, the average volume per acre will increase to about 2,800 board feet in 1994.

Although the overall volume changes are not large, the changes for some individual species are unfavorable. Loblolly pine, for example, an important species in the southern and eastern counties of Maryland, is one of the most heavily cut in relation to its inventory volume. The volume of loblolly pine dropped to 945 million board feet in 1964, a decrease of 21 percent. If this downward trend continues, the inventory of loblolly pine in 1994 will be about half of what it was in 1964.

Similarly, some hardwood species (such as red maple, sweetgum, white oak, and northern red oak) are being cut at a much faster rate than they are growing. Unless a considerably larger acreage of privately owned forest land is put under some kind of management to favor the more valuable species of hardwood trees, the composition of the timber stands in Maryland will change to a larger percentage of the less desirable and unwanted species.

In summary, the growing-stock volume in Maryland will continue to increase annually during the next 30 years; however, this increase will be at a continually decreasing rate.

III. Data Inputs

A. Preparation of Data Base

During an initial search for forest information, a series of State wide topographic quadrangles outlining forest areas by type, was located in the archives of the Department of Natural Resources. These 7½' and 15' quadrangles has been prepared from 1949 to 1951. Since this was the only detailed statewide data source available, it was decided to incorporate the information about forest types contained in these maps with that given in the 1970 Land Use Inventory. The inventor outlines existing forested areas without respect to species type.

It was assumed that the forests existing on the 1970 Inventory were essentially the same as those existing on the 1949 Inventory. Thus, the 1970 Land Use Inventory was used to update the outline of the forest types presented on the 1949 Forest Inventory. A series of composite maps was prepared at a 1:63,360 scale (1 inch = 1 mile) in order to encode the forest data for the computer system as well as to present the material in a graphic form.

The 1949-1951 Forest Inventory 7½' and 15' quadrangles were organized alphabetically and checked for completeness. Missing quadrangles were noted and an attempt was made to locate them. Most of the quadrangles missing from the map series were located in a slide series of the quadrangles subsequently obtained from the Department of Natural Resources. One notable exception, however, was the heavily forested 15' Paw Paw quadrangle, absent from both series. Other missing quadrangles were less important in that only non-forested marsh areas or small land areas in Maryland were depicted on these maps. (See Appendix I).

The 1949 Forest Inventory classified forest cover types according to a modification of the system used by the Society of American Foresters. (This system is presented in Appendix II). An index of these Inventory quadrangles and the forest types contained on each are presented in Appendix III. Twenty-three (23) forest types were found throughout Maryland. These types had been color coded and numbered. Table 1 lists the forest types in Maryland and the code number assigned to each according to the 1949 Inventory. In order to decrease the number of

Table 1: Forest Types in Maryland, as coded on the 1949-1951 Forest Inventory according to a modification of the Society of American Foresters Classification System.

<u>Code</u>	<u>Forest Cover Type</u>
5	Aspen - Pin Cherry
7	Northern Hardwoods - White Pine
8	White Pine - Hardwoods
9	Oak - White Pine
10	White Pine
11	Hemlock
12	Northern Hardwoods
35	Scrub Oak
36	Chestnut Oak
38	Hard Pine: Pitch, Shortleaf and Virginia Pine
41	Hard Pine - Oak
42	Oak - Hard Pine
50	White Oak
52	Red Oak
55	Cove Hardwoods
59	River Birch - Sycamore
60	Bottomland Hardwoods
69	Loblolly Pine
70	Loblolly Pine - Hardwoods
71	Hardwoods - Loblolly Pine
77	Red Gum - Yellow Poplar
90	Southern White Cedar
94	Southern Cypress

computer variables on the composite maps, forest types were consolidated wherever possible. The characteristics of each forest type, such as its commercial value and its preference for a particular climate and soil, were researched. Frequency and location of each type were also noted. In this way, several forest types were grouped together on the basis of similar characteristics or on the basis of location; the lowest code number (from the 1949 inventory) within each group was then assigned as the Department of State Planning code. With minimal loss in the specificity of the classification system, the number of computer variables was reduced from 23 to 15. Table II lists this final Department of State Planning classification scheme, indicating by forest type and county(ies) of occurrence, what 1949 inventory code numbers have been absorbed into this new numbering system.

Table II

Forest Types in Maryland
Reclassified and Coded By The
Department of State Planning

<u>Code</u>	<u>County</u>	<u>Forest Type</u>
5	Calvert (Cove Point Quadrangle)	Hemlock (1949 Inventory Code 11)
	Calvert (Prince Frederick Quadrangle)	Southern Cypress (1949 Inventory Code 94)
	Calvert (Solomons Island Quadrangle)	Hemlock (1949 Inventory Code 11)
	Garrett (Alvinton Quadrangle)	Hemlock (1949 Inventory Code 11)
	Garrett (Davis Quadrangle)	Aspen-Pin Cherry
	Somerset	S. Cedar or S. Cypress (1949 Inventory Code 90 or 94)
	Wicomico	S. Cypress (1949 Inventory Code 94)
	Worcester	S. Cedar or S. Cypress (1949 Inventory Code 90 or 94)

Table II
cont'd.

<u>Code</u>	<u>County</u>	<u>Forest Type</u>
7	Statewide	Northern Hardwoods - White Pine White Pine - Hardwoods (1949 Inventory Code 8) Oak - White Pine (1949 Inventory Code 9) or White Pine (1949 Inventory Code 10)
12	Allegany	Northern Hardwoods
	Frederick	Cove Hardwoods (1949 Inventory Code 55)
	Garrett	Northern Hardwoods
35	Statewide	Scrub Oak
36	Statewide	Chestnut Oak
38	Statewide	Hard Pines: Pitch, Shortleaf, Virginia
41	Statewide	Hard Pine - Oak
42	Statewide	Oak - Hard Pine
50	Statewide	White Oak
52	Statewide	Red Oak
59	Statewide	River Birch - Sycamore or Bottomland Hardwoods (1949 Inventory Code 60)
69	Statewide	Loblolly Pine
70	Statewide	Loblolly Pine - Hardwoods
71	Statewide	Hardwoods - Loblolly Pine
77	Statewide	Red Gum - Yellow Poplar

Each map of the 1949-1951 Forest Inventory was originally prepared at one of the following scales:

1:24,000

1:25,000

1:31,680

1:62,500

The 1970 Land Use Inventory, however, was prepared at a 1:63,360 scale. To produce a 1:63,360 (1" = 1 mile) composite forest map, the 1949 Inventory was redrafted at a 1:63,360 scale, then overlaid with the 1970 Inventory. First, county outlines and grid lines were traced from the State Highway Maps onto tracing vellum. The 1949 quadrangles were then enlarged with the Goodkin Enlarger-Reducer at Towson State College. In order to reduce distortion, each quadrangle was re-centered in the Enlarger-Reducer from four to nine times. The outlines of the forest types were then traced onto the county bases and identified using the state coordinate grid for the purpose of location. When a particular quadrangle map was missing, a slide was used in its place. The slides were mounted on a piece of glass in order to fit a Lantern Projector. The forest types were then transferred onto the base maps. When the maps were complete, the non-forested areas on each were shaded.

The 1970 Land Use Inventory presented forest areas according to the density of crown cover. Light crown cover indicated that 10% to 40% of the land area was forested, and heavy crown cover, that 40% or more was wooded. Blueprints of the Land Use Inventory at a 1:63,360 scale were obtained for all of the Maryland Planning Regions except the Western Maryland and Frederick Regions. For Garrett, Allegany, and Washington Counties combined, a mylar original was available. In the case of Frederick County, the forest areas were traced onto mylar from a slide projection at the proper scale.

The forest information contained in both data sources was then integrated; the 1970 Land Use Inventory was overlaid on the 1:63,360 1949 Forest Inventory on a light table and mylar composite maps were drafted. The blueprint copies of the 1970 Land Use Inventory were not exactly to scale and occasionally distorted. It was necessary to shift the maps in order to make the best possible fit. The composite maps portray the Department of State Planning classifications of the 1949 forest types encoded within the 1970 forest areas.

Large wooded areas present on the 1949 Forest Inventory but not the 1970 Land Use Inventory were outlined and indicated; those present on the 1970 Inventory but not the 1949 Inventory were also outlined and indicated. High altitude (65,000 msl) color infrared photography verified the existence/nonexistence of those forest areas which were indicated on one inventory but not on the other. Aerial photography was also used for vegetation mapping of the Paw Paw triangle. The aerial photography used is as follows:

<u>Date</u>	<u>Season</u>	<u>Flight Number</u>	<u>Coverage</u>
January 31, 1973	Winter	73-014 C	Southern Maryland
January 26, 1973	Winter	73-010	Western Maryland
December 3, 1972	Winter	72-209	Central Maryland
August 22, 1972	Summer	72-147	Maryland

The imagery was determined the existence of the forest areas in question and differentiated between coniferous and deciduous forest. With this in mind, estimations of unknown forest types (which were in forest areas depicted on the 1970 Inventory but not the 1949 Inventory) were made based on nearby known forest types. The completed composite maps were colored and attached to mylar encoding grids.

Figure 4 is a sample composite map of the Forest Inventory as prepared by the Department of State Planning for computer encoding.

Figure 4

Sample Composite Map - Forest Inventory
- County, - Quadrangle

50 WHITE OAK

52 RED OAK

59 RIVER BIRCH-SYCAMORE

77 RED GUM-YELLOW POPLAR

WATER

NON-FORESTED, 1949 INVENTORY

ADDITIONAL NON-FORESTED, 1970

(Each grid cell represents 91.5 acres)

B. Interpretation of Data Base: Problems and Suggestions

Several problems occurred in the preparation of the Forest Inventory for the Generalized State Land Use Plan. One of the most serious problems was the lack of a recent data source; the Forest Inventory prepared from 1949 to 1951 was the only available survey indicating forest areas by type. Although this source was twenty-five years old, it was considered adequate, because natural forest communities, especially climax communities, are rather stable through time unless altered by man. However, no written material accompanied the 1949 Inventory so that the classification system employed was not precisely defined or explained (See Table I). This classification closely corresponds (both in code numbers and headings) to a national system proposed in 1932 by the Society of American Foresters (See Appendix II). However, several modifications were made at the time of the Maryland survey which were probably intended to help the classifications conform more closely to the forest communities found in Maryland.

The amount of distortion incurred during the preparation of the 1:63,360 map series based on the 1949-1951 Forest Inventory was reduced by re-centering each quadrangle in the Enlarger-Reducer from four to nine times. However, additional distortion occurred when projections were drawn from the slides which were used to replace the missing quadrangles. Hence, some inaccuracies due to distortion were incorporated into the 1:63,360 series of the 1949 Forest Inventory.

The mapping problems mentioned were compounded when composite maps of the 1949-1951 Forest Inventory and the 1970 Land Use Inventory were drawn. It was almost always necessary to shift the two sources in order to produce the "best possible fit".

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APPENDIX I :

Quadrangles Missing from the 1949 - 1951

Forest Inventory

<u>7½ Missing Quadrangles</u>	<u>Slide Available</u>	<u>Significance of Missing Quadrangles</u>
Artenas	No	Large forest area
Bellgrove	No	Large forest area
Great Cacapon	No	Small land area in Maryland
Paw Paw	No	Large forest area
Bloodsworth Island	No	Marsh area; no forests
Kedges Straits	No	Marsh area; no forests
Richland Point	No	Marsh area; no forests
Cambridge	Yes	
Charlestown	No	Small land area in Maryland
Church Creek	Yes	
Claiborne	Yes	
East New Market	Yes	
Easton	Yes	
Ewell	No	Marsh area; no forests
Fowling Creek	Yes	
Great Fox Island	No	Marsh area; no forests
Hallwood	No	Area covered on Pocomoke City
Kent Island	Yes	
Leesburg	No	Small land area in Maryland
Oxford	Yes	
Queenstown	Yes	
Ridgely	Yes	
Sharps Island	Yes	
St. Michaels	Yes	
Terrapin Sand Point	No	Marsh area; no forests
Tilghman	Yes	
Trappe	Yes	
Widewater	No	Area covered on Nanjemoy Quadrangle
Wye Mills	Yes	

APPENDIX II: Forest Cover Types of the Eastern United States

REPORT OF THE COMMITTEE² ON FOREST TYPES

Society of American Foresters, Washington, D. C.

IN JULY 1929 a Committee on Forest Types was appointed by President Redington of the Society of American Foresters and charged with the duty of classifying and preparing a list of the forest types in the eastern United States.³ It was estimated that at least two years would be required to complete the project. Such has proved to be the case. The usual difficulties in the way of quick progress inherent in a committee, whose members are scattered and each occupied with his own work, have operated to prolong the task. The complexity of the forest itself and in several regions insufficient knowledge of the types at the beginning of the investigation have been additional retarding factors.

The present report sets forth the conclusions of the committee. It is recognized that as knowledge increases there will undoubtedly be need for changes—either additions, rejections or consolidations in the present list. Probably the list should be revised in ten years.

CONTENT OF REPORT

The report contains a discussion of the problem and the basis used in making the

forest type classification. Following this is a list of the forest types classified under various headings. Detailed descriptions for all the types are appended. A list giving the botanical and common names of all tree species mentioned in the type list and descriptions has been added. An index of forest types is included. Previously recognized forest types are listed in this index and their relation to the forest types in the classification is indicated.

NEED FOR A UNIFORM TYPE CLASSIFICATION

Demand for a comprehensive classification of the forest types in the eastern United States led to the appointment of this committee. Forestry is of relatively recent origin but has been rapid in expansion within the region considered. From the beginning of the movement up to the present date practically all foresters have had occasion to use forest types. Many of them have been forced to make new types. A variety of purposes which the types were to serve has governed in the recognition and naming of these types. Thus when the entire territory is reviewed we find a heterogeneous

¹Presented at the 31st annual meeting of the Society of American Foresters at New Orleans, La., December 29-31, 1931.

²Membership of the committee: R. M. Evans, Assistant Regional Forester, Eastern District, U. S. Forest Service; R. D. Forbes, Director, Allegheny Forest Experiment Station; E. H. Frothingham, Director, Appalachian Forest Experiment Station; Joseph Kittredge, Jr., Senior Silviculturist, Lake States Forest Experiment Station; E. F. McCarthy, Professor of Silviculture, New York State College of Forestry, formerly Director, Central States Forest Experiment Station; L. J. Pessin, Associate Forest Ecologist, Southern Forest Experiment Station; J. N. Spaeth, Research Assistant Professor of Forestry, Cornell University; Lenthall Wyman, Associate Silviculturist, Southern Forest Experiment Station; R. C. Hawley, *Chairman*, Professor of Forestry, Yale University.

³The term "eastern United States" as interpreted by the Committee includes the eastern forests which are separated from the western forests by a broad zone of relatively treeless or desert country. The territory covered by the Committee extends in some places to the westward of the eastern forests as shown on the map of the "Forest Regions of the United States" issued by the U. S. Forest Service in 1924. The western boundary of the "eastern United States" as thus defined is a wavy north and south line extending from Canada to Mexico between the 97th and 101st degrees of longitude.

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assortment of all kinds of forest types, (cover, physical, local, generalized, etc.), and much confusion and inconsistency in nomenclature. This inconsistency occurs not so much in the use of different names for the same tree as in the illogical use in the type names of generic, general, and site names and in the use of the same type name for two or more widely separated and distinct forest types.

So far as the interests of the individual within the boundaries of his own relatively restricted territory are concerned the types he now uses may be locally satisfactory. When the profession as a whole and the entire eastern United States are considered the present illogical situation as regards forest types becomes apparent and the usefulness of and necessity for a systematic classification and consistent list of forest types stands forth. Where local effort only is in operation the tendency is to create new types which could well be correlated with or included under a forest type already recognized. New type names of doubtful value have been introduced in this way.

DEFINITION OF FOREST TYPE AND COVER TYPE

Whenever the subject of forest types is discussed the question arises as to the definition of a forest type. The committee had to face this problem and decide exactly what the term "forest type" should mean in the classification to be issued. In 1913 there were published in the Proceedings of the Society of American Foresters a number of articles under the heading "Forest Types: Symposium."⁴ The practical effect of these articles and the subsequent thinking on the part of the profession was the recognition of the cover type as the most serviceable kind of forest type for general use. Forest type is

defined as follows by the Society of American Foresters:⁵ "A descriptive term used to group stands of similar character as regards composition and development due to given physical and biological factors, by which they may be differentiated from other groups of stands. The term suggests repetition of the same character under similar conditions" - - - "A cover type is a forest type now occupying the ground, no implication being conveyed as to whether it is temporary or permanent."

This definition is accepted by the Committee on Forest Types with the reservation that "composition" rather than "development" should be the primary basis for recognition of the forest types. It was felt that differences in character of "development" were subordinate to the cover itself and usually should be taken care of within a forest cover type by division into various qualities of site. For example it would logically follow that for any given forest cover type the development of the stands on the best sites would be different from those on the poorest sites.

BASIS FOR RECOGNITION OF FOREST TYPES

The classification of forest types here proposed is based on the *present tree cover*. Cover types are what the forester finds on the ground and must deal with. What is needed today is a classification on the basis of present forest cover. Forest cover types have a distinct ecological, silvicultural and management value and significance. This holds even in the case of cover types of temporary nature such as may start on burned-over or otherwise disturbed areas. The forest cover types of a temporary character as well as those of a climax character are dependent upon the physical and biological factors of the site. Today from the viewpoint of forest management the significance of ecological

⁴Proceedings of the Society of American Foresters, 8, 1913: 53-104.

⁵Journal of Forestry, 15, 1917: 80.

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relationships particularly succession is well recognized.

Having decided upon the existing forest cover as the basis for type division, the question as to the degree of refinement in recognizing differences in composition demanded consideration. The variations in the forest complex are infinite. A balsam fir stand on the upper slopes of Mt. Washington is radically different from a stand of red gum in Louisiana. But if we traverse the country from one to the other of these forest types we may pass from one combination of forest cover to another by such gradual steps that it will frequently be difficult to decide where one forest cover type ends and another begins. In other words the possible combinations of forest composition which might be recognized as cover types are innumerable.

Sudworth⁶ lists approximately 800 tree species within the eastern United States, a region containing over 375,700,000 acres⁷ of forest land. Not all of these 800 tree species come directly in association with one another. So many of them do meet, that the recognition of every single composition combination is impractical. In selecting the combinations to be recognized as forest types the following principles have been used.

1. The cover type must actually be found occupying in the aggregate hundreds of thousands of acres. This does not require that the type cover any single large area in a solid stand, but rather that it be of a characteristic composition found here and there throughout a considerable range of country.

2. The cover type must be distinctive and easily separated from other cover types which most closely resemble it.

3. Within the foregoing limitations

every important combination of cover must be recognized as a forest type.

No matter whether few or many types are made there will always be found areas in the field which stand as transition between the existing types. Careful judgment may be required to decide under which type the stand in question should be placed. It cannot be expected that any type list suitable for a region the size of the eastern United States will provide a name for every cover combination. Only those of distinctive character and considerable area merit recognition.

It is essential that this classification should take cognizance of the forest types now recognized in literature and practice. Only in this way can the cooperation of the profession be secured to accept and use the type classification. Many type names undesirable from the standpoint of nomenclature have been brought into use in the past. While it is desirable that these names be superseded, yet their relation to the new names has been indicated in the type descriptions and forest type index.

PROVISION FOR EXPANSION OR CONTRACTION

Numerous individuals and organizations with varying viewpoints make use of forest types. Undoubtedly diverse purposes and circumstances may justify, temporarily at least, different degrees of intensity in separating the forest into types. For example: A research forester, while conducting intensive experiments on small areas, may find his needs require a minute division into cover types which recognizes each small change in composition; on the other hand an administrator of a large inaccessible forest area can, in the early stages of development, usefully employ only a broad grouping which throws

⁶Check List of the Forest Trees of the United States, Their Names and Ranges by Geo. B. Sudworth. Miscellaneous Circular 92, U. S. Department of Agriculture, 1927.

⁷Report of the Forester for the fiscal year ending June 30, 1930, U. S. Department of Agriculture, p. 19.

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together several important combinations of cover.

The classification presented by your committee purposely takes a middle ground between the extremes. The list is so arranged as to permit and to encourage two procedures, namely, either expansion or contraction. As an illustration of possible expansion type 18, red spruce, is often subdivided in New England and New York into spruce flat, spruce slope, and old field spruce. If a smaller number of types is wanted types 12, 13, 14 and 15 may be combined under one name. This illustrates how the list may be contracted. Some of the more logical combinations of types are indicated in the type list under the column headed "type groups."

ARRANGEMENT OF THE TYPES ACCORDING TO HABITAT

Such combinations have been facilitated by the arrangement of the list. This has been designed so as to bring together those forest types which normally are found occupying similar habitats. In developing this idea all types are placed under one of the four great forest regions commonly recognized,⁸ namely the Northern, Central Hardwood, Southern and Tropical Forests. The word "Hardwood" has been omitted since coniferous types occur and the region is designated simply as "Central." Each type appears in the list only under the Forest Region in which that type characteristically belongs.

There are many cases where types occur to a limited extent in regions other than the one in which listed. For example occasional stands of type 90, southern white cedar, can be found near Boston, Mass., in Connecticut and northern New Jersey. Although these places are either in the northern or central forest regions, this does not change the fact that southern white cedar is characteristically a

southern forest type. One exception has been made in the case of type 61, cottonwood. This type is listed under the central forest and under the southern forest because it is widely distributed and at home in both regions.

As a further step in bringing together the forest types occupying similar habitats an additional grouping on the basis of soil moisture relation has been employed. Three divisions are recognized as follows:

Dry. Situations which are dry due to whatever cause whether it be light porous soil, shallow soil, steep slopes and ridges or low rainfall.

Fresh to moist. Situations with reasonably good but not excessive moisture supply.

Wet. Situations having an excessive supply of moisture, at least during a part of the year.

In all but one instance a forest type is listed only under one moisture division, namely the situation where found in greatest abundance and of most characteristic occurrence. As a matter of fact a good many types do spread to a limited extent over more than one moisture situation. Where distinctly characteristic of and abundant upon two moisture situations the type is listed on both situations but carries the same name and type number on both situations. It was necessary to do this only in the case of type 63, long-leaf pine.

Within each moisture situation the types are arranged, so far as possible, so as to bring side by side the types which stand closest in nature and hence could be logically grouped if a contraction of the type list was needed. As already stated some of the possible groupings are indicated in the list.

NAMING THE TYPES

In naming the cover types the principle

⁸See map "Forest Regions of the United States" issued by the United States Forest Service. 1924.

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of employing species names which would be descriptive of the composition has been followed. The type name if possible has been kept down to a single species or to a binomial. Trinomial names could not be avoided in a few cases. Generic names because of their indefiniteness have been avoided wherever possible. Exceptions to this rule were necessary in naming types 80, 85, and 86. One case in order to escape the employment of a name longer than a trinomial has required the use of a general descriptive name,—type 87, southern cypress—hardwood. Words indicative of site have not been used in the type names because site as commonly used on this continent is a subdivision of the cover type.

JUDGING PREDOMINANCE

Species which appear in the type name form a predominant part, (fifty per cent or more), of the composition. Predominance may be judged on the basis of number of stems in the dominant and codominant classes combined. Where only one species appears in the name that species alone predominates. If more than one species is listed in the type name predominance will usually only be secured by combining the number of all species in the name. In rare cases an indicator species has been used in the type name. Where this has been done it is specifically stated in the type description. An indicator species will be characteristic and indicative of the type but may not predominate.

Species are arranged in the type name in order of numerical importance or indicator value beginning with the most important.

SUDWORTH'S CHECK LIST USED FOR COMMON AND LATIN NAMES

Both the common and Latin names are taken from the Check List of the Forest Trees of the United States by Sudworth,

1927. A few exceptions have been made in cases where the check list common name is not generally known and accepted in the regions where the species is most important. For example Sudworth's "northern white pine" is changed to "white pine." Three species not included in Sudworth have been added, namely Nuttall's oak, *Quercus nuttallii* Palmer, post oak, *Quercus mississippiensis* (Ashe) Sargent and paper birch, *Betula cordifolia* Regel. Sudworth's Latin names are used as a matter of convenience because no other comprehensive check list covering the species of the region is readily available to foresters. The Committee recommends the revision of the Latin names as soon as a check list in harmony with the principles of the International Code as revised and adopted at London in 1930 is available. Such revision will bring the Latin names of this type list into harmony with the standardized nomenclature of the world.

MIXED VERSUS PURE TYPES

Wherever possible, as a matter of simplification, convenience and increased usefulness of the classification, the Committee avoided setting up a mixed type composed of two species for each of which a separate type already existed. The inevitable mixtures and transitions between types are relatively easy to assign to one or another type on the basis of simple predominance of one or another species. It is much less easy, however, to decide whether a given transition belongs to a pure type or to a mixed type composed of the same species in mixture with one or more other species.

For example no jack pine—Norway pine type is recognized although extensive areas in the aggregate exist composed of a mixture of jack pine and Norway pine. Creation of such a type was unnecessary since already type 1, jack pine, and type 3, Norway pine, were in use. Since these

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types are defined respectively as predominantly jack pine or predominantly Norway pine the situation as regards mixtures of the two is easily cared for. All mixed stands, except the practically non-existent case of the stand having an identical number of each species, can be thrown into either type 1 or type 3.

The committee realized, however, that some two-species mixtures are much more common than pure stands of either species, and in such cases has set up a mixed type in place of two pure types. Type 7, gray birch—red maple, is an example.

In some instances there has seemed to be no choice but to recognize as types both pure stands of the species concerned and a mixture of the two; to illustrate, the Committee has set up types 38 shortleaf pine, 69 loblolly pine, and 68 loblolly pine—shortleaf pine in recognition of the fact that although hundreds of thousands of acres of old fields have seeded to pure stands of both these pines, other hundreds of thousands of acres, mostly but not entirely cut-over land never cleared for farming, have seeded to mixtures of these species.

LIST OF THE FOREST COVER TYPES OF THE EASTERN UNITED STATES

Forest regions	Grouping by moisture relations	Type no.	Cover types	Type groups
Northern Forest	Dry	1.	Jack pine	
		2.	Jack oak	
		3.	Norway pine	
	Fresh to moist	4.	Aspen	Aspen—birch—pin cherry
		5.	Pin cherry	
		6.	Paper birch	
		7.	Gray birch—red maple	
		8.	White pine—red oak—white ash	White pine
		9.	White pine	
		10.	White pine—hemlock	
		11.	Hemlock	
		12.	Sugar maple—beech—yellow birch	Northern hardwood
		13.	Sugar maple—basswood	
		14.	Sugar maple	
		15.	Yellow birch	
		16.	Yellow birch—red spruce	Spruce—fir
		17.	Red spruce—sugar maple—beech	
		18.	Red spruce	
		19.	Red spruce—southern balsam fir	
		20.	Paper birch—red spruce—balsam fir	
		21.	White spruce—balsam fir—paper birch	
		22.	Balsam fir	
	Wet	23.	Black spruce	
		24.	Northern white cedar	
		25.	Tamarack	
		26.	Black ash—American elm—red maple	
Central Forest	Dry	27.	Mesquite	
		28.	Mountain cedar	
		29.	Shin oak	
		30.	Post oak	
		31.	Post oak—blackjack oak	Post oak
		32.	Black oak—post oak	
		33.	Southern oak—live oak	Live oak
		34.	Southern live oak—chestnut oak	
		35.	Bear oak	Pitch pine—oak
		36.	Chestnut oak	
		37.	Pitch pine	

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Forest regions	Grouping by moisture relations	Type no.	Cover types	Type groups
		38.	Shortleaf pine	Shortleaf pine—oak
		39.	Shortleaf pine—post oak	
		40.	Shortleaf pine—southern red oak—scarlet oak	
		41.	Shortleaf pine—white oak	
		42.	Shortleaf pine—Virginia pine	Virginia pine
		43.	Virginia pine—southern red oak	
		44.	Virginia pine	
		45.	Bur oak	
		46.	Eastern red cedar	
		47.	Black locust	
		48.	White pine—chestnut oak—chestnut	
	Fresh to moist	49.	White oak—black oak—red oak	White oak
		50.	White oak	
		51.	Red oak—basswood—white ash	Red oak
		52.	Red oak	
		53.	Yellow poplar	Yellow poplar
		54.	Yellow poplar—hemlock	
		55.	Yellow poplar—white oak—red oak	
		56.	Chestnut	
		57.	Beech—sugar maple	Beech
		58.	Beech	
		59.	River birch—sycamore	
		60.	Silver maple—American elm	
		61.	Cottonwood	
Southern Forest		62.	Sand pine	
		63.	Longleaf pine	
		64.	Longleaf pine—turkey oak	
		65.	Turkey oak	
		66.	Southern red cedar	
		67.	Live oak—cabbage palmetto	
	Fresh to moist	68.	Loblolly pine—shortleaf pine	Loblolly pine
		69.	Loblolly pine	
		70.	Loblolly pine—southern red oak	
		71.	Loblolly pine—white oak	
		72.	Loblolly pine—slash pine	
		73.	Longleaf pine	
		74.	Longleaf pine—slash pine	
		75.	Slash pine	
		76.	Cabbage palmetto—slash pine	
		77.	Water oak—willow oak	
		78.	Red gum—yellow poplar	
		79.	Live oak	
		80.	Beech—evergreen magnolia	
		81.	Hickory—swamp chestnut oak—white oak	Flood-plains¹
		82.	Cottonwood	
		83.	Red gum—swamp red oak	
		84.	Red gum	
		85.	Red gum—Nuttall's oak—willow oak	
		86.	Willow oak	
		87.	Sugarberry—elm	
		88.	Oak—elm—ash	
		89.	Southern cypress—hardwood	
		90.	Willow	
	Wet	91.	Overcup oak—water hickory	
		92.	Southern white cedar	
		93.	Pond pine	
			Slash pine—swamp black gum	
			Pond cypress	

Forest Cover Types

Forest regions	Grouping by moisture relations	Type no.	Cover types	Type groups
Tropical Forest	Dry Wet	94.	Southern cypress	Cypress—tupelo
		95.	Tupelo gum	
		96.	Mahogany	
		97.	Mangrove	

¹These types (with the exception of cottonwood) are based principally on investigations in the Mississippi Delta. Studies on other river systems in the south may indicate the necessity of recognizing additional types.

TYPE DESCRIPTIONS

TYPE 1 JACK PINE

Composition: Jack pine, pure or predominating.

Associates: Norway pine, jack oak, aspens; paper birch, black spruce and white spruce.

Aspen and paper birch are usually coordinate, the others subordinate in mixtures.

Occurrence: From northern New England and New York, central Michigan, Wisconsin and Minnesota, northward at elevations from 600 to 1,800 feet.

On driest sands, usually originating from glacial outwash; also occurs on moist sands near swamps and on rocky ledges. Occurs in large and small areas usually coincident with sandy outwash plains, and in the rock outcrop region of northeastern Minnesota. Range has been increased by fires over areas occupied originally by Norway pine.

Place in succession: Pioneer on driest sites, succeeded by Norway pine or by jack oak or in northeastern Minnesota by white spruce—balsam fir—paper birch type.

Importance: Important type in area covered and as source of pulpwood in the northern Lake States and in Canada. Unimportant in New York and New England.

Variants and synonyms: JACK PINE—OAK, Harvey, Mich. Acad. Sci. Report (1919) 213-217; Kittredge, Jour. For. 23(1925) 890-895. JACK PINE—WHITE BIRCH, Bergman and

Stallard, Minn. Bot. Stud. 4, part 4, (1916) 333-378. PINE—HARDWOOD, Lee, Bot. Gaz. 78, 2, (1924) 129-174.

TYPE 2 JACK OAK

Composition: Jack oak, pure or predominating in mixtures.

Associates include white oak, black oak, scarlet oak, or red oak, in varying proportions, either coordinate or subordinate. Sometimes also jack pine coordinate with jack oak.

Occurrence: Chiefly in central Michigan and central Wisconsin but extending also into southern Michigan, northern Wisconsin and east central Minnesota, at elevations from 700 to 1,600 feet.

On dry sandy soils of sand plains and gravelly morainal slopes.

Covers considerable areas on suitable soils along southern edge of the northern forest region in the Lake States; elsewhere local and spotty.

Place in succession: Probably originated as a subordinate species in Norway or jack pine stands. Now pioneer on those sites by reason of persistent sprouting after repeated fires. Succeeded by white oak—black oak—red oak type.

Importance: Covers a considerable aggregate area but unimportant commercially.

Variants and synonyms: SCRUB OAK, Forest Service, Instructions for making timber surveys in the National Forests, (1917); Wisc. Land

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Ec. Inv., Wisc. Dept. of Agr. and Markets, Bul. 100 (1929). OAK FLAT, Sherrard, Rep't Mich. For. Com. (1902) 28-34. JACK OAK—WHITE OAK, Kittredge and Chittenden, Mich. Agr. Exp. Sta. Spec. Bul. 190 (1929).

TYPE 3 NORWAY PINE

Composition: Norway pine, pure or predominating in mixture with white, jack or pitch pines.

Among the associates jack pine is coordinate, white pine either coordinate or subordinate, and jack oak, white oak and red maple are subordinate. Paper birch, gray birch and aspens are sometimes in mixture as coordinates in young stands.

In central and southwestern New York, chestnut oak, hemlock, red oak and white pine are the common associates.

Occurrence: Ranges from Maine to Connecticut, northern Pennsylvania, southwestern New York to central Michigan, Wisconsin and Minnesota northward at elevations from sea level to 1,700 feet.

On sandy and gravelly locations or dry sandy loam soils. Often found on shallow-soiled rocky knolls and lake shores. Remains as a type only in small scattered patches.

Place in succession: Often follows jack pine. Succeeded by white pine.

Importance: Valuable timber type but now unimportant because area remaining is small. By reforestation extensive areas of this type are being created. Hence it may become of considerable commercial importance.

Variants and synonyms: NORWAY PINE—JACK PINE, Davis, Mich. Geol. Surv. Ann. Reports (1906, 1907). NORWAY — WHITE PINE, Harvey, Mich. Acad. Sci. Report (1919) 213-217.

TYPE 4 ASPEN

Composition: Aspen, largetooth aspen, and balsam poplar singly or in various combinations with each other or with other associates. Balsam poplar is not an important constituent except along streams and swamp margins in the Lake States.

Associates commonly found are paper birch and pin cherry. Most of the other species in the northern forest region occur at times as subordinates. An understory of balsam fir frequently is present. Pin cherry early disappears. All other species tend to outlive aspen.

In North Dakota bur oak, green ash, American elm, paper birch, boxelder and pin cherry are in mixture with aspen and balsam poplar.

Occurrence: Throughout the northern forest region and westward to Turtle Mts., and Devils Lake region in North Dakota.

At elevations from sea level to 4,000 feet. On all types of soil except driest sands and wettest swamps. Occurrence chiefly on burns, clear cut areas and less frequently on abandoned fields and pastures. In North Dakota confined to fresh, well drained, fertile soils and to north slopes which remain moist in dry years.

Place in succession: A pioneer type after fires; relatively short lived and is succeeded by one of the white pine, northern hardwood or spruce—fir group of types.

Importance: The most widely distributed type in the Lake States and forms most of the forest in North Dakota. Elsewhere less prominent although occupying a large aggregate area. At present of minor commercial importance.

Variants and synonyms: ASPEN — PAPER BIRCH, Mich. Land Ec. Surv.; Wisc. Land Ec. Inv., Wisc.

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Dept. of Agr. Bul. 100 (1929); Chamberlain Geol. of Wisc. 2 (1877); Kittredge, Jour. For. 23 (1925) 890-895; Roth, U. S. F. Service Bul. 16 (1898); Stallard, Ecol. 10 (1929) 476-547; Whitford, Bot. Gaz. 31 (1901) 289; Zon, Bul. 1496, U. S. D. A. (1927).

ASPEN—JACK PINE—WHITE BIRCH, Bergman and Stallard, Minn. Bot. Stud. 4., part 4, (1916) 333-378. HIGHLAND HARDWOODS, Conzet, Rep't to Minn. Legis. (1928). BIRCH—ASPEN, Dana, Tech. Bul. 166, U. S. D. A. (1930) 52-55; Weaver and Clements, Plant Ecology (1929) 435. BIRCH and POPLAR, N. E. S. Com., Jour. For. 16 (1922) 122-129.

TYPE 5 PIN CHERRY

Composition: Pin cherry pure or predominating.

Associates: In the North principally aspen, largetooth aspen, paper birch, red maple and red oak, either coordinate with or subordinate to the pin cherry. In the Southern Appalachians yellow birch, red spruce, southern balsam fir, mountain ash.

Occurrence: Throughout the northern forest region at elevations above 600 feet in the North, 3,000 feet in West Virginia, and 4,500 feet in North Carolina.

On well drained soils from poor to good quality.

In northern Pennsylvania covers large continuous areas, elsewhere more often in small patches.

Place in succession: Short-lived pioneer type which originates on clear cut or heavily burned areas. In the North succeeded by aspen, or by types of the northern hardwood or white pine type groups, or by the red oak—basswood—white ash type. In Southern Appalachians,

succeeded by red spruce—southern balsam fir type, red spruce type, or by types of the northern hardwood group.

Importance: Of negligible commercial value even when prominent in area, because short-lived.

TYPE 6 PAPER BIRCH

Composition: Paper birch pure or predominating.

Associates include variable small proportions of aspen, largetooth aspen, balsam fir, red spruce, white pine, yellow birch, hemlock, red maple, red oak, basswood and others. Most associates are subordinate. Frequently an understory of conifers or tolerant hardwoods develops.

Occurrence: Northern and central New England, northern New York and the northern halves of the Lake States from near sea level to 3,000 feet.

Found on wide range of upland sites.

Place in succession: Pioneer on clear cut and burned areas, succeeded by some of the spruce—fir or northern hardwood group of types and sometimes by white pine.

Importance: Limited in area and in commercial importance.

Variants and synonyms: PAPER BIRCH — ASPEN, Stallard, Ecol. 10 (1929) 476-547. BIRCH — ASPEN, Dana, Tech. Bul. 166, U. S. D. A. (1930) 52-55; Weaver and Clements, Plant Ecology (1929) 435. BIRCH and POPLAR, N. E. S. Com. Jour. For. 16 (1922) 122-129.

TYPE 7 GRAY BIRCH—RED MAPLE

Composition: Gray birch and red maple predominating.

Principal associates are aspen, pin cherry, yellow and paper birch, white pine, white ash, sugar maple, red and white oak and eastern red cedar.

Occurrence: Central and southern

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New England, eastern half New York, northern New Jersey and northeastern Pennsylvania. From near sea level to 2,000 feet.

Wide variety of sites from sand plains to heavy-soiled uplands. Wet margins of streams and ponds.

Place in succession: Originates on abandoned farm land and on cut-over white pine areas on lighter class of soils. Succeeded by white pine or by one of several hardwood types. Gray birch is short-lived and disappears in less than 60 years.

Importance: Covers considerable area but is of little commercial value.

Variants and synonyms: GRAY BIRCH, Dana, Tech. Bul. 166, U. S. D. A. (1930) 78-9; Spaeth, Harvard Forest, Bul. 2 (1920); N. E. S. Com. Jour. For. 16 (1922) 122-129. RED CEDAR—GRAY BIRCH, Lutz, Yale School of Forestry Bul. 22 (1928).

TYPE 8 WHITE PINE—RED OAK—WHITE ASH

Composition: White pine, red oak and white ash in mixture with red maple as chief associate. Various other associates may appear. Among the more common are: basswood, yellow birch, largetooth aspen, sugar maple, beech, paper birch, black cherry, hemlock and black birch.

Occurrence: Central New England and New York, except in mountains, at elevations from sea level to 1,500 feet.

On deep, fertile, moist, well-drained soils.

Place in succession: Often follows "old field" white pine but occurs also on land never cleared for agriculture. May be permanent in some places but in general tends toward white pine—hemlock type or northern hardwood type group.

Importance: Limited area in New York, but of high commercial value. Important commercial type in central New England, and likely to become more important as practice of silviculture develops.

Variants and synonyms: PINE—HARDWOOD, N. E. S. Com. Jour. For. 20 (1922) 122-129; Cline and Lockard, Bul. 8 Harvard Forest (1925).

TYPE 9 WHITE PINE

Composition: White pine pure or predominant. Pure stands of white pine are characteristic.

Associates: In the North on light soils Norway pine, pitch pine, gray birch, aspen, red maple, pin cherry and white oak. On heavier soils paper birch, black birch, yellow birch, gray birch, black cherry, white ash, red oak, sugar maple, basswood, hemlock and red spruce.

In the Southern Appalachians on moist sites yellow poplar, chestnut, hemlock, red oak and white oak. On drier sites chestnut oak, scarlet oak, shortleaf pine and pitch pine.

Occurrence: Most commonly within southern and lower portions of the northern forest from southwestern Maine to east central Minnesota and along Appalachian Mountains to northern Georgia. Most abundant in central New England and in the Lake George and Lake Champlain section of New York at elevations from sea level to 2,500. In the Southern Appalachians of West Virginia, Virginia, Tennessee, North Carolina, and north Georgia, generally at elevations of from 1,500 to 4,000 feet, but occasionally as high as 4,700 feet. Formerly best developed in Tennessee and North Carolina between 3,000 and 4,000 feet.

In the Lake States chiefly in central part of Michigan and in north cen-

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tral Wisconsin and in north and east central Minnesota; less common northward. Elevations from 700 to 1,700 feet.

Typical on fresh, sandy loam upland but occurring occasionally on clay, in swampy areas, and on loamy sands. In the Northeast occurs on abandoned agricultural land of all soil types. In the Southern Appalachians on mountain slopes, flats and valleys varying widely in soil character from sandy to clayey loam and from relatively moist to dry.

Extensive areas occupied in the Northeast, elsewhere in small stands widely scattered.

Place in succession: Frequently first type to occupy agricultural land after abandonment. Approaches permanence on sandy soils. On heavier soils usually succeeded by sugar maple—beech—yellow birch, red oak—basswood—white ash, white pine—red oak—white ash, white pine—hemlock, sugar maple—basswood, white oak or white spruce—balsam fir—paper birch.

A long-lived temporary type seldom succeeding itself except after fires or under special cultural treatment.

Importance: Important commercial type in New England and Essex, Warren and Saratoga counties, New York; about 100,000 acres scattered through Pennsylvania. Elsewhere because of relatively small area covered, not of primary importance.

Variants and synonyms: WHITE PINE—NORWAY PINE. Bergman and Stallard, Minn. Bot. Stud. 4, part 4, (1916) 333-378; Buhler, Minn. State Forester 3rd. Ann. Rept. (1913) 120-135; Roth, U. S. F. S. Bul. 16 (1898). PINE—SPRUCE. Stallard, Ecol. 10 (1929) 476-547. WHITE PINE—BALSAM—HEMLOCK. Whitford, Bot. Gaz. 31 (1901) 289

TYPE 10 WHITE PINE—HEMLOCK

Composition: White pine and hemlock only or predominant in mixture.

Associates are numerous but none particularly characteristic. Principal associates: beech, sugar maple, basswood, red maple, yellow birch, black cherry, white ash, paper birch, black birch, red oak, white oak, chestnut oak, yellow poplar, cucumber magnolia and red spruce.

Occurrence: Central and southern New England, New York, northeastern Ohio, northern New Jersey, central and northeastern Pennsylvania, thence on mountains to North Carolina and Tennessee. From sea level to 1,500 feet in New England and to 3,000 feet in Pennsylvania. From 1,000 to 4,000 feet in Tennessee and North Carolina.

On wide range of site from sand plains to heavy upland soils. Favors cool locations, ravines and north slopes in the southern portion of its range.

Occurs in small bodies, much scattered but not rare.

Place in succession: Near climax, probably succeeded ultimately by northern hardwoods or hemlock. Occasionally the result of long continued grazing of woodlot containing scattered pine and hemlock in mixture with hardwoods.

Importance: Not important in area and therefore not commercially important. Its value per acre often is high due to extra fine quality of pine when grown with hemlock.

Variants and synonyms: PINE—HEMLOCK, Dana, Tech. Bul. 166, U. S. Dept. Agr. (1930) 93-94; Weaver and Clements, Plant Ecology (1929) 440-2; Tarbox and Reed, Harvard Forest Bul. 7 (1924) 17-18; Marshall, Harvard Forest Bul. 11 (1927) 9-17. PINE—HARDWOOD and HEMLOCK, Fisher Harvard

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Forest Bul. 1 (1921) 23-26. SUGAR MAPLE — BEECH — BIRCH — WHITE PINE — HEMLOCK, Jennings, Proc. Penna. Acad. Sci. 1 (1927).

TYPE 11 HEMLOCK

Composition: Hemlock pure or predominant over any single associate.

Associates: beech, sugar maple, yellow birch, basswood, red maple, black cherry, white ash, balsam fir, red spruce, white pine, paper birch, black birch, red oak and white oak.

Occurrence: Throughout the northern forest except in Minnesota. Elevations from sea level to 5,000 feet. In Southern Appalachians in pure stands in coves from 1,500 to 5,000 feet elevations.

From central Pennsylvania southward mostly in cool locations, moist ravines, north slopes. Somewhat drier and warmer locations at northern part of its range. Mixed with hardwoods occupies large aggregate area in northern Wisconsin and Michigan usually much intermingled with the sugar maple — beech — yellow birch type. Elsewhere in small bodies, widely scattered.

Place in succession: Probably climax

Importance: Formerly an extensive type, especially in northern Pennsylvania; still important in area and value for sawtimber and pulpwood in virgin forest in Michigan and Wisconsin. Not now so important elsewhere either in area or commercially.

Variants and synonyms: HARDWOOD—HEMLOCK, Roth, U. S. F. S. Bul. 16 (1898). MAPLE—HEMLOCK, Kittingredge, Jour. For. 23 (1925) 890-895. BEECH — MAPLE — HEMLOCK, Waterman, Bot. Gaz. 74 (1922) 1-31. HEMLOCK — BALSAM — WHITE SPRUCE, Davis, Geol. Surv. of Mich. Ann. Rept. (1906, 1907). HEMLOCK — WHITE OAK, — noted on Shenandoah National Forest, un-

published manuscript, U. S. F. Service. HEMLOCK—HARDWOOD, Lutz, Yale School of Forestry Bul. 22 (1928). HEMLOCK—BIRCH, Ashe, Jour. Elisha Mitchell Sci. Soc. 37 (1922) 194. HEMLOCK—YELLOW BIRCH, S. A. S. Com. Jour. For. 24 (1926) 676. COVE HEMLOCK, S. A. S. Com., Jour For. 24 (1926) 678.

TYPE 12 SUGAR MAPLE—BEECH—YELLOW BIRCH

Composition: Sugar maple, beech, yellow birch in different proportions sometimes with smaller and varying admixtures of basswood, red maple, hemlock, red oak, white ash, white pine, balsam fir, black cherry, paper birch, black birch, American elm, and red spruce. In the Southern Appalachians Ohio buckeye, chestnut and cucumber magnolia (also in Penn.) occur. Beech does not occur west of eastern Wisconsin and adjacent Michigan.

Occurrence: Throughout the northern forest except in Minnesota. In northern New England and New York goes up to 3,500 feet; in the Lake States to 1,600 feet and in the Southern Appalachians occurs in a zone from 3,500 to 5,500 feet elevation.

On loamy soils of excellent fertility and good moisture conditions.

Covers extensive areas, except where the forest is broken by settlement and in southern Pennsylvania and in Southern Appalachians where distribution is spotty.

Place in succession: A climax type.

As the type approaches the climax sugar maple, beech and hemlock assume increasing importance.

Importance: The most extensive commercial sawtimber type remaining in the northern forest.

Variants and synonyms: MAPLE — BEECH, Weaver and Clements,

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Plant Ecology (1929) 453; Chamberlain, Geology of Wisconsin 2 (1877) 176; Harvey, Mich. Acad. of Sci. Rept. (1919) 213-217; Veatch, Mich. Agr. Exp. Sta. Quart. Bul. 10 (1928) 116-126. A frequent variant in southern Michigan and southeastern Wisconsin. **HARDWOOD**—**CONIFER**, Wisc. Land Ec. Inv., Wisc. Dept. of Agri. & Markets Bul. 100 (1929); Chamberlain (loc. cit.); Veatch (loc. cit.). **BIRCH**—**BEECH**—**MAPLE**, U. S. F. Service, Instructions for making Timber Surveys in the National Forest (1917). **HARDWOOD** with **BASSWOOD**, Wisc. Land Ec. Inv., (loc. cit.). **HARDWOOD** and **WHITE PINE**, Davis, Mich. Geol. Surv. Ann. Rept. (1906). **MAPLE**—**BEECH**—**HEMLOCK**—**YELLOW BIRCH**, Whitford, Bot. Gaz. 31 (1901) 289. **NORTHERN HARDWOODS**, Frothingham, Bul. 285, U. S. Dept. Agri. (1915); Dana, Tech. Bul. 166, U. S. Dept. Agri. (1930) 45-52; Zon, Tech. Bul. 1,496, U. S. Dept. Agr. (1927) 6-7. **BEECH**—**BIRCH**—**MAPLE**, Illick and Frontz, Bul. 46, Penn. Dept. Forests and Waters (1928). **HARD MAPLE**—**YELLOW BIRCH**, McIntire, Papers Mich. Acad. Sci. 14 (1931). **YELLOW BUCKEYE**—**SUGAR MAPLE**—**YELLOW BIRCH**, Ashe, Jour. Elisha Mitchell Sci. Soc. 37 (1922) 193.

TYPE 13 SUGAR MAPLE—BASSWOOD

Composition: Sugar maple and basswood predominating in different proportions.

Associates: either coordinate or subordinate, include American elm, green ash, yellow birch, white pine, red oak and rarely hackberry. Hop-hornbeam and blue beech are subordinates.

Occurrence: East central and north central Minnesota, west of the range of hemlock and beech at elevations

from 600 to 1,600 feet, and intermingled with the sugar maple — beech—yellow birch type in Michigan and Wisconsin.

Rich upland loamy soils.

Occurrence spotty and in small areas. Often on lake shores.

Place in succession: A climax type.

Importance: Of minor commercial importance because limited in area.

Variants and synonyms: **BASSWOOD**—**MAPLE**, Buhler, Minn. State Forester, 3rd. Ann. Rept. (1913) 120-135. **MIXED HARDWOODS**, Lee, Bot. Gaz. 78 (1924) 129-174. **MAPLE**—**WHITE PINE**, Lee, (loc. cit.). **ELM**—**BASSWOOD**—**HACKBERRY**, Stallard, Ecol. 10 (1929) 476-547. **SUGAR MAPLE**—**BASSWOOD**—**ELM**, Pammel, Proc. Davenport Acad. Sci. 10 (1905) 32-126. **HARD MAPLE**—**ELM**—**BASSWOOD**—**YELLOW BIRCH**, McIntire, Papers Mich. Acad. Sci. 14 (1931).

TYPE 14 SUGAR MAPLE

Composition: Sugar maple pure.

A small proportion of other species may be present, such as yellow birch, black birch, white ash, red and white oaks.

Occurrence: Throughout the northern forest. In the Southern Appalachians at elevations of 3,000 to 4,500 feet. Elsewhere at lower elevations. Through northern Ohio found chiefly as pastured woods. Created artificially through desire to develop stand for sugar production.

On deep, fertile well-drained soils with good moisture.

Found in small patches usually not over 5 to 10 acres in size.

Place in succession: A climax type. In places may owe its origin to cultural practices.

Importance: Aggregate area limited, but type is commercially important where it occurs.

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TYPE 15 YELLOW BIRCH

Composition: Yellow birch pure.

There may be a small mixture of other species: in the North particularly red and sugar maples and paper birch and in the Southern Appalachians principally yellow buckeye, beech and hemlock with no paper birch and little sugar maple.

Occurrence: Northern New England, Pennsylvania and New York at elevations of 600 to 2,500 feet. Also in Southern Appalachian Mountains, mostly at altitudes between 4,500 and 6,000 feet.

On moist sites following clear cutting or other opening up of the forest.

Found in small patches.

Place in succession: Apparently a long-lived temporary type, followed by sugar maple — beech — yellow birch or yellow birch—red spruce.

Importance: Aggregate area limited, of minor importance.

Variants and synonyms: HEMLOCK—YELLOW BIRCH, S. A. S. Com., Jour. For. 24 (1926) 676

TYPE 16 YELLOW BIRCH—RED SPRUCE

Composition: Yellow birch and red spruce predominating.

Associates: In the North balsam, red maple, paper birch, northern white cedar and occasionally white spruce; in the Southern Appalachians southern balsam fir, yellow buckeye, beech, sugar maple and mountain-ash.

Occurrence: Northern New England and New York at low elevations on lower slopes and moist well-drained flats. In the Southern Appalachians at elevations of 3,500 to 5,000 feet.

Place in succession: Possibly climax on moist flats in North.

Importance: Most important type commercially and in area in northern Maine.

Variants and synonyms: YELLOW BIRCH sub-type, N. E. S. Com., Jour. For. 20 (1922) 128.

TYPE 17 RED SPRUCE—SUGAR MAPLE—BEECH

Composition: Red spruce, sugar maple and beech predominate. Hemlock is often present.

Occurrence: Northern New England and the mountainous portions of New York.

Found on deep, well-drained, fertile soils of lower slopes, benches and ridges.

Place in succession: Probably a climax.

Importance: A type of great commercial importance. Covers a large area.

Variants and synonyms: SPRUCE and HARDWOODS, N. E. S. Com., Jour. For. 20 (1922) 128; Dana, Tech. Bull. 166, U. S. D. A. (1930) 29-39.

TYPE 18 RED SPRUCE

Composition: Red spruce pure or predominating.

Associates: balsam fir, paper birch, yellow birch, sugar maple, beech, red maple, hemlock, white ash, mountain-ash. In the Southern Appalachians southern balsam fir and yellow buckeye are added.

Occurrence: Northern New England, mountainous areas of New York, Pennsylvania and Southern Appalachians.

Elevations from near sea level in eastern Maine and 1,500 feet in New York to 4,500 feet; above 3,200 feet in West Virginia and above 4,500 in North Carolina and Tennessee.

Moderately well drained to poorly drained flats but not true swamps, well-drained slopes though not on the best soils, thin-soiled upper slopes. On a wide variety of soils on abandoned fields and pastures.

In New England and New York occupies large areas of flat land and in zones at higher elevations on the mountains. Less abundant in Southern Appalachians.

Place in succession: Probably near climax on moist flats and on thin soiled sites at high elevations, in other locations tending to be re-

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placed by such species as sugar maple and beech.

Importance: Important in area and the most important type commercially in New England and New York. Of minor importance in the Southern Appalachians.

Variants and synonyms: In New York and New England three variants within the red spruce type are generally recognized, as follows: SPRUCE FLAT, SPRUCE SLOPE and OLD FIELD SPRUCE. See N. E. S. Com., Jour. For. 20 (1922) 125-126; Dana, Tech Bul. 166, U. S. D. A. (1930) 29-44.

In West Virginia SPRUCE—HEMLOCK is a characteristic variant.

TYPE 19 RED SPRUCE—SOUTHERN BALSAM FIR

Composition: Red spruce and southern balsam fir pure or predominating, associated in the lower altitudinal portions of the type with hemlock, yellow birch, and less frequently with beech, sugar maple, yellow buckeye, mountain-ash and hawthorn.

Occurrence: At elevations of over 4,500 feet in Southern Appalachian Mountains and over 3,200 feet in Allegheny Highlands of West Virginia on all exposures.

Place in succession: Climax. Replaced after cutting and fire by yellow birch except at highest altitudes.

Importance: Limited in area but wherever found of high importance commercially and as a protection forest.

Variants and synonyms: SPRUCE—FIR, S. A. S. Com., Jour. For. 24 (1926) 675-676.

TYPE 20 PAPER BIRCH—RED SPRUCE—BALSAM FIR

Composition: Paper birch, red spruce

and balsam fir predominant. Aspen, red maple, yellow birch, white pine and northern white cedar occur as scattered individuals.

Occurrence: Found extensively in Maine and less frequently in northern New Hampshire and Vermont.

Wide range of upland soils. Distribution determined more by treatment than by site.

Place in succession: Originates on burns in the red spruce types or may succeed the paper birch type. In initial stages aspen is commonly present but owing to its short life is eliminated from the stand. Succeeded by the red spruce type.

Importance: Of considerable commercial importance in Maine.

TYPE 21 WHITE SPRUCE—BALSAM FIR—PAPER BIRCH

Composition: Mixtures of the three species in which white spruce and balsam fir are the key species although they may not always predominate.

Jack pine, aspen and black spruce may also occur in the mixture and less commonly, white pine, northern white cedar, sugar maple, green ash and yellow birch.

Occurrence: Northern Minnesota and locally in northern Michigan and Wisconsin at elevations from 1,000 to 1,700 feet on upland loamy soils.

Only small local areas of typical development remain, chiefly in the inaccessible rock outcrop region of northeastern Minnesota.

Place in succession: A climax type, along its southern border giving way to the sugar maple—basswood climax.

Importance: The mature type has a high value commercially, but occupies only a small area.

Variants and synonyms: SPRUCE—BALSAM, Mich. Land Ec. Surv.; Gates, Mich. Acad. Sci. 14th Rept. (1912)

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46-103. WHITE SPRUCE U. S. F. Service (1917). BALSAM—SPRUCE, Lee, Bot. Gaz. 78 (1924) 129-174. PAPER BIRCH—BALSAM—SPRUCE, Lee, (loc. cit.) BALSAM—SPRUCE—PAPER BIRCH—ASH, Stallard, Ecol. 10 (1929) 476-547. FIR—WHITE BIRCH—YELLOW BIRCH—WHITE SPRUCE—CEDAR, Bergman and Stallard, Minn. Bot. Stud. 4, pt. 4, (1916) 333-378.

TYPE 22 BALSAM FIR

Composition: Balsam fir often pure. Chief associates: on upland sites red spruce, yellow birch, paper birch, beech, red maple, hemlock; in swamps black spruce, tamarack, red maple, black ash and northern white cedar.

Occurrence: Northern New England and mountainous areas of eastern New York. Occurs on low lying flats usually poorly drained, in swamps and on upper slopes of high mountains above the spruce types in a zone below timberline.

Relatively spotty in occurrence although extensive areas occur particularly in zones on upper slopes.

Place in succession: Pure balsam stands are usually the results of heavy cutting or blow-downs. Tend to be succeeded by red spruce on the flats and slopes and by black spruce in the swamps. Climax in the zone below timberline.

Importance: Important for protection at high altitudes. Secondary in commercial importance and in area to the spruce types.

Variants and synonyms: Sub-divisions recognized are FIR FLAT, FIR SLOPE and FIR SWAMP, N. E. S. Com., Jour. For. 20 (1922) 124-5.

TYPE 23 BLACK SPRUCE

Composition: Black spruce, pure or mixed with a minor proportion of

balsam fir, tamarack, northern white cedar, black ash, red maple and occasionally paper birch.

Occurrence: In swamps. Central Michigan, Wisconsin and Minnesota northward at elevations from 700 to 1,500 feet. Northeastern New York from 300 to 4,500 feet elevation. northern and central New England. On acid peat with little or no drainage. Closely confined to the peat swamps.

Place in succession: A subclimax type.

Importance: Covers a large area and is important commercially in the Lake States. Elsewhere of relatively small area, although often giving a heavy yield per acre of pulpwood.

Variants and synonyms: SPRUCE SWAMP (or BOG) type, N. E. S. Com., Jour. For. 20 (1922) 126; Dana, Tech. Bul. 166. U. S. D. A. (1930) 29.

TYPE 24 NORTHERN WHITE CEDAR

Composition: Northern white cedar pure or predominating.

Associates are usually not subordinate. They include tamarack, balsam fir, yellow birch, paper birch, black ash, red maple, black spruce, white pine and hemlock. Sometimes has an undergrowth of alder.

Occurrence: Northern halves of Michigan, Wisconsin and Minnesota at elevations from 700 to 1,500 feet, New York from 300 to 3,500 feet, northern and central New England.

On sites with slow drainage and high water table, not strongly acid, also on limestone upland.

Common in suitable swamps but more abundant in the limestone areas of eastern Wisconsin and Michigan. Spotty distribution throughout its eastern range.

Place in succession: If undisturbed, maintains itself as long as the swamp remains wet.

Importance: Important both commercially and in area covered in the

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Lake States. Elsewhere relatively small in area but commercially important wherever found.

Variants and synonyms: CEDAR — TAMARACK—SPRUCE, Roth, U. S. F. Service Bul. 16 (1898). CEDAR — TAMARACK — SPRUCE — BALSAM, Mich. Land Ec. Surv. CEDAR — SPRUCE — BALSAM — WHITE PINE, Veatch, Mich. Agr. Exp. Sta., Quart. Bul. 10 (1928) 116-126. BALSAM—CEDAR—TAMARACK—SPRUCE, Stallard, Ecol. 10 (1929) 476-547. CEDAR — PAPER BIRCH — BALSAM — RED MAPLE, Waterman, Bot. Gaz. 74 (1922) 1-31. MIXED SWAMP, Stewart, Jour. For. 23 (1925) 171.

TYPE 25 TAMARACK

Composition: Tamarack pure or predominating.

Common associates either black spruce or northern white cedar, or less commonly both. Other associates, mostly subordinate, include red maple, black ash and aspen.

Occurrence: Chiefly found throughout Michigan, Wisconsin and all except southwestern Minnesota at elevations from 700 to 1,500 feet. Elsewhere in the northern forest a rare type.

Pure tamarack occurs south of the range of black spruce and northern white cedar in the southern part of the Lake States.

Peat swamps with little or no natural drainage.

Place in succession: Succeeded by black spruce on undrained acid peat or by northern white cedar type in better drained less acid swamps.

Importance: Covers a large aggregate area in the Lake States but has little commercial importance now, because of the destruction of all merchantable tamarack by the sawfly.

Variants and synonyms: TAMARACK—SPRUCE, U. S. F. Service; Bergman

and Stallard, Minn. Bot. Stud. 4 (1916) 333-378; Whitford, Bot. Gaz. 31 (1901) 289. TAMARACK — CEDAR, Lee, Bot. Gaz. 78 (1924) 129-174. TAMARACK — CEDAR — SPRUCE, Roth, U. S. F. Service, Bul. 16. (1898). TAMARACK — BLACK SPRUCE — CEDAR, Waterman, Bot. Gaz. 74 (1922) 1-31. TAMARACK—ASPEN, Stallard, Ecol. 10 (1929) 476-547. TAMARACK—ASPEN—RED MAPLE, Veatch, Mich. Agr. Exp. Sta., Quart. Bul. 10 (1928) 116-126. MIXED SWAMP, Stewart, Jour. For. 23 (1925) 171.

TYPE 26 BLACK ASH — AMERICAN ELM — RED MAPLE

Composition: The three type species occur in different proportions but together predominate over any other species which occur in mixture. Black ash occurs least often in other types and therefore may be considered an indicator species for this type. Black ash is rarely as abundant as the other two species except in the Lake States. In New England red maple predominates and may often be pure.

Associates include:—in the Lake States balsam poplar, balsam fir, yellow birch and less commonly, white pine, tamarack, northern white cedar, basswood, bur oak and swamp white oak, the latter only in the southern part of the region; in northern Ohio and Indiana silver maple, swamp white oak, sycamore, pin oak, black gum and cottonwood; in New England yellow birch, black gum, sycamore and toward the north tamarack and black spruce; in New York white ash, slippery and rock elms, yellow birch, black gum, sycamore, hemlock, bur oak, swamp white oak and silver maple.

Occurrence: Throughout the Lake States, northeastern Indiana, northern Ohio, Pennsylvania and north-

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ern New Jersey, New York and New England.

Occupies moist to wet muck or shallow peat soils, in swamps, gullies and small depressions of slow drainage or in elongated areas along small sluggish streams, occasionally covering extensive swamps.

Place in succession: Climax for the site.

Importance: A minor type in area and unimportant commercially.

Variants and synonyms: BLACK ASH—MAPLE—ELM, Wisc. Land Ec. Inv. Dept. of Agr. and Markets Bul. 100 (1929); Kittredge, Jour. For. 23 (1925) 890-895. ELM—SOFT MAPLE—ASH, Veatch. Mich. Agr. Exp. Sta. Quart. Bul. 10 (1928) 116-126. ELM—BLACK ASH, Davis, Rept. Mich. Geol. Surv. (1906). BLACK ASH, Chamberlain, Geol. of Wisc. 2 (1877) 176. ELM—BALSAM POPLAR—BLACK ASH, Mich. Land Ec. Surv. Rept. (1924). ELM—ASH—BASSWOOD—RED MAPLE, Veatch, Mich. Agr. Exp. Sta. Quart. Bul. 10 (1928) 116-126. MIXED SWAMP, Zon, Bul. 1496 U. S. D. A. (1927). HARDWOOD SWAMP, N. E. S. Com., Jour. For. 20 (1922) 127.

TYPE 27 MESQUITE

Composition: Mesquite characteristically pure.

Occurrence: Central Texas and local in central western Oklahoma. On dry sites, principally flat prairies with fine compact soils.

Place in succession: Doubtful. Has taken possession of open prairie lands.

Importance: Large in area, but of minor commercial importance.

TYPE 28 MOUNTAIN CEDAR

Composition: Mountain cedar pure or predominating.

Associates: live oak, cedar elm, hackberry, Schneck red oak and shin oak.

Occurrence: Central Texas on dry, low limestone hills.

Place in succession: Aggressive in stocking open lands. After cutting and fires may succeed itself or be followed by Schneck red oak.

Importance: Chief commercial type in region of its occurrence.

Variants and synonyms: CEDAR BRAKE, Bray, Bul. 49, Bur. of For., U. S. D. Agri. (1904); Foster et al, Bul. 3, A. & M. Coll. Texas (1917).

TYPE 29 SHIN OAK

Composition: Shin oak pure or predominating.

Associates: in Texas live oak, Schneck red oak, hackberry, wild plum and holly; in Oklahoma principally in pure stands, occasionally live oak. Schneck red oak, hackberry and wild plum are found.

Occurrence: Edwards Plateau in Texas on dry, limestone areas; Oklahoma in extreme western part of the main body of the state and occasionally in islands throughout central part.

Place in succession: Unknown.

Importance: Valuable as a protector of watersheds.

Variants and synonyms: OAK SHINERIES, Bray, Bul. 49 Bur. of For., U. S. D. Agri. (1904) 17-18. MOUNTAIN OAK, Bray, Bul. 49, Bur. of For., U. S. D. Agri. (1904) 18.

TYPE 30 POST OAK

Composition: Post oak pure or predominating.

Associates: blackjack oak, black oak, southern red oak, white oak, scarlet oak, shingle oak, hickories, shortleaf pine, Virginia pine and black gum. In Oklahoma Schneck red oak and chinquapin oak may be present and Virginia pine and scarlet

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oak are absent. In Texas yaupon may be the chief associate.

Occurrence: Throughout the central forest. Dry flats, uplands and ridges, on heavy clay or loam soils often underlaid by rock, especially limestone, or by hardpan. At low elevations which may reach a maximum of 1,500 feet in the Southern Appalachian and Ozark mountains. Very dry sites if soil is heavy, otherwise blackjack oak predominates. Spotty distribution determined by soil types. In some places extensive areas are occupied.

Place in succession: Probably climax on some of the driest sites. In Texas is replacing open prairie following fire protection.

Importance: Products furnished are chiefly fuel, fence posts and ties. Relatively unimportant commercially today, but covers large area in the aggregate.

Variants and synonyms: A POST OAK—YAUPON type is recognized as a variant in Texas. On certain areas yaupon enters as an associate coordinate in the stand with post oak.

TYPE 31 POST OAK—BLACKJACK OAK

Composition: Post oak and blackjack oak predominate.

Associated in widely varying quantities are found shortleaf pine, black gum, black oak, scarlet oak, white oak, shingle oak, pignut hickory, mockernut hickory, sourwood, red maple, winged elm, chinquapin and eastern red cedar. In Oklahoma chinquapin oak is chief associate.

Occurrence: Very dry sites from Ohio westward into Oklahoma, where it is a common type, and east through southern part of central forest to Southern Appalachians and Piedmont Plateau.

On either heavy or light dry soils—post

oak predominates on former, blackjack on latter.

Over broad areas and also in spots determined by soil aridity.

Altitudinal range 500 to 2,800 feet.

Place in succession: On very dry sites may be subclimax. Occupies shortleaf pine sites after repeated burning.

Importance: Of little commercial importance, although furnishing fuel, fence posts, mine props and ties on the Piedmont Plateau. One of the chief types in Oklahoma, elsewhere occupies small proportion of the forested area.

TYPE 32 BLACK OAK—POST OAK

Composition: Black oak and post oak forming the entire stand or predominating.

Associates: scarlet oak, white oak, blackjack oak, black gum, red maple, dogwood, winged elm and southern red oak.

Occurrence: Southcentral Illinois, Ozarks of Missouri, Arkansas and Oklahoma, sandstone formation of Kentucky and Tennessee.

Occurs on sites more moist than post oak—blackjack oak land. South slopes of Ozarks and Chester sandstone region of Kentucky and Missouri.

Place in succession: Doubtful.

Importance: Quite wide in range on dry sites at elevations of 2,000 feet and lower.

Variants and synonyms: SCRUB OAK, Telford, For. Surv. Ill. 3rd. Report (1926) 36-7.

TYPE 33 SCARLET OAK—BLACK OAK

Composition: The type is marked by the presence in the dominant stand of either scarlet or black oak, or of both, in greater numbers than any one of the associates. Scarlet oak is generally more abundant and characteristic than black oak. Scarlet

Forest Cover Types

oak frequently forms small nearly pure stands, and small stands of almost pure black oak are occasionally found.

Associates: chestnut oak, white oak, hickories, pitch pine, black gum, chestnut, black locust, sourwood and dogwood.

Occurrence: Mountains and foothills of the Allegheny and Appalachian ranges, usually below 3,000 feet elevation, extending to the plateaus. Also in hill regions of Ohio, Indiana, Illinois and southward. Southeastern Missouri, but not in Arkansas. This type is likely to be found throughout the botanical ranges of the two predominant species.

Dry ridges, south or west facing slopes and flats, but often extending to moister situations probably as the result of logging or fire. If soil is too moist, white oak comes in. If soil is too thin, yellow pines take the site.

Place in succession: Probably a climax type on the dry soils, giving way to chestnut oak in places.

Importance: An important type in area, and of considerable commercial importance for ties and low grade lumber.

Variants and synonyms: Forms a considerable part of what was formerly known in Forest Service acquisition terminology, as "RIDGE" and "UPPER SLOPE." BLACK OAK—SCARLET OAK, S. A. S. Com., Jour. For. 24 (1926) 675 and 680. MOUNTAIN OAK, S. A. S. Com., Jour. For. 24 (1926) 680.

TYPE 34 SOUTHERN RED OAK—SCARLET OAK

Composition: Southern red oak and scarlet oak predominant.

Associates: black oak (chief), white oak, post oak, black gum and hickories with occasional shortleaf and Virginia pines.

Occurrence: Characteristic of dry sites on the plateaus, from Maryland and

Kentucky to Georgia and Tennessee usually below 1,000 feet in altitude in the northern part of the region, 2,500 feet in the southern, but reaching somewhat greater elevations in Georgia.

Place in succession: Unknown.

Importance: Important commercially and in area covered.

Variants and synonyms: Many slight variants due to large number of associated species. Grades into SHORT-LEAF PINE—SOUTHERN RED OAK—SCARLET OAK and POST OAK—BLACK-JACK OAK types on dry sites. PLATEAU OAK, S. A. S. Com., Jour. For. 24 (1926) 681. BLACK OAK—SOUTHERN RED OAK—WHITE OAK—SAND HICKORY, Ashe Jour. Elisha Mitchell Sci. Soc. 37 (1922) 195.

TYPE 35 BEAR OAK

Composition: Bear oak pure or predominating.

Associates include: pitch pine, white pine, shortleaf pine (in New Jersey), chinquapin, chestnut, scarlet oak, black oak, red oak, chestnut oak, black locust, red maple, sassafras and black gum.

Occurrence: Southern New England, particularly Cape Cod region. Northern and (occasionally) southern New Jersey, northeastern, central and southern Pennsylvania. western Maryland and mountains of Virginia and West Virginia. Sea-level to 3,000 feet.

Occurs on drier sites. Prevailing type in anthracite coal fields of Pennsylvania. Elsewhere less prominent but often occupying extensive areas.

Place in succession: Temporary type following heavy cutting and repeated fires.

Importance: Economically worthless except as game cover.

Variants and synonyms: SCRUB OAK,

Forest Cover Types

Dana, Tech. Bul. 166 U. S. D. A.
(1930) 98.

TYPE 36 CHESTNUT OAK

Composition: Chestnut oak pure or predominant.

Common associates: chestnut, scarlet oak, white oak, black oak, post oak, pitch pine, black gum and red maple. Occasional associates: white pine, red oak, shortleaf pine, Virginia pine and sourwood.

Occurrence: Southern New England. New York except Adirondack Mountains, Pennsylvania, New Jersey and southward along mountain ranges at elevations of 1,500 to 4,000 feet to Georgia and Alabama.

On rocky outcrops with thin soil. Also on sandy Coastal Plain of New Jersey. At higher elevations seeks warm aspects.

In mountains occupies narrow strips along ridges; in Coastal Plain covers wider areas.

Place in succession: Permanent in some localities. Frequently follows fire and clear cutting in types containing red oak and chestnut oak. On drier sites of the chestnut type it succeeds chestnut after death of the latter from blight.

Importance: Aggregate area considerable but generally ranks low in commercial importance.

Variants and synonyms: CHESTNUT OAK—CHESTNUT, CHESTNUT OAK—WHITE PINE—RED OAK. CHESTNUT—CHESTNUT OAK—BLACK OAK, Jennings, Proc. Penn. Acad. Sci. 1 (1927).

TYPE 37 PITCH PINE

Composition: Pitch pine pure or predominant.

Chief associates: chestnut oak and scarlet oak. Minor associates include mountain pine, black oak, black gum, chestnut.

Occurrence: Northern New England, New York, Pennsylvania and New Jersey, southward along the Appa-

lachian and Cumberland Mountains to Georgia.

In the Appalachian region, from 2,000 to 5,000 feet elevation. In New York and New England below 1,000 feet. In Pennsylvania and New Jersey from 100 to 3,200 feet.

Ridges, dry flats and slopes. Also in New Jersey on sands of the Coastal Plain.

Irregular, but sometimes covering considerable areas. Occasionally on old fields.

Place in succession: Probably temporary, resulting from fire, in the absence of which hardwoods will gradually become predominate.

Importance: Covers a large area in the aggregate, but not as yet of high commercial importance.

Variants and synonyms: PITCH PINE—CHESTNUT OAK—SCARLET OAK. PITCH PINE—MOUNTAIN PINE, S. A. S. Com., Jour. For. 24 (1926) 680. MOUNTAIN PINE—CHESTNUT OAK—BLACK OAK, Ashe Jour. Elisha Mitchell Sci. Soc. 37. (1922) 195. BLACK PINE—CHESTNUT OAK—SPANISH OAK, Ashe, (loc. cit.).

TYPE 38 SHORTLEAF PINE

Composition: Shortleaf pine pure or predominant.

Chief associates: white oak, southern red oak and black oak and in subordinated position sometimes hickories, post oak, blackjack oak, black gum and red maple; in addition on the Piedmont Plateau and in the Appalachians Virginia pine, pitch pine and scarlet oak; in Georgia and Alabama longleaf pine may occur.

Occurrence: Throughout the Piedmont Plateau and Southern Appalachians from southern New Jersey (Coastal Plain) and Pennsylvania southward to northern Georgia and Alabama, southern Tennessee, northern Mississippi and Louisiana, Arkansas, northeastern Texas and eastern Oklahoma.

Forest Cover Types

In Arkansas and Oklahoma at elevations of 300 to 2,000 feet; in Pennsylvania at about 1,000 feet; in the Southern Appalachians below 2,400 feet, elsewhere at low elevations.

In mountains on low, well-drained ridges to rocky, dry south slopes; north slopes on the better drained spur ridges. On Piedmont Plateau occupies dry uplands and ridges. Often occupies old fields and "hurricane areas."

Is widely distributed often forming extensive almost unbroken stands.

Place in succession: On certain areas considered climax but may be superseded by white and red oak in some places.

Importance: Of great importance commercially often being chief commercial type.

Variants and synonyms: ROSEMARY PINE—BLACK OAK—WHITE HICKORY, Ashe, Jour. Elisha Mitchell, Scientific Society, 37 (1922) 195. ROSEMARY PINE — BLACKJACK OAK, Ashe, (loc. cit.).

TYPE 39 SHORTLEAF PINE—POST OAK

Composition: Shortleaf pine and post oak predominating.

Associates include scarlet oak, blackjack oak, black oak, white oak, Virginia pine and hickories.

Occurrence: Plateaus and foothills of Southern Appalachian region, not ascending above 2,500 feet, northeastern and northcentral Mississippi, Arkansas; northeastern Texas and east central Oklahoma.

In the mountains on low ridges, dry flats and south slopes, elsewhere on thinner and poorer soils than those occupied by shortleaf pine—white oak type.

Place in succession: Unknown.

Importance: Less important than the shortleaf pine type.

Variants and synonyms: ROSEMARY

PINE—POST OAK, Ashe, Jour. Elisha Mitchell Sci. Soc. 37 (1922) 195.

TYPE 40 SHORTLEAF PINE—SOUTHERN RED OAK—SCARLET OAK

Composition: Shortleaf pine, southern red oak and scarlet oak predominating.

Common associates are black oak, white oak, post oak, black gum and hickories. Pitch pine, Virginia pine, blackjack oak and mountain pine appear in some places.

Occurrence: Characteristic of dry sites on the plateaus from Maryland to Georgia, usually below 1,000 feet in altitude in the northern part of the region and 2,500 feet in the southern part.

Place in succession: Unknown.

Importance: Important commercially and in area covered.

TYPE 41 SHORTLEAF PINE—WHITE OAK

Composition: Shortleaf pine and white oak predominate.

Associates: southern red oak, red oak, post oak, blackjack oak, black gum and hickories.

Occurrence: Throughout the central forest and northern edge of the southern forest within the range of shortleaf pine. 500 to 2,000 feet elevation in Arkansas.

Moderately deep-soiled, well-drained sites with better moisture conditions than the sites occupied by the shortleaf pine—post oak and shortleaf pine—southern red oak—scarlet oak types. Occupies the better quality soils on which shortleaf pine occurs. In Coastal Plain is found only on best soils.

Occurrence spotty as influenced by topography and soil.

Place in succession: Follows the shortleaf pine type and may be replaced by some hardwood types. Considered climax on some areas.

Forest Cover Types

Importance: Fairly important commercially and in area.

TYPE 42 SHORTLEAF PINE—VIRGINIA PINE

Composition: Shortleaf pine and Virginia pine pure or predominating. Associates include: pitch pine, southern red oak, black oak, scarlet oak, white oak, post oak, black gum, blackjack oak, mountain pine (only in the mountains), chestnut oak and hickories.

Occurrence: From New Jersey to southern Indiana and southward through plateaus and foothills of Southern Appalachians to northern Georgia and northeastern Mississippi reaching altitudes of 2,500 feet at southern end of the mountains.

Occupies dry sites on southern slopes and old fields. Spotty in distribution.

Place in succession: Succeeded by shortleaf pine and oaks.

Importance: Minor as to area. Important commercially only through percentage of shortleaf pine it contains.

TYPE 43 VIRGINIA PINE—SOUTHERN RED OAK

Composition: Virginia pine and southern red oak predominant.

Associates: shortleaf pine, black oak, scarlet oak, white oak, post oak, black gum, blackjack oak and hickories; in the foothills add pitch pine, mountain pine and chestnut oak.

Occurrence: Southern Pennsylvania, plateaus and foothills of the Southern Appalachian region, rarely above 2,500 feet on dry slopes and low ridges.

Irregular occurrence, intergrading with other dry site types.

Place in succession: Unknown.

Importance: Small commercial importance.

TYPE 44 VIRGINIA PINE

Composition: Virginia pine pure or predominating.

Principal associates: shortleaf pine, chestnut, white oak, chestnut oak, red oak, black oak, red gum, red maple and black gum. Pitch pine or loblolly pine is sometimes present.

Occurrence: Widely distributed in southern Pennsylvania, New Jersey, (not so abundant), the Piedmont Plateau south into Georgia and westward throughout the Appalachians, mostly below 2,000 feet elevation to eastern Kentucky and Tennessee, southeastern Ohio and southern Indiana.

Occupies dry sites.

Place in succession: A temporary type, often originating on old fields. Succeeded by shortleaf pine and various hardwoods.

Importance: Limited in area but often has commercial value for pulpwood.

Variants and synonyms: VIRGINIA PINE—CHESTNUT OAK—CHESTNUT, S. A. S. Com., Jour. For., 24 (1926) 682.

TYPE 45 BUR OAK

Composition: Bur oak pure or predominating.

Common associates: in Minnesota, jack oak, red oak, white oak or black oak and sometimes basswood and American elm either as coordinate or subordinate species; in North Dakota, American elm, green ash, boxelder, basswood, hackberry, cottonwood and hop-hornbeam; in southern part of type range—American elm, bigleaf shagbark hickory, white ash, basswood, blue beech, swamp white oak, pin oak, red maple and cottonwood.

Occurrence: Throughout the central West from prairies of Ohio to Nebraska, northward to central Minnesota and Devils Lake region of North Dakota.

Forest Cover Types

Found in Minnesota on dry, exposed sites of sandy plains or of loamy slopes on south and west exposures. Elsewhere on heavy soils usually black prairie loam from well-drained to fairly dry.

Local and spotty and westward in strips along upper slopes of stream bluffs.

Place in succession: Pioneer type on edge of prairies. Gradually succeeded by the jack oak or white oak—black oak—red oak types in Minnesota.

Importance: Limited in area and commercial importance. The commercial value is greater in the Turtle Mountains region of North Dakota than elsewhere.

TYPE 46 EASTERN RED CEDAR

Composition: Eastern red cedar pure or predominant.

Associates: in the Northeast gray birch, red maple, black birch and aspen; in Arkansas blackjack oak, post oak, black oak and shortleaf pine; on limestone soils black locust, blue ash, black oak, white oak and American elm.

Occurrence: Scattered throughout the central forest and occasionally in the southern forest in the interior of southern Alabama, northern and central Mississippi and eastern Texas.

Dry uplands, usually abandoned pastures or fields; never in strongly acid soils. Typical of limestone outcrops.

Place in succession: Temporary type. May be first to occupy pastures since grazing favors the type. Succeeded by various hardwood types.

Importance: Of limited area. Where merchantable stands occur they are commercially valuable.

Variants and synonyms: CEDAR BRAKE recognized in Alabama as a local type CEDAR HAMMOCK, CEDAR GLADE: Mohr, Contr. to U. S. Nat.

Herbarium 6 (1901) 81, 102. CHINQUAPIN OAK — SMALL SHAGBARK HICKORY — POST OAK — RED CEDAR, Ashe, Jour. Elisha Mitchell Sci. Soc. 37 (1922) 196. RED CEDAR — GRAY BIRCH, Lutz, Yale School of Forestry Bul. 22 (1928).

TYPE 47 BLACK LOCUST

Composition: Black locust pure or predominant.

A wide list of hardwoods and yellow pines may be in mixture with the black locust.

Occurrence: Throughout the central forest.

May occur on any well-drained soil but finds most favorable conditions on dry sites, especially on limey soils.

The species escaped from cultivation over much of its range. As a type is widely distributed but spotty in occurrence. Often occurs on old fields.

Place in succession: Temporary.

Importance: At present minor but increasing through fire and planting.

TYPE 48 WHITE PINE — CHESTNUT OAK — CHESTNUT

Composition: White pine, chestnut oak and chestnut predominating.

Yellow poplar, red oak, white oak, hemlock, hickories and many other species in the coves and on lower north exposures may occur in the mixture.

Scarlet oak, red maple, pitch pine, shortleaf pine, black gum and other dry site species are the associates on south exposures, upper slopes and ridges.

Occurrence: Southern Appalachian Mountains from West Virginia to northern Georgia, reaching area climax in southwest Virginia, eastern Tennessee, and western North Carolina, at elevations from 1,500 to 4,000 feet, but occasionally found as high as 5,000 feet in eastern Tennessee and western North Carolina.

Forest Cover Types

Occupies coves, mountain slopes, high hanging valleys and flat ridge tops, varying widely in soil from moist deep loams to sandy and gravelly dry sites.

This type, in which white pine sometimes constitutes as much as 40 per cent of the stand, occurs in broad zones between which there are areas sometimes twenty miles in width where the white pine becomes an unimportant and occasional tree in the stand. Now found chiefly as second-growth or in small stands of isolated virgin timber. The largest single body left in uncut condition lies on the headwaters of the Yadkin River in Caldwell and Wilkes Counties, North Carolina.

Place in succession: Unknown.

Importance: Commercially unimportant until second-growth becomes marketable.

TYPE 49 WHITE OAK — BLACK OAK — RED OAK

Composition: White oak, black oak and red oak predominate usually with a small admixture of other species.

Associates, usually coordinate with the type oaks, include: in the Lake States jack oak, scarlet oak and bur oak, shagbark or bitternut hickory, white or green ash, sugar maple and occasionally a few black cherry, butternut or large-toothed aspen; farther south American elm, red maple, black walnut, basswood, black locust, chinquapin, beech, red gum and black gum; in southeastern Pennsylvania yellow poplar, pignut hickory, shagbark hickory, mockernut hickory, white ash, red maple, beech and black gum with understory of dogwood.

Occurrence: Through the central forest, particularly the Middle West, chiefly at elevations from 500 to 2,000 feet.

Usually on loamy well-drained soils. Also found in the Lake States on gravelly mo-

rainal slopes and in northern Mississippi and Louisiana on dry ridges.

Common upland oak type in northern part of central forest from Ohio to Iowa and in southern Pennsylvania and western New Jersey.

Place in succession: In the Lake States and Ohio drainage succeeded by types in which sugar maple is more prominent.

Importance: Relatively limited in area and in commercial importance except as a large element in the farm woods.

Variants and synonyms: OAK—HICKORY, Illick, Penn. Dept. Forests and Waters, Bul. 11 (1914); Weaver and Clements, Plant Ecology (1929) 456; Telford, For. Surv. Ill., 3rd. Rpt. (1926) 54; Kittredge, Jour. For. 23 (1925) 890-895; Veatch, Mich. Agr. Exp. Sta. Quart. Bul. 10 (1928) 116-126. WHITE OAK—BLACK OAK, Kittredge, Mich. Agr. Exp. Sta. Spec. Bul. 190 (1929). BLACK OAK—WHITE OAK, Harvey, Mich. Acad. Sci. Rpt. (1919) 213-217. OAK RIDGE, Sherrard, Rpt. Mich. For. Com. (1902) 28-34. BUR—WHITE—RED OAK, Roth, U. S. F. Service, Bul. 16 (1898). OAK—MAPLE, Chamberlain, Geol. of Wisc. 2, (1877) 176. MIXED HARDWOODS, Telford, For. Surv. Ill., 3rd. Rpt. (1926) 11. BLACK OAK, Brown, Mich. Acad. Sci. 19th. Rpt. (1917) 209-217.

TYPE 50 WHITE OAK

Composition: White oak pure or predominant.

Chief associates: black oak, yellow poplar, chestnut, shagbark and mockernut hickories.

Occurrence: Throughout the central forest on well-drained loamy soils.

Place in succession: May be permanent on some sites.

Forest Cover Types

Importance: Of secondary importance due to limited area except in the Ozark region.

Variants and synonyms: A WHITE OAK—BLACK OAK type was found by McCarthy to exist in southern Indiana as a narrow zone between the SCARLET OAK—BLACK OAK and the WHITE OAK types.

TYPE 51 RED OAK—BASSWOOD—WHITE ASH

Composition: Red oak, basswood and white ash forming the whole or a predominant part of the stand.

Associates: in New England red maple (characteristic), yellow birch, aspen, sugar maple, paper birch and beech; in New York and western Pennsylvania to the above list often add black cherry, white oak, black birch, butternut, American elm and hemlock; in the Southern Appalachians and middle western states yellow buckeye, yellow birch, chestnut, black birch, sugar maple and black cherry. In Iowa shagbark hickory replaces basswood. White ash is generally unimportant or absent in the Southern Appalachians.

Occurrence: Throughout the central forest and southern part of northern forest. In Appalachian Mountains from West Virginia to northern Georgia type is located at elevations between 3,000 and 5,500 feet. Elsewhere occurs at low elevations.

Occupies deep, fertile, moist, well-drained soils. In Iowa seeks areas slightly ill-drained bordering swamps.

Place in succession: Semi-permanent although the proportion of hemlock and sugar maple tends to increase.

Importance: Relatively important in central New England and New York due to area covered and commercial value. Elsewhere of minor importance.

Variants and synonyms: BUCKEYE — BASSWOOD, S. A. S. Com., Jour. For. 24 (1926) 677. TRANSITION HARD-

WOODS, Spaeth, Harvard Forest Bul. 2 (1920). OAK—MAPLE, Kittredge, Jour. For. 23 (1925) 890-895 is a Lake States variant with more white oak and sugar maple. MOUNTAIN LIN — YELLOW BUCKEYE — WHITE ASH, Ashe. Jour. Elisha Mitchell Sci. Soc. 37 (1922) 193. BLACK CHERRY—SUGAR MAPLE—MOUNTAIN LIN—BLACK BIRCH, Ashe, (loc. cit.).

TYPE 52 RED OAK

Composition: Red oak pure or predominant.

Associates: black oak, scarlet oak, chestnut oak, chestnut and yellow poplar.

Occurrence: Southern Appalachian Mountains from West Virginia to northern Georgia, at elevations of 2,000 to 3,000 feet in West Virginia and 3,000 to 5,500 feet in North Carolina.

Spotty distribution, occurring on ridge crests and north slopes in park-like stands.

Place in succession: Climax type.

Importance: Of secondary commercial importance. The trees are short-bodied and flat-topped.

Variants and synonyms: NORTHERN RED OAK, S. A. S. Com., Jour. For. 24 (1926) 677.

TYPE 53 YELLOW POPLAR

Composition: Yellow poplar pure.

Associates: black locust, red maple, black birch, red oak, cucumber magnolia and other moist site species.

Occurrence: Appalachian Mountains and adjoining portions of the central forest, at altitudes of from 500 feet (or less in the north and west) to 4,000 feet in the southern Appalachian Mountains.

On moist lower slopes, northerly slopes, moist coves and flats. Usually in small scattered stands. Frequently in more or less interrupted strips at bottoms and sides of mountain coves.

Forest Cover Types

Place in succession: Characteristically a second-growth and temporary type often found on old fields. In small patches yellow poplar still predominates in old growth stands, and the yellow poplar type may once have been extensive in the virgin forest. In its pure form the yellow poplar type is not a climax. Stoneburner, for the Unaka National Forest, reports the yellow poplar type as rapidly replacing white pine hemlock stands after logging.

Importance: Extremely important in the Appalachians both commercially and in aggregate area. Relatively accessible, due to its occurrence in coves and on lower slopes.

TYPE 54 YELLOW POPLAR—HEMLOCK

Composition: Yellow poplar and hemlock predominating.

Associates include chestnut, basswood, black gum, red oak, white ash, black oak, white oak, sugar maple and cucumber magnolia.

Occurrence: Appalachian and Cumberland mountains from Kentucky to northern Georgia, at altitudes between 2,000 and 4,000 feet. Found only in virgin stands, not in second-growth.

Occupies moist coves, flats and ravines.

Strips along larger stream bottoms to foot of the slopes.

Place in succession: Unknown.

Importance: Commercially important where hemlock bark and pulpwood can be sold. Poplar is of excellent quality as fires do little damage. Aggregate area small.

TYPE 55 YELLOW POPLAR—WHITE OAK—RED OAK

Composition: Yellow poplar, white oak and red oak predominant.

Associates: chestnut, black oak, hemlock,

black gum, hickories and other species of the moist sites.

Occurrence: Southern Appalachian mountain ranges, between altitudes of 500 and 4,000 feet on northerly slopes, coves, and moist flats.

Irregular and "spotty," but may form considerable strips on moist slopes.

Place in succession: Unknown.

Importance: Important commercially as well as in area and location.

Variants and synonyms: YELLOW POPLAR — CHESTNUT. Described by Shields and Wasilik for the Nantahala National Forest as containing 70 per cent of yellow poplar and chestnut associated with white, red and black oaks, hemlock and black gum. Found on moist sites along streams at the lower elevations (2,500-3,000 feet). Also recognized as YELLOW POPLAR—CHESTNUT — RED OAK — HEMLOCK, Ashe, Jour. Elisha Mitchell Sci. Soc. 37 (1922) 193-4.

YELLOW POPLAR—WHITE OAK—SUGAR MAPLE. Characteristically developed in middle Kentucky and Tennessee, southward to Sand Mountain in northern Alabama, much of it on limestone soil. Generally at altitudes of less than 3,000 feet. Ashe, (loc. cit.). Also reported from West Virginia.

YELLOW POPLAR — WHITE OAK — BLACK GUM—RED MAPLE. Described by Ashe, (loc. cit.), as indicating the wettest site on which yellow poplar naturally grows.

YELLOW POPLAR — WHITE OAK — BLACK OAK — MOCKERNUT HICKORY. Described by Ashe, (loc. cit.) as typically developed on sandy soils, often calcareous, on the Cumberland Mountains in Tennessee and Sand Mountain in Alabama.

YELLOW POPLAR—WHITE OAK. Described by Shields and Wasilik, for the Nantahala National Forest, as containing 60 per cent of yellow poplar and white oak, associated

Forest Cover Types

with hemlock, white pine, basswood and ash.

TYPE 56 CHESTNUT

Composition: Chestnut pure or predominant.

Associates: chestnut oak, yellow poplar, red oak, white oak, black oak, scarlet oak, hickories, black gum, black birch, basswood, sugar maple and beech; in the northern Piedmont Plateau southern red oak, Virginia pine, scarlet oak, black oak and hickories.

Occurrence: Extended formerly from southern Maine and New Hampshire down the Appalachian and Cumberland Mountains into northern Georgia and Alabama. The death of chestnut from the blight has restricted the geographical range of the type. It now exists only in the mountains from West Virginia south at altitudes of 1,300 to 4,500 feet on northerly and to 5,500 feet on southerly exposures. Throughout its range chestnut is dying and the type seems doomed to extinction.

Occupies moist northerly slopes and coves, extending to southerly exposures at somewhat higher elevations. Often on crests of high ridges at 4,500 to 5,500 feet.

May occur in large stands on suitable sites but with no particular zonal distribution.

Place in succession: Future composition following the death of the chestnut cannot be accurately foreseen. Chestnut oak appears to be an abundant species in the replacement. At high altitudes red oak will probably succeed the chestnut in mixed stands of these species, converting them largely into red oak type.

Importance: Very important in area and commercially so long as the chestnut remains alive or merchantable.

Variants and synonyms: OAK—CHEST-

NUT, Weaver and Clements, Plant Ecology (1929) 455.

TYPE 57 BEECH—SUGAR MAPLE

Composition: Beech and sugar maple pure or predominating.

Associates: red maple, white oak, red oak, hemlock, red elm, American elm, basswood, pignut, shagbark and mockernut hickories and black cherry.

Occurrence: Ohio Valley and southern Michigan.

In zones determined by soil moisture and temperature factors throughout area of early Wisconsin glaciation. In valleys of southwestern Pennsylvania, southeastern Ohio and mountainous part of Kentucky. Occurs at level of Tennessee Valley near Union, Tenn.

Morainal hills of Ohio, central Indiana and adjacent Michigan, also lower slopes of valleys and talus slopes under cliffs. Common on moist shale formations.

Place in succession: Climax while moisture conditions remain stable.

Importance: One of the most important types from northeastern Ohio to eastern Indiana.

Variants and synonyms: SUGAR MAPLE—BEECH, Jennings, Proc. Penn. Acad. Sci. 1 (1927).

TYPE 58 BEECH

Composition: Beech pure or predominating.

Associates: Sugar maple, yellow poplar, pin oak, red gum, red maple, red oak, white ash, red elm, American elm, white oak, mockernut, pignut and bitternut hickories.

Occurrence: Middle western states.

Type created and extended by cutting through northern and eastern Ohio into central Indiana. Common in "flats" of Indiana and along all stream courses of mountain and hill region where heavy soils are poorly drained.

Clay land such as Clermont silt loam and

Forest Cover Types

flat ridges of central Ohio, poorly drained but with drainage enough to permit entry of beech.

Widely distributed—most common single species type in Ohio and Indiana.

Pure stands of beech occasionally occur on rocky stream flats in Southern Appalachians at elevations of 2,500 to 3,000 feet.

Place in succession: Climax. Hard to displace once cultural practice (cuttings), favors the beech.

Importance: Next in importance to principal oak types.

Variants and synonyms: PIN OAK.

TYPE-59 RIVER BIRCH—SYCAMORE

Composition: River birch and sycamore predominating.

Associates include red maple, black willow and other moist site hardwoods.

Occurrence: Southern New England, New Jersey, Pennsylvania, southern Lake States, tributaries of the Ohio and Mississippi Valley to Oklahoma and Tennessee, Allegheny and Piedmont Plateaus, reaching altitudes of 1,000 feet in the northern and 2,500 feet in the southern parts of the Appalachian Mountains. Scattered along river valleys in southern forest in Georgia.

Moist soils at the edges of creeks and rivers. In strips along streams and in small stands in moist places.

Place in succession: Unknown.

Importance: Widely distributed but of minor importance, commercially and in area.

Variants and synonyms: RIVER-EDGE HARDWOODS, S. A. S. Com., Jour. For. 24 (1926) 682. SYCAMORE, Brown, Mich. Acad. Sci. 19th Rpt. (1917) 209-217. RIVER BIRCH — SYCAMORE — RED MAPLE — BLACK WILLOW, Ashe, Jour. Elisha Mitchell Sci. Soc. 37 (1922) 196.

TYPE 60 SILVER MAPLE—AMERICAN ELM

Composition: Silver maple and American elm predominant.

Associates: red maple, slippery elm, cottonwood, white or green ash and many other moist site hardwoods varying with the region.

Silver maple is the indicator species.

Occurrence: Throughout the central forest.

On silty soils of river bottoms and flood plains. Soils usually poorly-drained. Occasionally in swamps. Occurs in long strips along the larger streams and sometimes on low lake shores.

Place in succession: Often follows cottonwood and willow stands. Gradually succeeded by sugar maple—basswood or other hardwood types as drainage of the site matures.

Importance: Relatively small in area and unimportant commercially.

Variants and synonyms: SILVER MAPLE — ELM — ASH — HICKORY and SILVER MAPLE—ASH—BASSWOOD—SWAMP WHITE OAK, Veatch, Mich. Agr. Exp. Sta. Quart. Bul. 10 (1928) 116-126. SILVER MAPLE, Brown, Mich. Acad. Sci. 19th Rpt. (1917) 209-217.

TYPE 61 COTTONWOOD

Composition: Cottonwood pure or predominant. Four different trees are included under type name as here used. They are as follows: Southern cottonwood *Populus deltoides virginiana* (Castiglioni) Sudworth, eastern cottonwood *Populus deltoides* Marshall, cottonwood *Populus sargentii* Dode and swamp cottonwood *Populus heterophylla* Linnaeus.

Chief associates (particularly in younger stages) sandbar willow and peachleaf willow. Other associated species, as invaders of the next successional stage, are subordinate.

Forest Cover Types

They include sycamore, red gum, river birch, white or green ash, American or slippery elm, silver maple and red maple.

Occurrence: Throughout the central forest and southern forest, but particularly the Mississippi, Ohio and Missouri river systems.

Sandy, gravelly or silty soils of river bottoms and flood-plains. Rich alluvial soils and river sandbars. Wherever moist, bare soil is available.

In narrow strips along the larger streams on the first bottoms and in the lower Mississippi Valley on batture land (i. e., land between levee and river) and on old fields, (especially old cotton or corn fields).

In the central forest has been planted on upland prairie soils as shelter-belts.

Place in succession: Temporary. Pioneer or follows willow in seizing newly made sandbars. Succeeded by silver maple—American elm, red gum and other hardwood types. May be permanent on overflowed sandbars and flats in the batture lands.

Importance: Very important along the Mississippi River.

On the Missouri River drainage the scarcity of forest on sites other than stream bottoms increases the relative importance of the cottonwood type.

Variants and synonyms: COTTONWOOD—WILLOW, Kittredge, Jour. For. 23 (1925) 890-895; Lentz, Jour. For. 29 (1931) 1052. WILLOW—POPLAR, Bergman and Stalard, Minn. Bot. Std. 4, part 4, (1916) 333-378. COTTONWOOD—SYCAMORE stands are recognized locally in the southern states.

In the bottomlands of the Missouri River and tributaries (west of Iowa and Missouri) the cottonwood is *Populus sargentii*. The associates comprise American elm, green ash, boxelder and willows. Overflow land, both rich alluvial soils and river sandbars, are occupied. Considered

here a climax type. Used for firewood and rough construction work on farms.

TYPE 62 SAND PINE

Composition: Sand pine predominant. Chief associates: myrtle oak, Florida hickory *Hicoria floridana* and Chapman white oak. Other associates include holly, (var. *arenicola*), turkey oak and live oak, (var. *geminata*).

Occurrence: Florida to Alabama on very dry, high sand ridges and coastal dunes.

Place in succession: Subclimax.

Importance: Not a valuable timber tree but dominant over many thousand acres of the poorest soil where no other tree of value can survive. Has possible use as pulp material.

Variants and synonyms: SCRUB, Harper, 3rd Ann. Report (1910) 224 and 18th Ann. Report, Fla. Geol. Surv. (1927) 79-81. SPRUCE PINE, Harper, 18th Ann. Report, Fla. Geol. Survey (1927) 79-81; Watson, Naturalist's Guide to the Americas (1926) 427-440.

TYPE 63 LONGLEAF PINE

Composition: Longleaf pine pure.

Associates: on dry sites turkey oak and less abundantly blue-jack oak, blackjack oak and post oak; on moist sites slash pine, live oak (var. *geminata*) with some red gum, southern red oak and loblolly pine.

Occurrence: Hills and rolling country of upper Coastal Plain and also old coastal dunes in North Carolina, South Carolina, Alabama, Georgia, Florida, Louisiana and southern Mississippi.

In the flatwoods belt of the lower Coastal Plain on the drier sites of these poorly-drained soils.

Place in succession: May be climax on dry sites, elsewhere temporary or subclimax and succeeded by

Forest Cover Types

slash pine, loblolly pine or by hardwoods.

Importance: Valuable for timber and naval stores.

Variants and synonyms: HILL PINE, LONGLEAF PINE FLATWOODS. FLATWOODS, Harper, Ann. Reports, Fla. Geol. Survey (1914) 330 and (1927) 82-87; Watson, Nat. Guide to the Americas (1926) 427-440; Ashe, Bull. 24 N. C. Geol. & Econ. Survey (1915) 14. HIGH PINE LAND, Harper, 18th Ann. Report, Fla. Geol. Survey (1927) 82-84. HIGH PINE WOODS, Watson, (loc. cit.). PINE BARRENS, Ashe, N. C. Geol. Survey Bull. 5 (1894) 34 and Bull. 24 (1915) 14; Luginbill, Nat. Guide to the Americas (1926) 419; Mohr Contr. to U. S. Nat. Herbarium 6 (1901) 96.

TYPE 64 LONGLEAF PINE—TURKEY OAK

Composition: Longleaf pine and turkey oak pure or predominating.

Associates: blue-jack oak, blackjack oak, post oak, persimmon, myrtle oak, laurel oak and live oak (var. *geminata*). The last three species are not common in the Carolinas.

Occurrence: Sand hill section of North Carolina and South Carolina at elevations of 200 to 400 feet above sea level and on coarse sands on Coastal Plain of North Carolina, South Carolina, Georgia, north Florida, Mississippi and eastern Louisiana.

The exclusive type on dry sand ridges and upper slopes and on rather large areas of well-drained coarse sands.

Place in succession: Often replaces longleaf pine after cuttings and repeated fires.

Importance: Of great economic importance since the area is extensive. This type has been commercially

important as a source of turpentine and longleaf pine lumber, but lumbering, repeated fires and consequent lack of longleaf pine seed trees have made the valueless oaks predominant.

Variants and synonyms: LONGLEAF PINE SAND HILLS, Ashe. Bull. 24, N. C. Geol. and Econ. Survey (1915) 14.

TYPE 65 TURKEY OAK

Composition: Turkey oak pure or predominant.

Chief associates: blue-jack oak, post oak and blackjack oak (except in eastern Florida where live oak (var. *geminata*) replaces blackjack oak).

Minor associates: persimmon, hickory, myrtle oak and laurel oak.

Occurrence: Common in all the southeastern states on dry sand ridges formerly occupied by longleaf pine.

Place in succession: Doubtful. Originates when longleaf pine type is clear cut.

Importance: Of no commercial importance. A waste land type under present conditions.

Variants and synonyms: Often called SCRUB OAK RIDGE type. SAND RIDGE, Metcalf and Wells, Naturalist's Guide to the Americas (1926) 414.

TYPE 66 SOUTHERN RED CEDAR

Composition: Southern red cedar pure or predominant.

A variety of associates may be present including live oak (var. *geminata*), cabbage palmetto, evergreen magnolia, myrtle oak and sweet bay.

Occurrence: On extensive shell mounds along the Gulf Coast.

Place in succession: Subclimax. Live oak—cabbage palmetto is the probable climax type.

Forest Cover Types

Importance: Valuable species but occupies relatively small area.

TYPE 67 LIVE OAK—CABBAGE PALMETTO

Composition: Live oak (var. *geminata*) and cabbage palmetto predominant.

Associates: southern red cedar and evergreen magnolia with smaller amounts of laurel oak, red maple, red bay and holly.

Occurrence: Beach dunes and calcareous hammocks mostly in Florida but extending northward into North Carolina.

Place in succession: Probably climax.

Importance: Unimportant.

Variants and synonyms: PALMETTO—LIVE OAK HAMMOCK. LIVE OAK HAMMOCK. PALM SAVANNA, Harper, 18th Ann. Report, Fla. Geol. Survey (1927) 100-101

TYPE 68 LOBLOLLY PINE—SHORTLEAF PINE

Composition: Loblolly pine and shortleaf pine alone or with such minor associates as hawthorn, persimmon, black gum, post oak, red oak and red gum.

Occurrence: Abundant in northern Mississippi and Louisiana and to a lesser extent wherever ranges of shortleaf and loblolly pines overlap.

Shortleaf pine predominates on drier ridges, while loblolly pine is found mostly on soils with a higher moisture content. Abandoned fields in the "hill prairies" of Mississippi are frequently taken possession of by shortleaf and loblolly pines.

Place in succession: Subclimax.

Importance: Of commercial importance.

Variants and synonyms: SHORTLEAF PINE HILLS, Goldsmith, Wyman and Kopman, Naturalist's Guide to the Americas (1926) 460.

TYPE 69 LOBLOLLY PINE

Composition: Loblolly pine pure or predominant.

Associates: red gum is characteristic; on fresh to moist sites add southern red oak, post oak and blackjack oak; on poorly-drained sites add black gum, water oak, yellow poplar and pond pine and in the far South tupelo gum and laurel oak.

Occurrence: Coastal Plain from Delaware and Maryland to Mississippi, Louisiana and eastern Texas. Occurs both on upland soils with abundant moisture but good drainage and also on poorly-drained depressions in the flatwoods. Largely on old fields or cutover areas of the longleaf pine flatwoods type.

Place in succession: Seizes abandoned fields. Succeeded by mixtures of loblolly pine and hardwoods.

Importance: Valuable timber type over extensive territory.

Variants and synonyms: OLD FIELD LOBLOLLY.

TYPE 70 LOBLOLLY PINE—SOUTHERN RED OAK

Composition: Loblolly pine and southern red oak predominating.

Associates: shortleaf pine, red gum, longleaf pine, post oak and persimmon.

Occurrence: Central and northern Louisiana and southern Arkansas. Clay ridges with fair drainage but with sufficient moisture in the ground.

Place in succession: Southern red oak tends to replace loblolly pine.

Importance: The loblolly pine is commercially important but not the oak on such sites.

TYPE 71 LOBLOLLY PINE—WHITE OAK

Composition: Loblolly pine and white oak predominating.

Associates: hickories, red maple, scarlet

Forest Cover Types

oak, black oak, red oak, southern red oak, swamp red oak, post oak, willow oak, water oak, black gum, red gum, white ash, red ash and water ash.

Occurrence: Lower Piedmont Plateau and upper Coastal Plain between 100 and 600 feet above sea level in Maryland, Virginia and the Carolinas; probably also occurs farther south.

Moderately moist and fertile soils.

Place in succession: Probably a transition or tension zone type.

Importance: Important commercially and in area.

Variants and synonyms: PINE—OAK, Chrysler, Md. Weather Service 3.

TYPE 72 LOBLOLLY PINE—SLASH PINE

Composition: Loblolly pine and slash pine predominating.

Associates: red gum, water oak, laurel oak, yellow poplar, sweet bay, red bay, black gum, tupelo gum and American elm.

Occurrence: Coastal Plain from South Carolina to eastern Louisiana.

On old fields and on moist areas along small creeks sometimes on slightly rolling flatwoods.

Place in succession: Temporary.

Importance: Valuable timber type but limited in area.

TYPE 73 LONGLEAF PINE—SLASH PINE

Composition: Longleaf pine and slash pine alone or with a small mixture of water oak and laurel oak and occasionally post oak, blackjack oak and live oak.

On ground intermittently wet loblolly pine, sand pine, southern cypress, pond cypress, black gum and tupelo gum are characteristic associates.

Occurrence: Coastal Plain from Georgia to Louisiana. Usually second growth stands coming in on longleaf pine ridges in the flatwoods or

in old fields. Also on borders of ponds on ground intermittently wet.

Place in succession: Temporary type caused by hogs tending to eliminate longleaf pine or by fire protection favoring slash pine. Probably succeeded by longleaf pine type.

Importance: Important timber type.

Variants and synonyms: FLATWOODS PINE. PALMETTO FLATWOODS, Harper, 4th Annual Report, Fla. Geol. Survey (1911) 66. PINE BARRENS, Hoke, Naturalist's Guide to the Americas (1926) 455. PINE BARREN FLATS, Harper, Naturalist's Guide to the Americas (1926) 116. PINE MEADOWS, Harper, 4th Annual Report, Fla. Geol. Survey (1911) 72.

TYPE 74 SLASH PINE

Composition: Slash pine ordinarily pure.

Chief associates: on moist areas pond cypress and swamp black gum with some red maple, red gum, sweet bay, loblolly bay, tupelo gum and pond pine; on limestone ridges in southern Florida live oak, gumbo-limbo, cabbage palmetto, stopper, thatch-palm and bustic.

Occurrence: Coastal Plains of Georgia, Florida, Alabama, Mississippi and Louisiana.

In shallow ponds on branch bottoms of flatwoods and on old fields.

Also found on limestone ridges along coast of southern Florida.

Place in succession: Subclimax.

Importance: Important timber type.

Variants and synonyms: FLATWOODS, Harper, 18th Ann. Report, Fla. Geol. Survey (1927). FLAT PINE WOODS, Harper, (loc. cit.). PALMETTO FLATWOODS, Sellards, 4th Ann. Report, Fla. Geol. Survey (1911) 66; Sellards and Gunter, 3rd Ann. Report, Fla. Geol. Survey (1910) 46. SLASH PINE BOGS and

Forest Cover Types

BAYS, Harper, 3rd Ann. Report, Fla. Geol. Survey (1910) 256.

TYPE 75 CABBAGE PALMETTO—SLASH PINE

Composition: Cabbage palmetto and slash pine predominate.

Associates: on marshes close to the coast pond pine and a scattering of red gum and loblolly pine; on flatwoods areas in southern Florida live oak (var. *geminata*) and myrtle oak.

Occurrence: Coastal Plain of Georgia and Florida on marshes close to coast or on flatwoods areas in southern Florida.

Importance: Important timber type.

Variants and synonyms: DRY PRAIRIE, Harper, 18th Ann. Rep., Fla. Geol. Survey (1927) 87. MARLY FLATWOODS, Harper, (loc. cit.) 173. PALMETTO BELT, Fox, Naturalist's Guide to the Americas (1926) 424.

TYPE 76 WATER OAK—WILLOW OAK

Composition: Water oak and willow oak together or singly forming practically the entire stand.

Occurrence: A flatwoods type scattered infrequently through the pine region of eastern Texas (but particularly in the northern part), and southeastern Oklahoma.

Place in succession: Doubtful.

Importance: Produces some valuable oak lumber and tie timber.

Variants and synonyms: OAK GLADE.

TYPE 77 RED GUM—YELLOW POPLAR

Composition: Red gum and yellow poplar predominating.

Associates: loblolly pine, red maple, white ash, red ash and other moist site hardwoods.

Occurrence: Reaches maximum importance in Coastal Plain from Maryland to central Florida. Ex-

tends into the Piedmont Plateau, but is there of less importance.

Occupies moist lower slopes, but does not extend into swampy ground.

Moisture conditions limit the type to lower slopes and limit its occurrence to belts between stream swamps and upper slopes.

Place in succession: Reproduces itself after logging and takes possession of abandoned farm land on the lower slopes. Probably climax on certain sites as both the red gum and yellow poplar reach large sizes and reproduce under their own shade.

Importance: An important type as both red gum and yellow poplar are used extensively for furniture and veneers. Yellow poplar is also used for pulpwood.

Variants and synonyms: BOTTOMLAND HARDWOOD, S. A. S. Com., Jour. For. 24 (1926) 683.

TYPE 78 LIVE OAK

Composition: Live oak pure or predominant.

Associates: red gum, evergreen magnolia, holly, laurel oak, water oak, and hawthorn.

Occurrence: Southern Louisiana along well-drained borders of tidal marshes.

Place in succession: Climax.

Importance: Commercially practically worthless and of limited area.

TYPE 79 BEECH—EVERGREEN MAGNOLIA

Composition: Beech is the indicator species and is often the most abundant. A great variety of other hardwoods occur. Common associates include black gum, yellow poplar, swamp red oak and southern red oak.

Occurrence: Loess ridges, ravines and branch bottoms between these ridges and branch bottoms intersecting many of the pine lands in

Forest Cover Types

Louisiana, Arkansas and Mississippi. Also on hammocks of southern Louisiana. Widely distributed.

Place in succession: Climax.

Importance: Important in loess region as it contains best merchantable timber. Less important in the hammocks.

Variants and synonyms: UPLAND HARDWOODS used in the Mississippi Delta by the Forest Survey, Southern Forest Experiment Station.

TYPE 80 HICKORY—SWAMP CHESTNUT OAK — WHITE OAK

Composition: At least six species of hickory, (shagbark, bigleaf shagbark, pignut [*H. leiodermis*], mockernut, nutmeg and bitternut), together with swamp chestnut oak, white oak, post oak and/or a related species *Quercus mississippiensis* Ashe, predominate. Hickories and oaks of the white oak group are always predominant; but the two oaks mentioned in the type name, although commonest of the oaks, are not indicator species or even present in certain cases.

Associates: Nuttall's oak, water oak (*Q. nigra*), overcup oak, red gum, American elm, green ash, sugarberry and numerous other hardwoods forming a widely variable mixture.

Occurrence: Throughout the southern forest within the alluvial floodplains usually on loamy ridges but sometimes, in the northern part of the Mississippi Delta, on loamy flats in second bottoms.

Place in succession: Doubtful.

Importance: Widely distributed but does not occur in large contiguous areas.

Variants and synonyms: Probably no one species of oak or hickory predominates except locally, and many different local types will be found.

OAK—HICKORY, Lentz, Jour. For. 29 (1931) 1052.

TYPE 81 RED GUM—SWAMP RED OAK

Composition: Swamp red oak is often only an indicator although usually the most abundant of the oaks. Under the name swamp red oak are included both *Quercus rubra pagodaefolia* and *Quercus rubra leucophylla*.

Chief associates: swamp chestnut oak, water oak, white oak, ashes (probably largely white ash), post oak, hickories and black gum.

Minor associates include honey locust, willow oak, Shumard red oak, American elm, and southern red oak.

Occurrence: Throughout the southern forest within the alluvial floodplains; on very high flats or ridges, distinctly elevated above typical low flats or glades. The soil is a silty clay, silty clay loam, silt loam or sandy loam, and fairly well to well-drained. These ridges may be either extensive or much interrupted by intervening low flats supporting a different type. The site is usually never covered with standing water and rarely if ever overflowed except at times of exceptionally high water, as in 1927.

Place in succession: Unknown.

Importance: Very important, due both to extensive distribution and abundance in both small and large areas and to value of principal species.

Variants and synonyms: Any one or two of the predominant species or chief associates may be most prominent on any given area. RED GUM—COW OAK and CHERRYBARK OAK—WATER OAK are, for example common variants.

Names commonly used in the Mississippi Delta are RED GUM—CHERRYBARK OAK or RED GUM—LOAMY RIDGE OAKS, Lentz, Jour. For. 29 (1931) 1052.

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TYPE 82 RED GUM

Composition: Red gum pure or predominant.

Chief associates: water oak, Nuttall's oak, American elm, willow oak, sugarberry, green ash, and white ash.

There are many minor associates.

Occurrence: Throughout southern forest within the alluvial flood-plains on high flats or low ridges. Areas not annually overflowed. Soils usually silty or loamy or, if a clay top soil occurs, it is usually underlain by sandy loam subsoil. Also found on old fields, once cultivated, where soil receives abundant moisture but is well-drained.

Place in succession: Doubtful.

Importance: Very important due to value of the species.

TYPE 83 RED GUM — NUTTALL'S OAK — WILLOW OAK

Composition: Red gum, Nuttall's oak and willow oak predominating. Nuttall's oak although the commonest oak in the type should be considered as an indicator species. Red gum is generally not as common as the oaks.

Chief associates: pin oak (rare or absent south of central Arkansas and northern Mississippi), overcup oak, water oak (*Quercus obtusa*), only in central and southern Louisiana, bur oak (same approximate range as pin oak), American elm and green ash.

Occurrence: Mississippi Delta in the alluvial flood-plains. On poorly-drained flats where a shallow sheet of water usually stands during the winter.

Place in succession: Unknown.

Importance: Quite important on flats.

Variants and synonyms: RED GUM—CLAY FLAT OAKS, Lentz, Jour. For. 29 (1931) 1052.

TYPE 84 WILLOW OAK

Composition: Willow oak is an indicator species and not always predominant, although it may be so. In general no one or two species are predominant. This is the only type where willow oak and swamp red oak occur together.

Chief associates: swamp red oak, swamp chestnut oak, Nuttall's oak, winged elm (chiefly in second bottoms) and cedar elm (chiefly in first bottoms). Many other hardwood species may appear in the mixture.

Occurrence: Mississippi Delta on alluvial flood-plains principally on sites having characteristics (of soil, moisture, elevation and overflow) midway between those of typical flats or glades and those of typical ridges. Topography is frequently undulating or washboarded, with a resultant mixture of flat and ridge conditions.

On poorly-drained flats principally on second bottoms.

Place in succession: When heavily cut usually succeeded by the oak—elm—ash type.

Importance: Very common but ordinarily not covering large individual areas.

Variants and synonyms: Any of the principal species may be locally predominant. Grades into types containing red gum and either the oaks of the flats or those of the ridges. BOTTOMLAND OAKS, Lentz, Jour. For. 29 (1931) 1052.

TYPE 85 SUGARBERRY—ELM

Composition: Sugarberry, American elm, winged elm and cedar elm predominate.

Associates depend upon what the type was previous to cutting.

Occurrence: Throughout the southern forest within the alluvial flood-

Forest Cover Types

plains. May occur anywhere except in sloughs, along bayous or in deep swamps.

Place in succession: Temporary. Usually a residual type found after heavy cutting.

Importance: Usually worthless commercially but widespread and from that viewpoint important.

Variants and synonyms: HACKBERRY—ELM, Lentz, Jour. For. 29 (1931) 1053.

TYPE 86 OAK—ELM—ASH

Composition: Mixtures of five oaks, three elms and two ashes in a variety of combinations are characteristic.

Predominant species are: willow oak, water oak, overcup oak, Nuttall's oak, swamp red oak, American elm, winged elm, cedar elm, green ash and white ash. Usually only one (occasionally two) species of elm is abundant in any given stand.

Other minor associates are present.

Occurrence: Throughout southern forest in the alluvial flood-plains.

Most common on poorly-drained flats but may occur on any cutover areas.

Place in succession: Usually a residual type, following cutting in the red gum — Nuttall's oak — willow oak type or in the willow oak type.

Importance: Not usually important commercially but occasionally a source of much ash.

Variants and synonyms: Common variants are WILLOW OAK—CEDAR ELM, GREEN ASH, and GREEN ASH—MIXED HARDWOODS. OAK — ELM, Lentz, Jour. For. 29 (1931) 1053.

TYPE 87 SOUTHERN CYPRESS—HARDWOOD

Composition: Southern cypress and a complex and widely varying admixture of hardwood species.

Chief associates: ash (probably green or, at the north, water ash), red gum, red ma-

ple and silver maple (only from central Arkansas and northern Mississippi northward).

Other associates include overcup oak, Nuttall's oak, water hickory, American elm, pin oak (same approximate range as silver maple) and sugarberry.

Occurrence: Throughout the southern forest in the alluvial flood-plains on areas where water stands at frequent intervals and which can be classed as flats rather than swamps. The soil is generally either a clay or a silty clay loam. The cypress is ordinarily without knees or with knees of low height.

Place in succession: Climax. With cutting of cypress has reverted in many cases to red gum type or red gum — Nuttall's oak — willow oak type.

Importance: Originally important, now of minor importance. Common in Arkansas.

Variants and synonyms: CYPRESS — HARDWOOD, Lentz, Jour. For. 29 (1931) 1052.

TYPE 88 WILLOW

Composition: Willow usually pure or in some cases predominant. Several species of willow are included. Black willow is the commonest species.

Chief associates: southern cottonwood, swamp privet and water locust.

Occurrence: Throughout southern and central forest in alluvial flood-plains. Along river's edge and in the Mississippi Delta on low "bat-ture" land, usually annually overflowed.

Place in succession: First to appear on river margins, almost to the exclusion of any other species. Replaced by other types as soil is built up. Cottonwood usually is the first to replace willow.

Importance: Extensive along Missis-

Forest Cover Types

issippi, Red, Yazoo and Atchafalaya Rivers in Louisiana and Mississippi.
Variants and synonyms: COTTONWOOD—WILLOW, Kittredge, Jour. For. 23 (1925) 890-895; Lentz, Jour. For. 29 (1931) 1052. WILLOW—POP-LAR, Bergman and Stallard, Minn. Bot. Std. 4, part 4 (1916) 333-378.

TYPE 89 OVERCUP OAK—WATER HICKORY

Composition: Overcup oak and water hickory predominate.

Chief associates: green ash, willow oak, persimmon, Nuttall's oak, American elm and red maple.

Minor associates: southern cypress, red gum, water oak and cedar elm.

Occurrence: Throughout the southern forest in the alluvial flood-plains. On poorly-drained clay flats in first bottoms (principally in Louisiana and Mississippi), and in poorly drained depressions, sloughs and shallow swamps in second bottoms throughout the Mississippi Delta, especially the southern half.

Place in succession: Climax.

Importance: Secondary, due to poor form and slow growth.

Variants and synonyms: OVERCUP OAK—PECAN, Lentz, Jour. For. 29 (1931) 1053.

TYPE 90 SOUTHERN WHITE CEDAR

Composition: Southern white cedar characteristically in pure even-aged stands, although sometimes only predominating.

Associates apt to increase in abundance after fire or cutting.

Associates include: in the North, gray birch, pitch pine and black gum; elsewhere pond pine, southern cypress, swamp black gum, sweet bay, red bay, loblolly-bay, slash pine, spruce pine and titi. Red maple is a common associate throughout the entire range.

Occurrence: In many detached tracts

in Coastal Plain from southern Maine to northern Florida and southern Mississippi in a comparatively narrow zone near the coast. Most abundant in Coastal Plain of New Jersey, North and South Carolina and western Florida. Occasional swamp in hills of northern New Jersey. Confined to sandy-bottomed, usually peaty, interior and river swamps, wet depressions and stream banks.

Place in succession: A second-growth type, largely in even-aged stands, which apparently under natural succession tends to be replaced slowly by swamp hardwoods, especially on the more fertile soils. Pure stands occur on areas of swamp peat overlying a sandy subsoil; but as the quantity of silt and clay in the underlying subsoil increases, the proportion of swamp hardwoods, increases until southern white cedar can no longer compete with them. Pure stands of cedar frequently follow slash fires which occur when the swamps are full of water. After fires which occur when the water table is low enough to permit the upper layers of peat to be burned, the cedar may be replaced by swamp hardwoods.

Importance: A valuable type because of the excellent technical qualities of southern white cedar. Relatively limited in area particularly north of New Jersey.

Variants and synonyms: JUNIPER GLADE or CEDAR GLADE are often used locally, Korstian, Tech. Bul. 251, U. S. D. A. 1931.

TYPE 91 POND PINE

Composition: Pond pine pure or predominant.

Chief associate: slash pine (not found in North Carolina).

Forest Cover Types

Minor associates include loblolly pine, pond cypress, red gum, sweet bay, loblolly-bay, red bay and swamp black gum.

Occurrence: Coastal Plain from North Carolina to Florida on flatwoods near the coast or in bays and ponds.

Place in succession: Probably climax type.

Importance: Poor timber but of some economic importance. A fairly extensive type.

Variants and synonyms: POND PINE POCOSINS used locally. SAVANNA PINE, Ashe, N. C. Geol. Survey Bul. 5 (1894) 17. SPRUCE PINE, Ashe, (loc. cit.). POCOSIN PINE, Ashe, (loc. cit.). POCOSIN PINE and BAYS, Ashe, N. C. Geol. Survey Bul. 24 (1915) 15.

TYPE 92 SLASH PINE—SWAMP BLACK GUM

Composition: Slash pine and swamp black gum predominating.

Associates: in ponds in the flatwoods pond cypress, black gum, red maple, sweet bay and loblolly-bay; in smaller creeks and branches swamp ironwood, titi, water ash, red maple, American elm and pond pine; in shallow ponds yaupon, dahoon (var. *myrtifolia*) and pond pine.

Occurrence: Coastal Plain of Georgia, Florida and Alabama.

In ponds in the flatwoods, in smaller creeks and branches and in shallow ponds.

Place in succession: Subclimax.

Importance: Slight.

TYPE 93 POND CYPRESS

Composition: Pond cypress predominant or sometimes only an indicator species.

Associates: in Georgia, Florida, and Alabama. swamp black gum, slash pine, yaupon, dahoon, titi, and black willow; in the Carolinas swamp black gum and swamp ironwood.

Occurrence: Coastal Plain from North Carolina through Florida to southern Alabama.

Shallow ponds and flatwoods wet most of the year in flatwoods region.

Place in succession: Doubtful.

Importance: Covers 20 to 30 per cent of the area in many counties; valuable for ties but not as good as southern cypress.

Variants and synonyms: BAY, Harper, 6th. Ann. Report, Fla. Geol. Survey (1914) 248. BAY-CALL, Harper, (loc. cit.). CYPRESS SWAMP, Metcalf and Wells, Naturalist's Guide to the Americas (1926) 414; Watson, Naturalist's Guide to the Americas (1926) 430. CYPRESS PONDS, Harper, 3rd. Ann. Report, Fla. Geol. Survey (1910) 264.

TYPE 94 SOUTHERN CYPRESS

Composition: Southern cypress pure or predominating.

Associates: tupelo gum in south (black gum in extreme north), red maple, planer tree, water oak, and swamp black gum.

Occurrence: Coastal Plain from Delaware and Maryland to Texas and in alluvial flood-plains throughout Mississippi and Louisiana northward into Arkansas and Tennessee.

Sloughs, margins of bayous, deep swamps and river bottoms wet all the year.

Place in succession: Climax. After cutting may revert to tupelo gum type.

Importance: A valuable and important type.

Variants and synonyms: CYPRESS — TUPELO, Foster et al, Bul. 3, A. & M. Coll. Texas (1917) 24; Lentz, Jour. For. 29 (1931) 1051-52. SOUTHERN CYPRESS—TUPELO GUM used locally in the Coastal Plain of Virginia and the Carolinas where mixtures of southern cypress and tupelo gum are customarily found rather than pure stands of either species. CYPRESS BRAKES, Foster, Bul. 114 U. S. D. A. (1912) 46. CYPRESS and

Forest Cover Types

HARDWOODS, Foster, (loc. cit.).
BALD CYPRESS—TUPELO GUM, Foster, et al, Bul. 3, A. & M. Coll. Texas (1917) 24.

TYPE 95 TUPELO GUM

Composition: Tupelo gum pure or predominating.

Associates: southern cypress, red maple, swamp black gum, pumpkin ash and (in the north) water ash.

Occurrence: Coastal Plain from Virginia to Texas and in alluvial floodplains throughout Mississippi and Louisiana northward into Arkansas and Tennessee.

In deep swamps, sloughs and margins of bayous. Frequently occupies deeper swamps or sloughs than the southern cypress type.

Place in succession: Probably climax except where it appears as residual stands after cypress has been cut.

Importance: Due to dense stands and large areas the type is important.

Variants and synonyms: SWEET BAY—SWAMP BLACK GUM; on smaller creeks and minor river bottoms and in ponds within the uplands sweet bay and swamp black gum may predominate sometimes to the complete exclusion of tupelo gum. Lack of knowledge as to the extent and exact composition of such stands have led to their inclusion as a variant under type 95.

SOUTHERN CYPRESS — TUPELO GUM used locally in the Coastal Plain of Virginia and the Carolinas where mixtures of southern cypress and tupelo gum are customarily

found rather than pure stands of either species.

CYPRESS—TUPELO, Foster et al, Bul. 3, A. & M. Coll. Texas (1917) 46; Lentz, Jour. For. 29 (1931) 1051-52. BALD CYPRESS—TUPELO GUM: Foster et al, (loc. cit.).

TYPE 96 MAHOGANY

Composition: Mahogany is the indicator species characterizing the type.

Chief associates: gumbo-limbo, wild fig, Jamaica dogwood and mastic.

Minor associates include pigeon plum, cabbage palmetto, thatch-palm and several stoppers.

Occurrence: Dry hammocks and keys of south Florida.

Place in succession: Climax.

Importance: Unimportant.

Variants and synonyms: TROPICAL HAMMOCK. Watson, Naturalist's Guide to the Americas (1926) 434; Harper, 18th Ann. Report, Fla. Geol. Survey (1927) 106.

TYPE 97 MANGROVE

Composition: Mangrove pure or predominant.

Chief associates buttonwood, white buttonwood, cabbage palmetto and seagrape.

Minor associates: blackwood and golden fig.

Occurrence: Tidal swamps and islands in south half of Florida peninsula.

Place in succession: Climax.

Importance: Unimportant.

Variants and synonyms: MANGROVE SWAMP, Watson, Naturalist's Guide to the Americas (1926) 430; Harper, 3rd. Annual Report, Fla. Geol. Survey (1910) 233.

COMMON AND BOTANICAL NAMES OF THE TREE SPECIES MENTIONED IN THE TYPE DESCRIPTIONS

Common name	Botanical name	Type numbers ¹
Ash, Black	<i>Fraxinus nigra</i> Marshall	22, 23, 24, 25, 26
Ash, Blue	<i>Fraxinus quadrangulata</i> Michaux	46
Ash, Green	<i>Fraxinus pennsylvanica lanceolata</i> (Borkhausen) Sargent	4, 13, 21, 45, 49, 60, 61, 80, 82, 83, 86, 87, 89

Common & Botanical Names, Cont.

Common name	Botanical name	Type numbers ¹
Ash, Pumpkin	<i>Fraxinus profunda</i> Bush	95
Ash, Red	<i>Fraxinus pennsylvanica</i> Marshall	71, 77
Ash, Water	<i>Fraxinus caroliniana</i> Miller	71, 87, 92, 95
Ash, White	<i>Fraxinus americana</i> Linnaeus	7, 8, 9, 10, 11, 12, 14, 18, 26, 45, 49, 51, 54, 58, 60, 61, 71, 77, 81, 82, 86
Aspen	<i>Populus tremuloides</i> Michaux	1, 3, 4, 5, 6, 7, 9, 20, 21, 25, 46, 51
Aspen, Largetooth	<i>Populus grandidentata</i> Michaux	1, 3, 4, 5, 6, 8, 49
Basswood	<i>Tilia</i> Linnaeus	6, 8, 9, 10, 11, 12, 13, 26, 45, 49, 51, 54, 56, 57
Bay, Loblolly	<i>Gordonia lasianthus</i> (Linnaeus) Ellis	90, 91, 92
Bay, Red	<i>Persea borbonia</i> (Linnaeus) Sprengel	67, 72, 90, 91
Bay, Sweet	<i>Magnolia virginiana</i> Linnaeus	66, 72, 74, 90, 91, 92, 95
Beech	<i>Fagus grandifolia</i> Ehrhart	8, 9, 11, 12, 15, 16, 17, 18, 19, 22, 49, 51, 56, 57, 58, 79
Beech, Blue	<i>Carpinus caroliniana</i> Walter	13, 45
Birch, Black	<i>Betula lenta</i> Linnaeus	8, 9, 10, 11, 12, 14, 46, 51, 53, 56
Birch, Gray	<i>Betula populifolia</i> Marsh	3, 7, 9, 46, 90
Birch, Paper	<i>Betula papyrifera</i> Marshall	1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, 16,
	<i>Betula cordifolia</i> Regel	18, 20, 21, 23, 24, 51
Birch, River	<i>Betula nigra</i> Linnaeus	59, 61
Birch, Yellow	<i>Betula lutea</i> Michaux	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 26, 51
Blackwood	<i>Avicennia nitida</i> Jacquin	97
Boxelder	<i>Acer negundo</i> Linnaeus	4, 45
Buckeye, Ohio	<i>Aesculus glabra</i> Willdenow	12
Buckeye, Yellow	<i>Aesculus octandra</i> Marshall	15, 16, 18, 19, 51
Bustic	<i>Dipholis salicifolia</i> (Linnaeus) A. de Candolle	74
Butternut	<i>Juglans cinerea</i> Linnaeus	49, 51
Buttonwood	<i>Conocarpus erecta</i> Linnaeus	97
Buttonwood, White	<i>Laguncularia racemosa</i> (Linnaeus) Gaertner filis	97
Cedar, Eastern Red	<i>Juniperus virginiana</i> Linnaeus	7, 31, 46
Cedar, Mountain	<i>Juniperus mexicana</i> Sprengel	28
Cedar,	<i>Thuja occidentalis</i> Linnaeus	18, 20, 21, 22, 23, 24, 25, 26
Northern White		
Cedar, .	<i>Juniperus lucayana</i> Britton	66, 67
Southern Red		
Cedar,	<i>Chamaecyparis thyoides</i> (Linnaeus) Britton, Sterns, and Poggenberg	90
Southern White		
Cherry, Black	<i>Prunus serotina</i> Ehrhart	8, 9, 10, 11, 12, 49, 51, 57
Cherry, Pin	<i>Prunus pennsylvanica</i> Linnaeus filis	4, 5, 7, 9
Chestnut	<i>Castanea dentata</i> (Marshall) Borkhausen	9, 12, 33, 35, 36, 37, 44, 48, 50, 51, 52, 54, 55, 56
Chinquapin	<i>Castanea pumila</i> (Linnaeus) Miller	31, 35, 49
Cottonwood,	<i>Populus deltoides</i> Marshall	26, 45, 60, 61
Eastern		
Cottonwood	<i>Populus sargentii</i> Dode	61
Cottonwood,	<i>Populus deltoides virginiana</i> (Castiglioni) Sudworth	61, 88
Southern		
Cottonwood,	<i>Populus heterophylla</i> Linnaeus	61
Swamp		
Cypress, Pond	<i>Taxodium ascendens</i> Brongniart	73, 74, 91, 92, 93
Cypress, Southern	<i>Taxodium distichum</i> (Linnaeus) Richard	73, 87, 89, 90, 94, 95
Dahoon	<i>Ilex cassine myrtifolia</i> (Walter) Sargent	92, 93
Dogwood	<i>Cornus florida</i> Linnaeus	32, 33, 49
Dogwood, Jamaica	<i>Ichthyomethia piscipula</i> (Linnaeus) A. S. Hitchcock	96
Elm, American	<i>Ulmus americana</i> Linnaeus	4, 12, 13, 26, 45, 46, 49, 51, 57, 58, 60, 61, 72, 80, 81, 82, 83, 85, 86, 87, 89, 92

Common & Botanical Names, Cont.

Common name	Botanical name	Type numbers ¹
Elm, Cedar	<i>Ulmus crassifolia</i> Nuttall	28, 84, 85, 86, 89
Elm, Red	<i>Ulmus serotina</i> Sargent	57, 58
Elm, Rock	<i>Ulmus racemosa</i> Thomas	26
Elm, Slippery	<i>Ulmus julva</i> Michaux	26, 60, 61
Elm, Winged	<i>Ulmus alata</i> Michaux	31, 32, 84, 85, 86
Fig, Golden	<i>Ficus aurea</i> Nuttall	97
Fig, Wild	<i>Ficus brevifolia</i> Nuttall	96
Fir, Balsam	<i>Abies balsamea</i> (Linnaeus) Miller	4, 6, 11, 12, 16, 18, 20, 21, 22, 23, 24, 26
Fir,	<i>Abies fraseri</i> (Pursh) Poiret	16, 18, 19
Southern Balsam		
Gum, Black	<i>Nyssa sylvatica</i> Marshall	26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 48, 49, 54, 55, 56, 68, 69, 71, 72, 73, 79, 81, 90, 92, 94
Gum, Red	<i>Liquidambar styraciflua</i> Linnaeus	44, 49, 58, 61, 63, 68, 69, 70, 71, 72, 74, 75, 77, 78, 80, 81, 82, 83, 87, 89, 91
Gum, Swamp Black	<i>Nyssa biflora</i> Walter	74, 90, 91, 92, 93, 94, 95
Gum, Tupelo	<i>Nyssa aquatica</i> Linnaeus	69, 72, 73, 74, 94, 95
Gumbo-limbo	<i>Bursera simaruba</i> (Linnaeus) Sargent	74, 96
Hackberry	<i>Celtis occidentalis</i> Linnaeus	13, 28, 29, 45, 82
Hawthorn	<i>Crataegus</i> Linnaeus	19, 68, 78
Hemlock	<i>Tsuga canadensis</i> (Linnaeus) Carrière	3, 6, 8, 9, 10, 11, 12, 15, 17, 18, 19, 22, 24, 26, 48, 51, 54, 55, 57
Hickories	<i>Hicoria</i> Rafinesque	30, 33, 34, 38, 39, 40, 41, 42, 43, 48, 55, 56, 65, 71, 80, 81
Hickory, Bigleaf	<i>Hicoria laciniosa</i> (Michaux f.)	45, 80
Shagbark	Sargent	
Hickory, Bitternut	<i>Hicoria cordiformis</i> (Wangenheim) Britton	49, 58, 80
Hickory, Florida	<i>Hicoria floridana</i> (Sargent) Sudworth	62
Hickory,	<i>Hicoria alba</i> (Linnaeus) Britton	31, 49, 50, 57, 58, 80
Mockernut		
Hickory, Nutmeg	<i>Hicoria myristicaeformis</i> (Michaux f.) Britton	80
Hickory, Pignut	<i>Hicoria glabra</i> (Miller) Sweet	31, 49, 57, 58
Hickory, Pignut	<i>Hicoria leiodermis</i> (Sargent) Sudworth	80
Hickory, Shagbark	<i>Hicoria ovata</i> (Miller) Britton	49, 50, 51, 57, 80
Hickory, Water	<i>Hicoria aquatica</i> (Michaux f.) Britton	87, 89
Holly	<i>Ilex opaca</i> Aiton	29, 67, 78
Holly	<i>Ilex opaca arenicola</i> Ashe	62
Hop-hornbeam	<i>Ostrya virginiana</i> (Miller) Koch	13, 45
Ironwood, Swamp	<i>Cyrilla racemiflora</i> Linnaeus	92, 93
Locust, Black	<i>Robinia pseudoacacia</i> Linnaeus	33, 35, 46, 47, 49, 53
Locust, Honey	<i>Gleditsia triacanthos</i> Linnaeus	81
Locust, Water	<i>Gleditsia aquatica</i> Marshall	88
Magnolia,	<i>Magnolia acuminata</i> Linnaeus	10, 12, 18, 19, 53, 54
Cucumber		
Magnolia,	<i>Magnolia grandiflora</i> Linnaeus	66, 67, 78, 79
Evergreen		
Mahogany	<i>Swietenia mahagoni</i> Jacquin	96
Mangrove	<i>Rhizophora mangle</i> Linnaeus	97
Maple, Red	<i>Acer rubrum</i> Linnaeus	3, 5, 6, 7, 9, 10, 11, 12, 15, 16, 18, 20, 22, 23, 24, 25, 26, 31, 32, 35, 36, 38, 44, 45, 46, 48, 49, 51, 53, 57, 58, 59, 60, 61, 67, 71, 74, 77, 87, 89, 90, 92, 94, 95
Maple, Silver	<i>Acer saccharinum</i> Linnaeus	26, 60, 61, 87
Maple, Sugar	<i>Acer saccharum</i> Marshall	7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 49, 51, 54, 56, 57, 58
Mastic	<i>Sideroxylon foetidissimum</i> Jacquin	96
Mesquite	<i>Prosopis juliflora</i> (Schwartz) de Candolle	27
Mountain-ash	<i>Sorbus americana</i> Marshall	16, 18, 19

Common & Botanical Names, Cont.

Common name	Botanical name	Type numbers ¹
Oak, Bear	<i>Quercus ilicifolia</i> Wangenheim	35
Oak, Black	<i>Quercus velutina</i> La Marck	2, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43, 44, 45, 46, 49, 50, 52, 54, 55, 56, 58, 71
Oak, Blackjack	<i>Quercus marilandica</i> Muenchhausen	30, 31, 32, 38, 39, 40, 41, 42, 43, 46, 63, 64, 65, 69, 72
Oak, Blue-jack	<i>Quercus cinerea</i> Michaux	63, 64, 65
Oak, Bur	<i>Quercus macrocarpa</i> Michaux	4, 26, 45, 49, 83
Oak, Chapman White	<i>Quercus chapmanii</i> Sargent	62
Oak, Cherrybark	See swamp red oak. Cherrybark oak is the name locally used in the Mississippi Delta	81
Oak, Chestnut	<i>Quercus montana</i> Willdenow	3, 9, 10, 33, 35, 36, 37, 42, 43, 44, 48, 52, 56
Oak, Chinquapin	<i>Quercus muehlenbergii</i> Engelm	30, 31
Oak, Cow	See swamp chestnut oak	81
Oak, Jack	<i>Quercus ellipsoidalis</i> E. J. Hill	1, 2, 3, 45, 49
Oak, Laurel	<i>Quercus laurifolia</i> Michaux	64, 65, 67, 69, 72, 78
Oak, Live	<i>Quercus virginiana</i> Miller	73, 74, 78
Oak, Live	<i>Quercus virginiana fusiformis</i> (Small) Sargent	28, 29
Oak, Live	<i>Quercus virginiana geminata</i> (Small) Sargent	62, 63, 64, 65, 66, 67, 73, 74, 75
Oak, Mountain	See Schneck, red oak	29
Oak, Myrtle	<i>Quercus myrtifolia</i> Willdenow	62, 64, 65, 66, 75
Oak, Nuttall's	<i>Quercus nuttallii</i> Palmer	80, 82, 83, 84, 86, 87, 89
Oak, Overcup	<i>Quercus lyrata</i> Walter	80, 83, 86, 87, 89
Oak, Pin	<i>Quercus palustris</i> Muenchhausen	26, 45, 58, 86, 87
Oak, Post	<i>Quercus stellata</i> Wangenheim	30, 31, 32, 34, 36, 38, 39, 40, 41, 42, 43, 46, 68, 69, 70, 71, 72, 80, 81
Oak, Post	<i>Quercus stellata margaretta</i> (Ashe) Sargent	63, 64, 65
Oak, Post	<i>Quercus mississippiensis</i> Ashe	80
Oak, Red	<i>Quercus borealis</i> Michaux f.	2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 35, 36, 41, 44, 45, 48, 51, 52, 53, 54, 55, 56, 57, 58
Oak, Red	<i>Quercus borealis maxima</i> (Marshall) Ashe	36, 41, 44, 48, 51, 53, 54, 55, 56, 57, 58, 68, 71
Oak, Scarlet	<i>Quercus coccinea</i> Muenchhausen	2, 9, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43, 48, 49, 52, 56, 71
Oak, Schneck Red	<i>Quercus shumardii schneckii</i> (Britton) Sargent	28, 29, 30
Oak, Shin	<i>Quercus mohriana</i> Rydberg	28, 29
Oak, Shingle	<i>Quercus annulata</i> Buckley	
Oak, Shumard Red	<i>Quercus imbricaria</i> Michaux	30, 31
Oak, Southern Red	<i>Quercus shumardii</i> Buckley	81
Oak, Southern Red	<i>Quercus rubra</i> Linnaeus	30, 32, 34, 38, 40, 41, 42, 43, 56, 63, 69, 70, 71, 79, 81
Oak, Swamp Chestnut	<i>Quercus prinus</i> Linnaeus	80, 81, 84
Oak, Swamp Red	<i>Quercus rubra pagodaefolia</i> (Elliott) Ashe	71, 79, 81, 84, 86
Oak, Swamp White	<i>Quercus rubra leucophylla</i> Ashe	
Oak, Turkey	<i>Quercus bicolor</i> Willdenow	26, 45
Oak, Turkey	<i>Quercus catesbaei</i> Michaux	62, 63, 64, 65, 72
Oak, Water	<i>Quercus nigra</i> Linnaeus	69, 71, 72, 73, 76, 78, 80, 81, 82, 83
Oak, Water	<i>Quercus obtusa</i> Ashe	86, 89, 94
Oak, White	<i>Quercus alba</i> Linnaeus	2, 3, 7, 9, 10, 11, 14, 30, 31, 32, 33, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 51, 54, 55, 56, 57, 71, 80, 81

Common & Botanical Names, Cont.

Common name	Botanical name	Type numbers ¹
Oak, Willow	<i>Quercus phellos</i> Linnaeus	71, 76, 81, 82, 83, 84, 86, 89
Palm, Thatch	<i>Thrinax floridana</i> Sargent	74, 96
Palmetto, Cabbage	<i>Sabal palmetto</i> (Walter) Roemer and Schultes	66, 67, 74, 75, 96, 97
Persimmon	<i>Diospyros virginiana</i> Linnaeus	64, 65, 68, 70, 89
Pine, Jack	<i>Pinus banksiana</i> Lambert	1, 2, 3, 20
Pine, Loblolly	<i>Pinus taeda</i> Linnaeus	44, 63, 68, 69, 70, 71, 72, 73, 74, 75, 77, 91
Pine, Longleaf	<i>Pinus palustris</i> Miller	38, 63, 64, 70, 73
Pine, Mountain	<i>Pinus pungens</i> Lambert	37, 40, 42, 43
Pine, Norway	<i>Pinus resinosa</i> Solander	1, 3, 9
Pine, Pitch	<i>Pinus rigida</i> Miller	3, 9, 33, 35, 36, 37, 38, 40, 42, 43, 44, 48, 90
Pine, Pond	<i>Pinus rigida serotina</i> (Michaux) Loudon	69, 74, 75, 90, 91, 92
Pine, Sand	<i>Pinus clausa</i> (Engelmann) Sargent	62, 73
Pine, Shortleaf	<i>Pinus echinata</i> Miller	9, 30, 31, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 46, 48, 68, 70
Pine, Slash	<i>Pinus caribaea</i> Morelet	63, 72, 73, 74, 75, 90, 91, 92, 93
Pine, Spruce	<i>Pinus glabra</i> Walter	90
Pine, Virginia	<i>Pinus virginiana</i> Miller	30, 34, 36, 38, 39, 40, 42, 43, 44, 56
Pine, White	<i>Pinus strobus</i> Linnaeus	3, 6, 7, 8, 9, 10, 11, 12, 13, 14, 20, 21, 24, 26, 35, 36, 48
Planer Tree	<i>Planera aquatica</i> (Walter) Gmelin	94
Plum, Pigeon	<i>Coccolobis laurifolia</i> Jacquin	96
Plum, Wild	<i>Prunus americana</i> Marshall	29
Poplar, Balsam	<i>Populus balsamifera</i> Linnaeus	1, 3, 4, 26
Poplar, Yellow	<i>Liriodendron tulipifera</i> Linnaeus	9, 10, 48, 49, 50, 52, 53, 54, 55, 56, 58, 69, 72, 77, 79
Privet, Swamp	<i>Forestiera acuminata</i> (Michaux) Poiret	88
Sassafras	<i>Sassafras variifolium</i> (Salisbury) Kuntze	35
Seagrape	<i>Coccolobis uvifera</i> (Linnaeus) Jacquin	97
Sourwood	<i>Oxydendrum arboreum</i> (Linnaeus) de Candolle	31, 33, 36
Spruce, Black	<i>Picea mariana</i> (Miller) Britton, Sterns and Poggenberg	1, 21, 22, 23, 24, 25, 26
Spruce, Red	<i>Picea rubra</i> Link	4, 6, 9, 10, 11, 12, 16, 17, 18, 19, 20, 22
Spruce, White	<i>Picea glauca</i> (Moench) Voss	1, 16, 21
Stopper	<i>Eugenia</i> Linnaeus	74, 96
Sugarberry	<i>Celtis laevigata</i> Willdenow	80, 82, 85, 87
Sycamore	<i>Platanus occidentalis</i> Linnaeus	25, 59, 61
Tamarack	<i>Larix laricina</i> (Du Roi) Koch	22, 23, 24, 25, 26
Titi	<i>Cliftonia monophylla</i> (La Marck) Sargent	90, 92, 93
Tupelo, Gum	<i>Nyssa aquatica</i> Linnaeus	69, 72, 73, 74, 94, 95
Walnut, Black	<i>Juglans nigra</i> Linnaeus	49
Willow	<i>Salix</i> Linnaeus	88
Willow, Black	<i>Salix nigra</i> Marshall	59, 88, 93
Willow, Peachleaf	<i>Salix amygdaloides</i> Andersson	61
Willow, Sandbar	<i>Salix longifolia</i> Muehlenberg	61
Yaupon	<i>Ilex vomitoria</i> Aiton	30, 92, 93
Yellow Poplar	<i>Liriodendron tulipifera</i> Linnaeus	9, 10, 48, 49, 50, 52, 53, 54, 55, 56, 58, 69, 72, 77, 79

¹Where type number is shown in italics the species occurs in the type name, otherwise only in the description.

FOREST TYPE INDEX

Includes the types listed in the classification, all those mentioned in the type descriptions under "variants and synonyms" and some other type names recognized in literature and local usage.

Undoubtedly there are other type names which

should be added to this index in order to make it more nearly complete. As here given the index includes 295 type names. Since only 97 of these names are accepted in the list of cover types of the Eastern United States the work of the Committee in correlating and condensing types is evident.

FOREST TYPE INDEX

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Bear Oak	35	Eastern Red Cedar	46
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Beech—Evergreen Magnolia	79	Elm—Basswood—Hackberry	13
Beech—Maple	19	Elm—Black Ash	26
Beech—Maple—Hemlock	11	Elm—Soft Maple—Ash	26
Beech—Sugar Maple	57	Fir Flat	22
Birch and Poplar	4, 6	Fir Slope	22
Birch—Aspen	4	Fir—White Birch—Yellow Birch— White Spruce—Cedar	21
Birch—Beech—Maple	12	Flat Pine Woods	74
Black Ash	26	Flatwoods	63, 74
Black Ash—Maple—Elm	26	Flatwoods Pine	73
Black Cherry—Sugar Maple— Mountain Lin—Black Birch	51	Gray Birch	7
Black Locust	47	Gray Birch—Red Maple	7
Black Oak	49	Green Ash	86
Black Oak—Post Oak	32	Green Ash—Mixed Hardwoods	86
Black Oak—Scarlet Oak	33	Hackberry—Elm	85
Black Oak—Southern Red Oak— White Oak—Sand Hickory	34	Hard Maple—Elm—Basswood— Yellow Birch	13
Black Oak—White Oak	49	Hard Maple—Yellow Birch	12
Black Pine—Chestnut Oak—Span- ish Oak	37	Hardwood and White Pine	12
Black Spruce	23	Hardwood—Conifer	12
Bottomland Hardwood	77	Hardwood—Hemlock	11
Bottomland Oaks	84	Hardwood Swamp	26
Buckeye—Basswood	51	Hardwood with Basswood	12
Bur Oak	45	Hemlock	11
Bur—White—Red Oak	49	Hemlock—Balsam—White Spruce	11
Cabbage Palmetto—Slash Pine	75	Hemlock—Birch	11
Cedar Brake	28, 46	Hemlock—Hardwood	11
Cedar Glade	46, 90	Hemlock—White Oak	11
Cedar Hammock	46	Hemlock—Yellow Birch	11, 15
Cedar—Paper Birch—Balsam—Red Maple	24	Hickory—Swamp Chestnut Oak— White Oak	80
Cedar—Spruce—Balsam—White Pine	24	High Pine Land	63
Cedar—Tamarack—Spruce	24	High Pine Woods	63
Cedar—Tamarack—Spruce—Balsam	24	Highland Hardwoods	4
Cherrybark Oak—Water Oak	81	Hill Pine	63
Chestnut	56		
Chestnut—Chestnut Oak—Black Oak	36		
Chestnut Oak	36		
Chestnut Oak—Chestnut	36		
Chestnut Oak—White Pine—Red Oak	36		
Chinquapin Oak—Small Shagbark			
Hickory—Post Oak—Red Cedar	46		
Cottonwood	61		
Cottonwood—Sycamore	61		

*A term originally used in the Southern Appalachians by the U. S. Forest Service. More properly a site designation rather than a type name. Somewhat more inclusive than "Cove-Hardwood," which see.

†Recognized by the Southern Appalachian Section Type Committee, Jour. Forestry 24 (1926) 677, but now split up and included under types 50 to 57 inclusive.

Forest Type Index, Cont.

Type	Find under type number
Jack Oak	2
Jack Oak—White Oak	2
Jack Pine	1
Jack Pine—Oak	1
Jack Pine—White Birch	1
Juniper Glade	90
Live Oak	78
Live Oak—Cabbage Palmetto	66, 67
Live Oak Hammock	67
Loblolly Pine	69
Loblolly Pine—Shortleaf Pine	68
Loblolly Pine—Slash Pine	72
Loblolly Pine—Southern Red Oak	70
Loblolly Pine—White Oak	71
Longleaf Pine	63
Longleaf Pine Flatwoods	63
Longleaf Pine Sand Hills	64
Longleaf Pine—Slash Pine	73
Longleaf Pine—Turkey Oak	64
Lower Slope†	
Mahogany	96
Mangrove	97
Mangrove Swamp	97
Maple—Beech	12
Maple—Beech—Hemlock—Yellow Birch	12
Maple—Hemlock	11
Maple—White Pine	13
Marly Flatwoods	75
Mesquite	27
Mixed Hardwoods§	13, 49
Mixed (Northern) Softwoods	
Mixed Swamp	24, 25, 26
Mountain Cedar	28
Mountain Lin—Yellow Buckeye—White Ash	51
Mountain Oak	29, 33
Mountain Pine—Chestnut Oak—Black Oak	37
Northern Hardwoods	12
Northern Red Oak	52
Northern White Cedar	24
Norway Pine	3
Norway Pine—Jack Pine	3
Norway—White Pine	3
Oak—Chestnut	56
Oak—Elm	86

†A term originally used by the U. S. Forest Service in the Southern Appalachians. More properly a site designation rather than a type name.

§In addition the name is used in various parts of the eastern United States for a variety of forest cover combinations. For example as used by the Southern Forest Experiment Station in the Forest Survey in the Flood-plains of the Mississippi Delta this term may include portions of types 80, 81, 83, 84, 85 and 86.

||A local type of importance in northern Maine. Not readily placed under any of the listed types, being transitional between several of the northern forest coniferous types.

Type	Find under type number
Oak—Elm—Ash	86
Oak Flat	2
Oak Glade	76
Oak—Hickory	49, 80
Oak—Maple	49, 51
Oak Ridge	49
Oak Shinneries	29
Old Field Loblolly	69
Old Field Spruce	18
Overcup Oak—Pecan	89
Overcup Oak—Water Hickory	89
Palm Savanna	67
Palmetto Belt	75
Palmetto Flatwoods	73, 74
Palmetto—Live Oak Hammock	67
Paper Birch	6
Paper Birch—Aspen	6
Paper Birch—Balsam—Spruce	21
Paper Birch—Red Spruce—Balsam Fir	20
Pin Cherry	5
Pin Oak	58
Pine Barren Flats	73
Pine Barrens	63, 73
Pine—Hardwood	1, 8
Pine—Hardwood and Hemlock	10
Pine—Hemlock	10
Pine Meadows	73
Pine—Oak	71
Pine—Spruce	9
Pitch Pine	37
Pitch Pine—Chestnut Oak—Scarlet Oak	37
Pitch Pine—Mountain Pine	37
Plateau Oak	34
Pocosin Pine	91
Pocosin Pine and Bays	91
Pond Cypress	93
Pond Pine	91
Pond Pine Pocosins	91
Post Oak	30
Post Oak—Blackjack Oak	31
Post Oak—Yaupon	30
Red Cedar—Gray Birch	7, 46
Red Gum	82
Red Gum—Cherrybark Oak	81
Red Gum—Clay Flat Oaks	83
Red Gum—Cow Oak	81
Red Gum—Loamy Ridge Oaks	81
Red Gum—Nuttall's Oak—Willow Oak	83
Red Gum—Swamp Red Oak	81
Red Gum—Yellow Poplar	77
Red Oak	52
Red Oak—Basswood—White Ash	51
Red Spruce	18
Red Spruce—Southern Balsam Fir	19
Red Spruce—Sugar Maple—Beech	17
Ridge	33
River Birch—Sycamore	59
River Birch—Sycamore—Red Maple—Black Willow	59

Forest Type Index, Cont.

Type	Find under type number	Type	Find under type number
River-edge Hardwood	59	Sycamore	59
Rosemary Pine—Black Oak—White Hickory	38	Tamarack	25
Rosemary Pine—Blackjack Oak	38	Tamarack—Aspen	25
Rosemary Pine—Post Oak	39	Tamarack—Aspen—Red Maple	25
Sand Pine	62	Tamarack—Black Spruce—Cedar	25
Sand Ridge	65	Tamarack—Cedar	25
Savanna Pine	91	Tamarack—Cedar—Spruce	25
Scarlet Oak—Black Oak	33	Tamarack—Spruce	25
Scrub	62	Transition Hardwoods	51
Scrub Oak	2, 32, 35	Tropical Hammock	96
Scrub Oak Ridge	65	Tupelo Gum	95
Shin Oak	29	Turkey Oak	65
Shortleaf Pine	38	Upland Hardwoods	79
Shortleaf Pine Hills	68	Upper Slope	33
Shortleaf Pine—Post Oak	39	Virginia Pine	44
Shortleaf Pine—Southern Red Oak		Virginia Pine—Chestnut Oak—Chestnut	44
—Scarlet Oak	40	Virginia Pine—Southern Red Oak	43
Shortleaf Pine—Virginia Pine	42	Water Oak—Willow Oak	76
Shortleaf Pine—White Oak	41	White Pine	9
Silver Maple	60	White Pine—Balsam—Hemlock	9
Silver Maple—American Elm	60	White Pine—Chestnut Oak	48
Silver Maple—Ash—Basswood—Swamp White Oak	60	White Pine—Hemlock	10
Silver Maple—Elm—Ash—Hickory	60	White Pine—Norway Pine	9
Slash Pine	74	White Pine—Red Oak—White Ash	8
Slash Pine Bogs and Bays	74	White Oak	50
Slash Pine—Swamp Black Gum	92	White Oak—Black Oak	49, 50
Southern Cypress	94	White Oak—Black Oak—Red Oak	49
Southern Cypress—Hardwood	87	White Spruce	21
Southern Cypress—Tupelo Gum	94, 95	White Spruce—Balsam Fir—Paper Birch	21
Southern Red Cedar	66	Willow	88
Southern Red Oak—Scarlet Oak	34	Willow Oak	84
Southern White Cedar	90	Willow Oak—Cedar Elm	86
Spruce and Hardwoods	17	Willow—Poplar	61, 88
Spruce—Balsam	21	Yellow Birch	15, 16
Spruce Bog	23	Yellow Birch—Red Spruce	16
Spruce—Fir	19	Yellow Buckeye—Sugar Maple—Yellow Birch	12
Spruce Flat	18	Yellow Poplar	53
Spruce—Hemlock	18	Yellow Poplar—Chestnut	55
Spruce—Pine	62, 91	Yellow Poplar—Chestnut—Red Oak—Hemlock	55
Spruce Slope	18	Yellow Poplar—Hemlock	54
Spruce Swamp	23	Yellow Poplar—White Oak	55
Sugar Maple	14	Yellow Poplar—White Oak—Black Gum—Red Maple	55
Sugar Maple—Basswood	13	Yellow Poplar—White Oak—Black Oak—Mockernut Hickory	55
Sugar Maple—Basswood—Elm	13	Yellow Poplar—White Oak—Red Oak	55
Sugar Maple—Beech	57	Yellow Poplar—White Oak—Sugar Maple	55
Sugar Maple—Beech—Birch—White Pine—Hemlock	10		
Sugar Maple—Beech—Yellow Birch	12		
Sugarberry—Elm	85		
Sweet Bay—Swamp Black Gum	95		

EDITOR'S NOTE: Copies of this report are available at the Society's Office, 810 Hill Bldg., Washington, D. C., for 50 cents a copy.

APPENDIX III:

Key to Index of 1949 - 1951

Forest Inventory Maps

<u>County Codes</u>		<u>Forest Type Codes</u>	
1	Allegany	5	Aspen - Pin Cherry
2	Anne Arundel	7	Northern Hardwoods - White Pine
3	Baltimore	8	White Pine - Hardwoods
4	Baltimore City	9	Oak - White Pine
5	Calvert	10	White Pine
6	Caroline	11	Hemlock
7	Carroll	12	Northern Hardwoods
8	Cecil	35	Scrub Oak
9	Charles	36	Chestnut Oak
10	Dorchester	38	Hard Pine: Pitch, Shortleaf, and Virginia Pine
11	Frederick	41	Hard Pine - Oak
12	Garrett	42	Oak - Hard Pine
13	Harford	50	White Oak
14	Howard	52	Red Oak
15	Kent	55	Cove Hardwoods
16	Montgomery	59	River Birch - Sycamore
17	Prince George's	60	Bottomland Hardwoods
18	Queen Anne's	69	Loblolly Pine
19	St. Mary's	70	Loblolly Pine - Hardwood
20	Somerset	71	Hardwoods - Loblolly Pine
21	Talbot	77	Red Gum - Yellow Poplar
22	Washington	90	Southern White Cedar
23	Wicomico	94	Southern Cypress
24	Worcester		

APPENDIX III: **Index to 1949 - 1951 Forest Inventory Maps**

MAP NO.	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																			
			7 1/2'	15'																				
1	ACCIDENT	12	24,000																					
2	ACCIDENT <McHENRY>	12		62,500																				
3	ALEXANDRIA	17	31,680																					
4	ANACOSTIA	17	31,680																					
5	ANNAPOLIS	2	25,000																					
6	ASSAWOMAN BAY	24	25,000																					
7	AVILTON	12	24,000																					
8	BALTIMORE EAST	3 4	25,000																					
9	BALTIMORE WEST	3 4	25,000																					
10	BARREN ISLAND	10	25,000																					
11	BARTON	1 12	24,000																					
12	BEL AIR	3 13		62,500																				
13	BELTSVILLE	16 17	31,680																					
14	BERLIN	24	25,000																					
15	BETTERTON	15	25,000																					
16	BITTINGER	12	24,000																					
17	BLACKISTON ISLAND ¹	19	25,000																					
18	BLACKWATER RIVER	10	25,000																					
19	BLUE RIDGE SUMMIT	11 22	25,000																					
20	BOXIRON	24	25,000																					

¹ Now called St. Clement's Island

NO	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																						
			7 1/2'	15'	5	7	8	9	10	11	12	35	36	38	41	42	50	52	55	59	60	69	70	71	77	90	94
21	BRANDYWINE	9 17	25,000																								
22	BRISTOL	2 5 17	25,000																								
23	BUCKEYSTOWN	11	31,680																								
24	CAMBRIDGE	10 21	25,000																								
25	CATOCTIN FURNACE	11	31,680																								
26	CECILTON	8 15	31,680																								
27	CENTERVILLE	15 18	25,000																								
28	CHARLOTTE HALL	9 19	25,000																								
29	CHESTER OWN	15 18	25,000																								
30	CHICAM COMING	10	25,000																								
31	CHURCH CREEK	10	25,000																								
32	CHURCH HILL	15 18	25,000																								
33	CLAIBORNE	18 21	25,000																								
34	CLARKSVILLE	14 16 17	25,000																								
35	CLEAR SPRING	22	25,000																								
36	COCKEYSVILLE	3	25,000																								
37	COVE POINT	5	31,680																								
38	CRISFIELD	20	25,000																								
39	CURTIS BAY	2 3 4	25,000																								
40	DAMASCUS	7 11 14 16	25,000																								
41	DAVIDSONVILLE	2 17	25,000																								
42	DAVIS (KEMPTON)	12	62,500																								
43	DEAL ISLAND	10 20 23	25,000																								
43	DELMAR	23	25,000																								
44	DENTON	6	25,000																								

APPENDIX III cont'd

MAP NO	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																						
			7 1/2'	15'																							
45	DIVIDING CREEK	20 24	25,000																								
46	EARLEVILLE	8	31,680																								
47	EAST NEW MARKET	10	25,000																								
48	EASTON	21	25,000																								
49	EDEN	20 23	25,000																								
50	ELK GARDEN	1 12		62,500																							
51	ELKTON	8		62,500																							
52	ELLICOTT CITY	3 14	25,000																								
53	EMMITSBURG	11	31,680																								
54	FALLS CHURCH	16	31,680																								
55	FEDERALSBURG	6 10	25,000																								
56	FINKSBURG	3 6	25,000																								
57	FLINTSTONE	1		62,500																							
58	FOWLING CREEK	6 21	25,000																								
59	FREDERICK		31,680																								
60	FRIENDSVILLE	12	24,000																								
61	FROSTBURG	1 12		62,500																							
62	FUNKSTOWN	22	25,000																								
63	GAITHERSBURG	16	25,000																								
64	GALENA	8 15	25,000																								
65	GERMANTOWN	16--	31,680																								
66	GIBSON ISLAND	2	25,000																								
67	GIRDLETREE	24	25,000																								
68	GOLDEN HILL	10	25,000																								
69	GOLDSBORO	6	25,000																								

TOWNSHIP	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																						
			7 1/2'	15'	5	7	8	9	10	11	12	35	36	38	41	42	50	52	55	59	60	69	70	71	77	90	94
70	GRANTSVILLE	12	24,000																								
71	GUNPOWDER	3 13		62,500																							
72	HAGERSTOWN	22	25,000																								
73	HAMPSTEAD	3 7	31,680																								
74	HANCOCK	22		62,500																							
75	HANESVILLE	13 15	25,000																								
76	HARPERS FERRY	11 22	25,000																								
77	HARRINGTON	6		62,500																							
78	HAVRE DE GRACE	8		62,500																							
79	HEBRON	23	25,000																								
80	HEDGESVILLE	22	25,000																								
81	HEREFORD	3	25,000																								
82	HOBBS	6	25,000																								
83	HONGA	10	25,000																								
84	HUGHESVILLE	9 17 19	25,000																								
85	INDIAN HEAD (MT. VERNON)	9 17		62,500																							
85	INDIAN HEAD	9	25,000																								
86	KEEDYSVILLE	11 22	25,000																								
87	KENSINGTON	16	31,680																								
88	KENNESAW	18	25,000																								
89	KEYSER	1		62,500																							
90	KINGSTON	20 24	25,000																								
91	LANGFORD CREEK	15 18	25,000																								
92	LANHAM	17	25,000																								
93	LA PLATA	9	31,680																								

APPENDIX III con't

[illegible]

1. Now called Colonial Beach North

MAP NO.	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																						
			7 1/2'	15'	5	7	8	9	10	11	12	35	36	38	41	42	50	52	55	59	60	69	70	71	77	90	94
119	PAW PAW 1	1 22																									
120	PERRYMAN	13	31,680																								
121	PHOENIX	3 13	31,680																								
122	PINEY POINT	19	25,000																								
123	PISCATAWAY	9 17	25,000																								
124	PITTSVILLE	23	25,000																								
125	POCOMOKE CITY	20 24	25,000																								
126	POINT LOOKOUT	19	25,000																								
127	POINT NO POINT	19	25,000																								
128	POINT OF ROCKS	11	25,000																								
129	POOLESVILLE	11 16	31,680																								
130	POPES CREEK	9	25,000																								
131	PORT TOBACCO	9	31,680																								
132	PRESTON	6 10 21	25,000																								
133	PRICE	6 18	25,000																								
134	PRINCE FREDERICK	2,5,9,17,19		62,500																							
135	PRINCESS ANNE	20	25,000																								
136	QUANTICO	9	25,000																								
137	QUEENSTOWN	18	25,000																								
138	REISTERSTOWN	3	25,000																								
139	RELAY	2 3 4 14	25,000																								
140	RIDGELY	6 18 21	25,000																								
141	ROCK HALL	15	25,000																								
142	ROCK POINT	9 19	25,000																								
143	ROCKVILLE	16	31,680																								

.. All 15' missing

APPENDIX III con't

TOWNSHIP	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																						
			7 1/2	15'	5	7	8	9	10	11	12	35	36	38	41	42	50	52	55	59	60	69	70	71	77	90	94
144	RHODESDALE	10 23	25,000																								
145	ROUND BAY	2	25,000																								
146	ST. GEORGE ISLAND	19	25,000																								
147	ST. MARYS CITY	19	25,000																								
148	ST. MICHAELS	18 21	25,000																								
149	SALISBURY	20 23 24	25,000																								
150 ^a	SANDY SPRING	16	25,000																								
150 ^b	SANG RUN	12	24,000																								
151	SAVAGE	2 3 14	25,000																								
152	SAXIS	20	25,000																								
153	SEAFORD	6 10 23		62,500																							
154	SELBYVILLE	24	25,000																								
155	SENECA	16	31,680																								
156	SHARPS ISLAND	10	25,000																								
157	SHEPHERDSTOWN	22	25,000																								
158	SMITHSBURG	11 22	25,000																								
159	SNOW HILL	24	25,000																								
160	SOLOMONS ISLAND	5 19	25,000																								
161	SOUTH RIVER	2	25,000																								
162	SPARROWS POINT	2 3	25,000																								
163	SPESUTIE	8 13	25,000																								
164	STERLING	16	31,680																								
165	STRATFORD ¹	19	31,680																								
166	SUDDLERSVILLE	6 15 18	25,000																								
167	SWAN POINT	15	25,000																								

1. Now called Stratford Hall

APPENDIX III con't

MAP NO	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																							
			7 1/2'	15'	5	7	8	9	10	11	12	35	36	38	41	42	50	52	55	59	60	69	70	71	77	90	94	
168	SYKESVILLE	3 7 14	31,680																									
169	TANEYTOWN	7 11	31,680																									
170	TAYLORS ISLAND	10	25,000																									
171	TILGHMAN	21	25,000																									
172	TINGLES ISLAND	24	25,000																									
173	TOWSON	3	25,000																									
174	TRAPPE	21	25,000																									
175	UNION BRIDGE	7 11	31,680																									
176	UPPER MARLBORO	17	25,000																									
177	URBANA	11 16	25,000																									
178	WALKERSVILLE	11	25,000																									
179	WANGO	23 24	25,000																									
180	WASHINGTON EAST	16 17	31,680																									
181	WASHINGTON WEST	16	31,680																									
182	WATERFORD	16	31,680																									
183	WESLEY ¹	24	25,000																									
184	WESTMINSTER	7	31,680																									
185	WEST RIVER ²	2	25,000																									
186	WETIPQUIN	20 23	25,000																									
187	WHALEYSVILLE	23 24	25,000																									

1. Now called Public Landing

2. Now called Deale

APPENDIX III con't

MAP NO.	QUADRANGLE	COUNTY	MAP SIZE AND SCALE		FOREST TYPES																						
			7 1/2'	15'	5	7	8	9	10	11	12	35	36	38	41	42	50	52	55	59	60	69	70	71	77	90	94
188	WHITTINGTON POINT	24	25,000																								
189	WILLIAMSPORT	22	25,000																								
190	WINFIELD	7 11	25,000																								
191	WINGATE	10	25,000																								
192	WOODBINE	7 14 16	25,000																								
193	WOODSBORO	7 11	31 680																								
194	WYE MILLS	18 21	25,000																								
195	WYOMING	6		62,500																							