

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Region One

FOREST COVER TYPES
OF
SHENANDOAH NATIONAL PARK
Virginia

Field data by *L. Y. Bogg*
L. Y. Bogg
Senior Foreman (Forester)

Compiled by *R. B. Moore*
R. B. Moore
Assistant Forester

July, 1941

INDEX

	<u>Page</u>
THE FOREST COVER	1
Geologic Influences	1
Forest Cover Types	2
1. Chestnut Oak	2
2. Red Oak	3
3. Scarlet Oak	3
4. Cove Hardwoods	3
5. Pitch Pine	4
6. Bear Oak	4
7. Black Locust	4
8. White Pine	5
9. Virginia Pine	5
10. Grey Birch	5
11. Open	5
12. Barren	6
Age Classes	6
Burns	6
PARK SECTIONS	8
Park Section I	9
Park Section II	12
Park Section III	14
Park Section IV	17
Park Section V	20

Park Section VI	24
Park Section VII	27
Park Section VIII	30
Park Section IX	34
Park Section X	38
Park Section XI	42
Park Section XII	45
Park Section XIII	48
Park Section XIV	50
Park Section XV	53
Park Section XVI	56
Park Section XVII	59
Park Section XVIII	62
Park Section XIX	64

APPENDIX

Table I	Acreeage - Forest Types by Park Sections
Table II	Total Acreeage and Net Burned Acreeage by Forest Types
Table III	Total Acreeage by Age Classes
Table IV	Gross and Net Area Burned by Forest Types
Table V	Net Burned Area - Forest Types by Park Sections
Table VI	Net Burned Area - 1933 to 1940 Inclusive by Forest Types and Park Sections
Table VII	Area Burn by Years

Map - Geology of North District

Geology of Central District

Geology of South District

Photographs of Major Types

Check List of Trees and Major Shrub Associates

THE FOREST COVER
OF
SHENANDOAH NATIONAL PARK

The forest cover of Shenandoah National Park is essentially second growth mixed hardwoods, predominantly oak. Along the main Blue Ridge, which extends the entire length of the Park in a northeast, southwest-erly direction, the forest cover retains a marked uniformity of composition although many of the trees, particularly on the exposed crests, have the wind-swept, storm-damaged, and stunted form characteristic of the site. There is a gradual but evident change in the general form of the trees and the composition of the stands with descent of the slopes and side ridges. This change to a heterogeneous composition of generally thrifty successional species intermixed with the more stable climax species has been influenced by and in many instances is the direct result of the interaction of causal factors of site, disease, repeated fire, and cuttings.

The american chestnut (*Castanea dentata*) occurred throughout the forest, reaching dominance on the moderately moist to moist sites. The high mortality of this species as a result of the chestnut blight (*Endothea parasitica*) has left a significant gap in the forest cover. The more valuable coniferous timber trees, particularly white pine and hemlock, were more abundant throughout the lands now comprising the Park area, and the extent of natural reproduction indicates a proportionate return in the years to come.

Early exploitation by man for the purposes of securing grazing and crop lands resulted in large areas of meadowland, many of which are rapidly restocking with successional tree and shrub species. These areas, found extensively through the central and north and less frequently in the south district, are located on high, cool, fertile flats and gentle slopes on the ridge crests or in the gaps and the sheltered bottomlands of the more fertile hollows.

Geologic Influences

Underlying rock formations with residual soil overburden have had a definite influence on the existing forest cover. This influence is evidenced by the Red Oak type associations, which are found generally throughout the moderately moist to moist soils overlying Catoclin greenstone and, less frequently, Hypersthene granodiorite formations; Chestnut Oak types, which prevail on moderately dry to dry aspects underlain by granodiorite and quartzite; and the Bear Oak, Scarlet Oak, and Pitch Pine types, which are found on the dry to very dry quartzite, shale, and limestone soils. This type differentiation caused by variations

in basic soil formation is clearly illustrated in Park Section XIV by a comparison of the forest types of the main ridge with those found on the western spur ridges. The main Blue Ridge in this Park Section is predominantly Catoctin greenstone, while the western spurs are composed of Unicoi formation of shale and quartzite, Erwin quartzite, and shady dolomite found nearer the valley floor.

Previously grazed and cultivated lands are confined in general to the more fertile greenstone and granodiorite soils.

The Forest Cover Types

To secure a systematic description of the forest cover, associations or "Forest Types" were recognized and so delineated. This forest type recognition was in accordance with "Forest Cover Types of Eastern United States," Society of American Foresters, April, 1932. A forest type as defined is "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."

Types are numbered by priority in accordance with gross acreage found within the Park. The number enclosed by parentheses indicates with which type as described in "Forest Cover Types of Eastern United States" it most nearly agrees.

TYPE 1* - CHESTNUT OAK (36)**

Composition: Chestnut oak pure or predominating.

Associates: Red oak, which is commonly codominant with chestnut oak through portions of the drier upper slopes of the main ridge, pignut hickory, mountain laurel, bear oak and pitch pine, scarlet oak (lower elevations), black locust, black gum, american chestnut, red maple, white pine, sassafras, black birch, serviceberry, table mountain pine, witch hazel, and white oak. New Jersey tea, *Ceanothus americanus*, and azalea, *Rhododendron nudiflorum*, are typical of the understory and are more or less indicative of the type.

Occurrence: On granodiorite and quartzite soils on the drier slopes of the main ridge and rough upper slopes of the spur ridges.

*The wooded types are listed according to gross acreage figures, the chestnut oak type having the greater acreage.

**Indicates with which type as defined in Forest Cover Types of the Eastern United States, Report of the Committee on Forest Types, Society of American Foresters, April, 1932, this type most nearly agrees.

TYPE 2 - RED OAK (52)

Composition: Red oak pure or predominant. The type is purest at the higher elevations.

Associates: Chestnut oak, white oak, and the hickories (pignut, mockernut, and to a less extent shagbark and bitternut) are frequently co-dominant with red oak, the chestnut oak on the drier portions, and the white oak and hickories, usually separately, on the flats and gentler slopes of southern and western aspect. Other associates are black birch, basswood, hop-hornbeam, white pine, striped maple, and butternut. Witch hazel is common throughout the type.

Occurrence: On the crest of the Blue Ridge on Catoclin (schist) greenstone and Hypersthene granodiorite soils, extending to lower elevations on north and east slopes than on south and west.

Subtype Red Oak - Blue Ridge (Fraser) Fir

Blue Ridge fir, because of its limited local as well as natural range and its high aesthetic regard within the Park, has been rated in a subtype with red oak.

Composition: Red oak predominant and Blue Ridge fir. The few associates are black birch, white pine, and witch hazel.

Occurrence: Limited to top of Hawksbill Mountain and Crescent Rock on greenstone soils. Fire has probably reduced its range within the Park.

TYPE 3 - SCARLET OAK (33)

Composition: Scarlet oak pure or predominant.

Associates: White oak is frequently predominant on moist sites and blackjack oak on dry, rough slopes. Other associates are chestnut oak, pignut hickory, bear oak, pitch pine, virginia pine, black gum, red maple, american chestnut, laurel, chinquapin, and sycamore.

Occurrence: On quartzite, shale, and limestone soils on lower western slopes extending upward along stream courses.

TYPE 4 - COVE HARDWOODS (53 and 55)

Composition: A mixture of moist site species, none of which are predominant. The mixture includes black birch, basswood, red oak, tulip poplar, white oak, butternut, black gum, white pine, red, striped and sugar maples, white oak, sycamore, yellow birch, slippery and american elms, umbrella magnolia, and papaw.

Occurrence: Along streams, on north and other moist slopes and flats.

Subtype Cove Hardwoods - Hemlock

The stands of hemlock within the Park are few and small. However, because of its aesthetic value, it is rated as a subtype with cove hardwoods.

Composition: Hemlock pure or predominant.

Associates: Black and yellow birch, red oak, white ash.

Occurrence: Along gentle upland streams in swamp-like conditions.

TYPE 5 - PITCH PINE (37)

Composition: Pitch pine pure or predominant. Pitch pine, as a result of fire and cutting, frequently dominates a mixed hardwood understory.

Associates: Bear oak, which at times is codominant in the younger stands, blackjack oak, which often predominates the more exposed sites, chestnut oak, scarlet oak, virginia pine, black gum, laurel, black locust, table mountain pine, american chestnut (sprouts), pignut hickory, and chinquapin.

Occurrence: On dry middle slopes fronting on Page Valley, on limestone and quartzite soils.

TYPE 6 - BEAR OAK (35)

Composition: Bear oak pure or predominating.

Associates: Pitch pine, chestnut oak, scarlet oak, blackjack oak, black locust, laurel, american chestnut (sprouts), table mountain pine, black gum, and serviceberry.

Occurrence: On shale soils on gentle to moderately steep southern slopes of the western side ridges.

TYPE 7 - BLACK LOCUST (47)

Composition: Black locust pure or predominant.

Associates: Sassafras, virginia pine, smooth sumac, black birch, white ash, pignut hickory, flowering dogwood, persimmon, red maple, and the oaks.

Occurrence: On former fields on dry to moderately fresh sites and poor to rich soils below 3000 feet elevation.

TYPE 8 - WHITE PINE (9)

Composition: White pine pure or predominant.

There are numerous associates, of which red, chestnut, and white oaks, flowering dogwood, virginia pine, black locust, and black birch are the more common. Others are pignut hickory, hemlock, butternut, sassafras, laurel, red maple, white ash, bear oak, scarlet oak, pitch pine, and serviceberry.

Occurrence: Found on a variety of sites but more commonly on the sunnier locations on the better drained soils. It is commonly found on old fields.

TYPE 9 - VIRGINIA PINE (44)

Composition: Generally pure with black locust, sassafras, white, pitch, and table mountain pines, smooth and staghorn sumacs, and black gum as minor associates.

Occurrence: On former fields on dry sites below 2500 feet.

TYPE 10 - GRAY BIRCH (7)

Composition: Gray birch pure.

Minor associates are crataegus species, black birch, white and pitch pines.

Occurrence: A solitary stand exists in a meadow swamp, elevation 3500 feet, at Big Meadows. Other individual specimens or clumps are sparsely found through the Park on some of the upper north slopes.

TYPE 11 - OPEN

This type consists of non-forested lands (excluding rocky barrens). It comprises lands previously cleared of their forest cover by man for use as pastures, orchards, or crop lands, and which have not as yet been reclaimed by any of the forest types. The type has been subdivided into Open - Grassland, Open - Cultivated, and Open - Restocking.

Open - Grassland: Lands which, although no longer being used, are essentially grassland and on which little tree or shrub growth had appeared at the time of mapping.

Open - Cultivated: Lands, essential meadows, which had been recently cultivated or grazed but on which little or no woody growth has appeared.

Open - Restocking: Lands in the intermediate stage between being completely "open" and completely reforested by some recognized forest type. On such lands are a variety of tree and shrub species in varying densities and size classes. The more common species are black locust, sassafras, smooth sumac, virginia pine, and persimmon. Others are black birch, pignut hickory, white pine, butternut, white, red, and chestnut oaks, and tulip poplar. Crataegus, hazelnut, and Ribes are commonly found at higher elevations.

TYPE 12 - BARREN

This type consists of rock outcrops, talus slopes, bare mountain tops, and other barren areas on which there is little or no vegetal growth.

Age Classes

The forest cover of the Park is further classified by ages according to the following groups:

Even-age class groups: Stands in which the types, as a group, are all of essentially the same age or nearly so within a 20-year range: 1 - 20, 21 - 40, 41 - 60, etc.

Mixed-age class group: Stands in which two or more distinct age classes are represented on the same area. When more than two classes are represented on the same area, the stand approaches an uneven-age condition which prevails through much of the Park area.

All-age class group: Stands in which trees of all age classes are represented, from the youngest to the oldest, with no distinct arrangement in even-age groups. This condition is infrequently found in the Park, largely because fire, cutting, or disease has disrupted one or more of the age classes so that a continuous gradation is not present.

Burns

Forest fires occurring within the Park are mostly surface fires burning the dried leaves and other litter on the forest floor during the spring season before the new vegetal growth appears and the hardwood foliage creates a dense shade and then again in the fall after

the annuals have died and the hardwoods have shed the foliage. Crown fires infrequently occur within the dry pine types (Pitch Pine), killing most of the hardwood associates within the stands. Fires run fast during the heat of the day and make rapid spread up the steep slopes.

Although many of the fires, particularly those occurring on the more hazardous days during these periods, burn fiercely and do considerable damage to the forest cover, nowhere within the area has any one fire caused a complete change of type. On the harder burned slopes damage is occasionally severe enough to cause serious depletion of the formerly dominant species in the stand. These openings are rapidly reclaimed by successional species, and a change in age class frequently results.

Record of fire occurrence on the Park is complete from the year 1933 to the present. In view of the accuracy of this data, burn acreage by forest types is shown in tabular form for this period.

Record of burns which occurred prior to 1933 was secured by field mapping. Only those burns or portions of burns which were severe enough to cause significant damage to the forest or ground cover could, with reasonable accuracy, be determined in the field and delineated on a map.

Since the base map used to delineate forest types is of comparatively small scale, only those fires of 100 acres or over total burn have been shown outlined in red ink. In a portion of the southern end of the Park where fires have overlapped one another between the years 1925 and 1930, the burns were grouped under one fire year, 1930.

PARK SECTIONS

The entire Park was subdivided into units called Park Sections, numbering nineteen in all. In general, each section includes several watersheds, and all sections were established relatively uniform as to size, shape, and similarity of forest cover. This subdivision was effected to allow a smaller, more compact unit for detailed narrative description. Smaller areas or watersheds within the established Park Sections comprising associations distinctly different from the broad forest types and type arrangement received special note in the narrative description accompanying the Park Section maps.

PARK SECTION I

NORTHERN END OF PARK

Extending From

Front Royal Entrance to Hogwallow Flats

GENERAL

Park Section I consists of the extreme northern portion of the Park. Here the Park area, forming a true panhandle, encompasses the spur Dickey Hill before broadening on to the main Blue Ridge at Lands Run Gap. In ascending from the northern entrance at Front Royal, one passes through the grass and pasture lands and orchards of the lower slopes, now evidencing signs of successional trends, on to the more characteristic forest types of the main ridge, the Red and Chestnut Oak. The abrupt drop on the western face of this section affords many inspiring views quite unlike those seen from any other point along the Skyline Drive.

HISTORY

Much of the lower portion of the Park section is former orchards and pasture fields now restocking. Adjacent areas have been subject to repeated thinnings for fuel wood, while the more remote slopes have been logged for lumber and tan-bark. Three large fires have burned inside the section within the last twelve years. The Burgess River fire of 1930 and the fire of 1925 on the western slope of Dickey Hill did considerable damage to the over-story on both areas.

TYPES AND ASSOCIATED SPECIES

Red Oak: Chestnut oak is the common associate, and the two species frequently make up equal percentages of the same stand. This is particularly true of the precipitous western slopes of Dickey Hill. On the higher western slopes, red oak is found with small percentages of black birch and basswood as its only associates. On the gentler and eastern slopes are found in addition chestnut, white oak, white pine, and pignut hickory, the latter making up as much as 40 percent of the stand in places.

Chestnut Oak: The type is found on the drier exposures usually of southern and western aspects. In addition to red oak, pignut hickory is a common associate, and on the severely burned slopes, black locust and sassafras make up a large percentage of the young stand.

Cove Hardwoods: A variety of species comprise the type, none of which are predominant: Basswood, black birch, tulip poplar, red oak, white ash, hemlock, yellow birch, red maple, hop-hornbeam, and redbud.

Scarlet Oak: The single stand found on Smith Creek has as associates chestnut oak, red oak, blackjack oak, white oak, pignut hickory, flowering dogwood, sassafras, and black locust.

Black Locust: Pure with sassafras, virginia pine, and smooth sumac as minor associates. The stands are dense and even-aged, having come in on former clearings.

Virginia Pine: Like black locust, stands of this type have claimed old fields. They are dense and even-aged. The type is found pure with black locust, sassafras, pitch pine, and smooth sumac but minor associates.

Open Restocking: The restocking areas are coming back to black locust chiefly, sassafras, virginia pine, smooth sumac, pitch pine, redbud, and pignut hickory.

Open Grassland: The more recently abandoned fields are as yet still grassland.

REPRODUCTION

Reproduction on the burned western slope of Dickey Hill is slow in returning and on the harder burned sites is of a temporary composition. Here such species as sassafras, black locust, and ailanthus predominate. The other burns seem to be restocking naturally. Repeated cuttings on the more accessible locations have culled these areas, and the reproduction found here is also of a temporary nature.

FIRE HAZARD

The fire hazard is considered to be low for the section. A notable exception is the burned north-facing slope of Burgess River where fallen trees, heavy debris, and vines create a dense and hazardous condition. Some fire hazard reduction work has been done on the burned upper slope at Lands Run Gap.

INSECTS AND DISEASES

Infestations of the Devils Walking Stick, *Diapheromera femorata*, in 1939 and 1940 have defoliated the black locust and some of the adjacent species within the Park section. As a result of the burn of 1930, remnant trees on the southern slope of the Burgess River watershed are left in a poor and highly susceptible condition to fungus and insect attack. Heart rot is prevalent in the remnant trees throughout all of the burned areas.

COMMENTS

Differentiation between grassland and restocking types is sometimes difficult to establish. What today is grassland will in the course of a year's time become a restocking area. The manner in which black locust and, on a smaller scale, virginia pine have reclaimed open areas as pure types is worthy of special note.

PARK SECTION II

Extending From

Hogwallow Flats to Gravel Springs Gap

GENERAL

On the slopes of Mount Marshall a good mixture of oak and hickory on the southeast and of oak and Cove Hardwoods on the northwest combine to form one of the largest and best unbroken stands of the Red Oak type in the Park. Other forest types do not appear until well down off the ridge. Although recent cutting operations are evident on outlying points, none have touched the aforesaid expanse within the past two decades. Several disastrous fires have occurred within the past ten years, and the whole section has been burned at one time or another during the past fifteen years. Devil Stairs, with its steep, barren, canyonlike walls, is a spectacle uncommon to the Park.

HISTORY

Two major fires within the last ten years have inflicted severe damage to this Park section. (The Waterfall Branch burn of 1930 is a portion of the Burgess River fire of Park Section I.) Both fires resulted in a loss of the younger growth and a heavy depletion in the overstory. Older burns were observed on both sides of upper Devil Stairs (1925) and on the southeastern slope of The Peak (1925). The greater portion of Mount Marshall bears little evidence of having been lumbered, but other sections definitely indicate recent operations. In the more accessible areas fuel wood thinnings were common. The old pasture fields, garden plots, and orchards are now restocking.

TYPES AND ASSOCIATED SPECIES

Red Oak: On southeastern aspects, pignut and mockernut hickories make up as much as 60 percent of the type, with red, white, chestnut, and scarlet oaks and basswood associates. With the red oak on northwestern aspects are found chestnut oak, basswood, and hophornbeam, while on lower Phils Arm are found white and scarlet oak associates. On top of The Peak pignut, mockernut, and shagbark hickories combine to form a pure stand.

Chestnut Oak: On the drier aspects, chestnut oak is found either pure or associated with pignut hickory; on the lower western slopes with scarlet oak, pitch pine, black locust, and laurel. Red oak is the common associate of the rocky upper slopes and moister aspects.

Scarlet Oak: Chestnut oak, red oak, blackjack oak, pitch pine, and laurel are the common associates.

Cove Hardwoods: Narrow strips of Cove Hardwood species border the streams and on the northwestern side of Mount Marshall extend well up the rocky draws, their width broadening on the ascent. Black birch, basswood, red oak, hophornbeam, and striped maple are found along the stream courses with basswood, tulip poplar, red oak, flowering dogwood, white oak, pignut hickory, and american elm being found on the larger areas. Papaw and red mulberry were noted on The Peak.

Open Restocking: Open areas are restocking with black locust chiefly, smooth sumac, virginia pine, sassafras, black birch, and pignut hickory.

Barren: The steep sides of Devil Stairs are mostly void of vegetation.

REPRODUCTION

Advanced growth over most of the area with favorable site conditions on all but the steeper slopes maintain a natural reproduction. Fires and cutting have created a local deviation by increasing the proportion of black locust, sassafras, black birch, red maple, and ailanthus.

FIRE HAZARD

Mount Marshall and the surrounding country is considered to be low in respect to fire hazard except in the burned areas, where hanging debris, much of which is small chestnut snags, constitutes a real menace. Southwestern aspects present the greater hazard.

INSECTS AND DISEASES

Remnant trees on the harder burned slopes and ridge crests, particularly in the Chestnut Oak type, are breaking and dying and are subject to active fungus attacks. Several outbreaks of Devils Walking Stick, *Diapheromera femorata*, were encountered in Phils Arm Run, Waterfall Branch, and on The Peak attacking locust, red and chestnut oaks, and pignut hickory.

COMMENTS

It is interesting to note that hickory attains dominance in stands on the eastern and southern slopes of Mount Marshall and pure stands on the top of The Peak.

PARK SECTION III

Hogback Mountains, Overall Run

GENERAL

This section of the Park is just northwest of the main ridge and is represented by spur ridges of Hogback and Little Hogback Mountains. The forest cover of Matthews Arm and Gimlet Ridge descend with a general fusion of the Red Oak and Chestnut Oak types, while on Beecher Ridge it changes into the drier forest types characteristic of the western-most faces. Although the whole country has been extensively cut and burned, the lower Park section contains some thrifty young stands. The dominant cover of the upper slopes is stunted and wind-swept. An excellent panoramic view off the sheer rugged western slopes onto the background of quiet pastoral life is attainable from the Hogback Mountains.

HISTORY

Fire has played a prominent part in the history of the Park section. Three major fires swept over its slopes in 1929 and 1931 doing considerable damage. A source of much wood, the upland country has been selectively reduced of fine stands for fuel wood, tan bark, and saw log purposes. The lower country in the vicinity of Compton and Overall has been spared of cutting for the past decade and now contains some thrifty new growth.

TYPES AND ASSOCIATED SPECIES

Red Oak: The type is found purest in the stunted and remnant growth of the rugged upper slopes of the Hogback Mountains. Basswood is a common associate, as are black birch, bitternut hickory, and hophornbeam on the cooler slopes, while chestnut oak and pignut hickory are more common to the drier aspects, and white oak and mockernut hickory to the gentler middle slopes and flats. On Gimlet Ridge and lower Matthews Arm are instances of both red and chestnut oak being closely associated with pignut hickory. White oak makes up as much as 35 percent of the type on the flat of Matthews Arm.

Chestnut Oak: The type is inclined to hold to the drier, sunnier locations of the main ridge and to the cooler aspects of the lower country. It is frequently found pure. Red oak and pignut hickory are common associates through Matthews Arm and Gimlet Ridge, with scarlet oak, white oak, and white pine being less commonly found. Scarlet oak, blackjack oak, pitch pine, and pignut hickory are common at lower elevations.

Scarlet Oak: White oak makes up a considerable portion of the type on the moist locations, frequently dominating. On drier aspects, scarlet oak is found dominant with chestnut oak, pignut hickory, black locust, black gum, bear oak, pitch and virginia pines, chestnut sprouts, chinquapin, and blackjack oak associates, the latter frequently dominating small areas on the driest exposures. Mountain laurel is common throughout.

Pitch Pine: The Pitch Pine type dominates the driest west and southwest slopes of the western extension on limestone and quartzite soils. Associate species include scarlet, chestnut, blackjack, and bear oaks, virginia pine, pignut hickory, black gum, and chestnut sprouts. Greater fire-resisting qualities of pitch pine have favored it on burned areas.

Virginia Pine: Several pure, densely stocked stands of virginia pine are found on former fields of shale soil.

Black Locust: A small pure stand of black locust is found in upper Compton Hollow on a former clearing.

Cove Hardwoods: Below the Hogback Mountains are several stands of Cove Hardwoods consisting of basswood, red oak, white ash, hophornbeam, sugar maple, bitternut and mockernut hickories, dogwood, and black and yellow birch. A small grove of large-sized sugar maples is found here.

Open - Grassland: Several areas, more recently grazed, retain their grassy cover. The area in middle Dry Run, acquired more recently than the rest of the Park section, was being heavily grazed by sheep until its purchase in 1938.

Open - Restocking: Less recently abandoned open areas which have not already been claimed by a wooded type are restocking with a variety of species, including virginia pine, black locust, sassafras, smooth sumac, white pine, dogwood, sprout oaks and hickories, and redbud.

Barren: Below Hogback Mountain and in Overall Run, due to sheer rockiness of slope, are several barren areas.

REPRODUCTION

Sprout oak and hickory make up the general understory of the Park section. The rapidity of reproduction following severe burns and cuttings is well illustrated in the thrifty stands of the lower country. Pitch pine, locust, sassafras, and some table mountain and virginia pine restock the harder burned slopes where reproduction by residual seed is often the only means of natural regeneration. A former stand of chestnut oak on upper Beecher Ridge, destroyed by the fire of 1931, has become a dense growth of locust and sassafras.

FIRE HAZARD

The harder burned areas of western aspect present the greatest hazard in that the amount of dead material is not yet down. The density of new growth, including mountain laurel, tends to increase the fuel content on these sites. Along the flat of Matthews Arm spotty hazardous conditions exist in accumulated masses of grape vines and debris.

INSECTS AND DISEASES

Annual infestations of *Diapheromera femorata* have been observed on Gimlet Ridge attacking locust principally, the oaks, pignut hickory, and lesser species. Mortality in chestnut oak stands, following fires, is high on ridge crests below Hogback Mountain and on the floor of upper Overall Run. Nearly all of the remnant trees through the burned portions bear basal scars.

COMMENTS

Bearwallow is of special interest because of the variety of plant life found here.

PARK SECTION IV

Embracing

Jeremys Run Watershed, Pass Mountain, West

GENERAL

Park Section IV embraces the Jeremys Run watershed and the area to the south as far as the Lee Highway, including the Park Headquarters parcel. As most of the Park section is underlain by granodiorite, quartzite, and shale formations, the soil is generally rocky with little humus and the forest cover mostly of the dry land types. Only on the upper western slope of Pass Mountain, which is of greenstone origin, are the moister types found. Widespread fires burned through the Park section in 1930 and 1931. Recent cuttings are evident only in the more accessible areas.

HISTORY

The rocky character and scant vegetable content of the soil over much of this area undoubtedly influenced the spread and intensity of the burns so that the burned-over area is often not clearly defined and the general results not severe. However, local damage was intense, particularly to upper north slopes and to southwestern slopes below Three Sisters. The Park section has been widely cut over, although no lumbering operations within recent years are evident. Local cuttings in the vicinity of dwellings and open areas are quite conspicuous.

TYPES AND ASSOCIATED SPECIES

Chestnut Oak: The Chestnut Oak type is pure throughout and is inclined to be purest on the upper slopes. Bear oak sometimes makes up a good portion of the understory on these upper slopes. Other associates are red maple, black gum, serviceberry, pitch pine, and table mountain pine. The type blends well into the Scarlet Oak type. Mountain laurel makes up a general ground cover.

Scarlet Oak: The Scarlet Oak type, found on the lower, sunnier slopes, has numerous associates in white oak, pignut hickory, blackjack oak, bear oak, chestnut oak, pitch and virginia pines, black gum, red oak, chestnut sprouts, locust, and laurel. Along Jeremys Run, in the absence of sufficient area of Cove Hardwoods, it has additional associates in sycamore, red maple, butternut, slippery elm, dogwood, persimmon, ailanthus, white pine, and an occasional hackberry, wild black cherry, and black walnut. On the drier aspects of the type, blackjack oak sometimes assumes dominance.

Red Oak: The type is found in the cooler, more fertile aspects of the higher ridge. Associate species are chestnut oak, black birch, white pine, scarlet and white oaks, mockernut, shagbark, pignut and bitternut hickories, hophornbeam, basswood, dogwood, and white ash.

Pitch Pine: Stands of Pitch Pine are usually well defined on dry southwestern slopes. Bear, blackjack, chestnut, and scarlet oaks and laurel are common associates. There are instances on severely burned slopes where pine has survived in pure stands, a former pine-hardwood cover.

Cove Hardwoods: Lying in fertile recesses appressed to the main ridge, the type is represented by numerous species: Black birch, basswood, red oak, white ash, hophornbeam, hemlock, white pine, butternut, bitternut and mockernut hickories. Black ash, blue dogwood, and red mulberry were noted.

Bear Oak: There are several small stands of Bear Oak in which the pitch pine and chestnut oak associates usually overtop the bear oak.

White Pine: The several small stands of White Pine consist of white pine in association with chestnut, red and white oaks, pignut and mockernut hickories, white ash, dogwood, black locust, and black birch.

Black Locust: Black locust, one of several species rapidly reclaiming open areas, has asserted itself in stands in numerous instances, but few of which are as yet of significant size.

Open - Grassland: There are several formerly pastured areas which at the time of mapping retained their grassy cover.

Open - Cultivated: The Park Headquarters parcel, of more recent acquisition, had at the time of mapping open areas still under cultivation.

Open - Restocking: Large portions of the formerly open areas are restocking with the more vigorous species such as locust, sassafras, virginia pine, smooth sumac, and persimmon. Other species found are the oaks, hickories, pitch pine, white pine, black birch, butternut, ailanthus, red maple, and dogwood. Black birch is coming in pure in the formerly open area at the head of Jeremys Run.

REPRODUCTION

Reproduction on the harder burned slopes of the Pitch Pine and Chestnut Oak types is slow in becoming re-established. Recent cuttings have resulted in apparently little change in cover except in the Cove Hardwood type where an amount of the young growth is of temporary species.

FIRE HAZARD

Except for hazardous conditions which exist on the north side and upper south side of The Neighbor Mountain and on the lower slopes west of Three Sisters, the fire hazard is not considered to be high. Partially down, fire-killed material, including a quantity of young chestnut on the north slope of The Neighbor together with slash resulting from cutting in the vicinity of Kibler Knob, comprise the hazard on these areas. A constant fire risk exists on the westernmost portion of the section where the Park boundary lies in close proximity to the Norfolk and Western Railroad.

INSECTS AND DISEASES

Fires have damaged the remnant trees on the harder burned slopes to such an extent that fungus attack is widespread. No insect attacks, other than those common to the Park, were noted.

PARK SECTION V

Extending From

Hogback Mountains South to Lee Highway, East Side

GENERAL

Park Section V, embracing the North Fork Thornton River and Piney Run watersheds, takes in the eastern side of the Blue Ridge from the Hogback Mountain and Rattlesnake Point on the north to the Lee Highway on the south. This fertile country has been intensively exploited. Large restocking areas, formerly pasture, orchard, and crop land, together with cutting and fires, have produced a varied landscape. The forest types contain some excellent though broken stands of Red Oak, Cove Hardwoods, and Chestnut Oak. Three major fires have burned in this section since 1929 doing extensive damage. The section has much to offer in the way of recreation.

HISTORY

The broken and patchwork effect of the accompanying map gives some idea of the intensive use to which this Park Section has been subjected. General fertility of land and gentleness of slope brought numerous homesteads and consequent clearing of large tracts of land. The more accessible of the wooded portions have been the source of local lumber and fuel wood for generations. Lumbering concerns have carried on operations from time to time. A last major one just preceded the Government acquisition in 1937 of some 45,000 acres of splendid timber land in lower North Fork Thornton River and Piney River watersheds. Practically all of the former open areas are now in some stage of forest succession. Since 1929 three fires of major character have burned in this section. The first, and probably most severe, located on Pignut Mountain, burned everything down to mineral soil over much of the southern slope, while fire scars extend well up into the large remnant trees on the northern slope. The fire of 1930 in upper Piney Branch burned most intensively through the southern and middle portions. The third and smallest fire occurred on Fork Mountain in 1933, destroying all of the preceding stand on the upper southern slope.

TYPES AND ASSOCIATED SPECIES

Red Oak: Stands of the Red Oak type frequent the greenstone soil of the main ridge. As found on the slopes of the Hogback Mountain, hickories make up as much as 50 percent or more of the type with white oak, chestnut oak, basswood, white ash, black gum, flowering dogwood,

and witch hazel appearing as subordinate species. The type remains much the same on other slopes of eastern aspect, with a possible reduction in the amount of hickory and chestnut oak and increase of basswood, white ash, and other cove species. Chestnut oak is the common associate on slopes of western aspect and often comprises 50 percent of the stand.

Chestnut Oak: Stands of the Chestnut Oak type are usually found away from the main ridge on granodiorite soils. For the most part they are pure with an understory of laurel. Where fire or cuttings have occurred, locust and sassafras have come in and in places almost shut out the chestnut oak. On the better sites of the type, for instance on the eastern slope south from Elkwallow Gap, red and chestnut oak are in close association with hickory, a minor subordinate. Other associates found throughout the type are pitch pine, scarlet oak, black-jack oak, and white and virginia pines.

Cove Hardwood: Associated with the numerous streams and better than usual site conditions are extensive though broken stands of the Cove Hardwood type. Extending well up northern slopes, the fusion of this and the Red Oak type is sometimes very close. The presence of basswood, red oak, black birch, white ash, hemlock, hophornbeam, butternut, and white pine are seen here. Confined more to the streams and more truly representative of the type are hemlock, yellow birch, white ash, sycamore, sugar maple, black walnut, beech, and blue beech. Hemlock is perhaps the most prominent species throughout the type.

White Pine: The White Pine type found northwest of Pignut Mountain consists of a young, even-aged stand of white pine with sassafras, locust, and virginia pine associates on what was formerly part of the adjacent clearing, and a mixed-aged stand of larger pines under which chestnut oak is the common associate. Other white pine is found dispersed throughout the Park section, most of it as young growth restocking former clearings but covering too small an area to map.

Black Locust: Black locust is vigorously claiming many of the open areas. On those areas claimed it is usually found pure in rather dense, even-aged stands. An exception is one of the 21-40 age stands southeast of Pass Mountain, where white ash makes up about 40 percent of the type.

Open - Restocking: The large tracts of cleared land are in various stages of restocking: From recently cultivated plots, pasture fields, and orchards having scattered briar clumps, locusts, and sumac to mark the first signs of forest progression, to stands of twenty or more years of age which are hardly recognizable as once having been open. Restocking species listed in approximate order of prominence are: Black locust, smooth sumac, sassafras, persimmon, flowering dogwood, virginia pine, black birch, red maple, white pine, tulip poplar, hickories, ailanthus, pitch pine, sycamore, butternut, red, chestnut, and white oaks, witch hazel crataegus, smooth alder, and redbud. Some of the rarer species included are wild black cherry, juniper, crack willow, american elm, and dwarf sumac.

Open - Grassland: Openings which are as yet essentially grassland comprise this type.

Open - Cultivated: Orchards and more recently abandoned garden plots comprise the type.

REPRODUCTION

Throughout the wooded sections the advanced growth and especially receptive site conditions on all but the severely burned slopes maintain a natural reproduction. New growth following a fire is often so dense that keen competition at an early age results in a quantity of dead material. This has been particularly noted on upper eastern slopes at the lower portion of the Piney Ridge fire. An exception here is a stand of mixed-aged Red Oak where after a period of seven years since the fire there is not a trace of reproduction beneath the badly damaged overstory largely because of grazing. Locust and sassafras are usually among the new growth following a fire, sometimes completely dominating the harder burned slopes of the Chestnut Oak type. The laurel under-story characteristic of the Chestnut Oak type probably retards reproduction to some extent. Where forest meets field, there are some fine examples of seeding in, notably of white pine.

FIRE HAZARD

Fire-killed material, slash left from cuttings, dead material resulting from natural thinnings in the denser stands of reproduction following previous fires, and the degrees of inflammability reached at certain stages in the restocking of cleared lands present various hazardous conditions in the Park section. The cleared area south of Rattlesnake Point was restocking at the time it was hit by the fire of 1930. The resulting fire-killed material together with the keen competition in the new growth has effected an almost impenetrable accumulation of dead and hanging debris. Conditions quite similar to this are seen on the north slope of Pignut Mountain in the CO, 1-20, and MA stands where dead standing laurel and much fallen timber and debris present a high fire hazard. Further hazardous conditions are met on the southern slopes of Fork Mountain and the ridge between Frazier Hollow and Butterwood Branch in the accumulation of vines, fallen logs, and hanging debris present.

INSECTS AND DISEASE

A major infestation of the locust borer, *Cyrtene robiniae*, was noted in the first stand of Black Locust, 21-40, southeast of Pass Mountain. This stand, believed to have been at one time a clearing, contains in addition to the locust about 40 percent white ash and a luxuriant growth of herbaceous plants. While a generally unhealthy condition

prevailed in the stand and a small heap of frass was found at the base of almost every locust, no deaths as a result of the insect were noted. Strangely, no signs of the insect were seen in nearby stands of locust. No fungus or plant disease were observed other than those commonly present in the Park.

COMMENTS

This attractive country has big recreational possibilities. Piney Branch and the North Fork Thornton River, the two major streams, with their numerous pools and cascades and the cool, dark depths of their hollows, are inviting to fishermen. Readily accessible by auto, numerous old mountain trails lead further into the interior. Many of the former homesteads would make ideal picnic and camp sites. Numerous rare tree species have been observed, among them devils club, dwarf sumac, red mulberry, cucumber magnolia, american elm, hackberry, trembling aspen, crack willow, american beech, and ironwood. Little Devil Stairs is very similar to Devil Stairs of Park Section III in rugged grandeur.

PARK SECTION VI

Extending from

Lee Highway to Hawksbill Mountain, Western Side

GENERAL

Park Section VI extends along the abrupt western slopes of the main ridge from the Lee Highway on the north to Hawksbill Mountain on the south. In descending from the aged and weathered Red Oak stands of the upper slopes, the cover changes to younger, more fully stocked stands of Chestnut Oak, Scarlet Oak and Cove Hardwoods below. The adhesion of the granodiorite formation to the main ridge bears relation to the extension of the Chestnut Oak type well up on southwestern slopes. For the past two decades there has been little cutting except in the lower watersheds. Fires have been few over a like period.

HISTORY

Twenty years ago this Park Section was extensively cut over and burned. Cuttings extended well up the slopes and in a few instances stands were clear cut. In the more remote draws numerous logs were left as felled. Since this time the cuttings have been generally confined to the lower watersheds where the policy has been to cut over the land before Government acquisition. Two recent burns have been noted: One on the lower southern slope of Elder Ridge about 1924; the other on the northwestern slope of Naked Top about 1930, neither of them being very extensive or very severe.

TYPES AND ASSOCIATED SPECIES

Red Oak: The type is quite pure on the rough upper slopes in stands consisting of poorly formed, stunted, mostly remnant trees. On the ridge flats white oak is an important associate, while on the drier sites chestnut oak makes up a good portion of the type. On northern aspects numerous associates are found in black birch, basswood, locust, bitternut hickory, sugar maple, hophornbeam, striped maple, and butter-nut, with hemlock, white ash, and yellow birch in the more moist locations. Mountain ash is quite common on the western brink of the more precipitous upper slopes. The rare Blue Ridge fir, red spruce, and canadian yew are found on the crests of several of the mountains.

Red Oak - Blue Ridge Fir: On the top of Hawksbill Mountain and at Crescent Rock occur limited stands of Blue Ridge Fir in light mixture with red oak, witch hazel, black birch, and other minor species. Red spruce and canadian yew are also found in limited quantities on Hawksbill and Stony Man Mountains, respectively.

Chestnut Oak: Generally found quite pure, red oak is the common associate throughout the type. Mountain laurel forms a general understory. Other associates include black birch, striped maple, and white pine on the upper slopes of the type, locust, scarlet oak, flowering dogwood, pignut hickory, red maple, and sassafras on the lower slopes, and pitch pine, table mountain pine, and bear oak on the drier middle slopes.

Cove Hardwoods: Narrow strips of Cove Hardwood species extend upward along the streams and in the coolness of the upper slopes and draws sometimes broaden into stands closely associated with the Red Oak type. Basswood, black birch, red oak, sugar maple, hemlock, hornbeam, striped maple, and butternut are the more common species; yellow birch, bitternut hickory, tulip poplar, redbud, white oak, sycamore, and slippery elm are also found. The upper draws are very rugged and support a minimum growth of trees. The lichen-covered rocks commonly have dense growths of Virginia creeper and grape vines about them.

Scarlet Oak: The type has numerous associates: Chestnut oak and pitch and virginia pines probably predominating, table mountain pine, pignut hickory, red oak, blackjack oak, flowering dogwood, black locust, bear oak, sassafras, and white pine also being found.

White Pine: The White Pine stands consist of a light intermixture of hardwoods and virginia pine with the white pine in the overstory and a definite hardwood understory in which are found scarlet, white, red, and chestnut oaks, black birch, flowering dogwood, locust, redbud, and virginia pine.

Pitch Pine: Associated with pitch pine are chestnut oak, virginia pine, table mountain pine, and scarlet oak in varying proportions.

Open - Restocking: Among those species rapidly reclaiming the former open areas are locust, smooth sumac, virginia pine, persimmon, sassafras, pitch pine, juniper, black birch, mountain laurel, and flowering dogwood. Other species are ailanthus, pignut hickory, red maple, butternut, table mountain pine, tulip poplar, and sycamore.

Open - Grassland: A few openings slower to restock comprise this type.

REPRODUCTION

Comparatively little cutting and the few fires within recent date over most of the Park section have allowed a natural reproduction to become well established beneath the remnant overstory. The minor clear cut areas of the Chestnut Oak type are restocking well in pure stands of sprout origin. Reproduction on the lower frequently thinned areas contains a greater number of flowering dogwood, virginia pine, and such

species than formerly, but the sprouting capacity of the oaks maintain the latter's dominance in the stands. Peculiarly, in the White Pine stands in Kettle Canyon, there is little white pine reproduction, yet in the neighboring Hardwood stands there is a good supply of white pine seedlings. Reduction through cutting of the white pine has affected the supply of the species in the understory on the upper slopes. The quantity of sugar maple seedlings on the forest floor is conspicuous.

FIRE HAZARD

Leaning and down dead chestnut sprouts and snags, together with mountain laurel, constitute a hazardous condition on numerous sites. On lower cutover areas the slash and mountain laurel make up local hazardous areas. General rugged conditions of the steep upper slopes tend to decrease rapidity of fire spread. Judging from the past, the fire risk is low for the Park section.

INSECTS AND DISEASES

A minor infestation of Devils Walking Stick was noted in the Red Oak type just north of the lower switchback on the Lee Highway. The insects were found feeding on the leaves of everything from oaks to brambles, seemingly preferring those of black locust.

An interesting condition was observed on top of the Pinnacle, where masses of Lady Bird Beetles had collected on mountain ash and other small growth.

COMMENTS

The abrupt slopes of the Park section afford numerous inspiring views of the valley and distant Allegheny Mountains. Some of the early ideas toward the establishment of this area as a national park originated at Skyland, which was a mountain resort before becoming one of the major park developments. The presence of Blue Ridge fir (formerly Frager fir), canadian yew, and red spruce on Hawksbill Mountain, Crescent Rock, and Stony Man, and of mountain ash, another comparatively rare species, on the western edge of some of the crests, is of especial interest.

PARK SECTION VII

Extending From

Lee Highway South to Stony Man and Robertson Mountain, East Side

GENERAL

Park Section VII, lying on the eastern side of the Blue Ridge, is bounded on the north by the Lee Highway, on the south by Stony Man and Robertson Mountains, and includes the Hazel and Hughes Rivers and south branches of the Thornton River watershed. The lower country of the park section has been subjected to man's use and misuse for generations and presents a varied and broken landscape, while the more remote slopes, having felt man's influence to a less degree, support a more unified expanse of forest cover. Of the forest types, Chestnut Oak, Red Oak, and Cove Hardwood are the principal cover, with minor stands of Pitch Pine, White Pine, and Bear Oak.

HISTORY

The Thorofare, Corbin, and Robertson Mountain country has been a hot spot for fires until the last few years. The numerous fires have burned with such severity as to destroy all the forest cover on some of the slopes and to create a hazardous accumulation of fuels on others. Catlett Mountain and Hannah Run as far west as Sexton Shelter was the scene of a scorching fire on all but the rougher slopes in 1930. White Rocks was burned over in 1929. Another less significant burn occurred in the vicinity of White Oak Canyon Parking Overlook in 1930. Subsequent reproduction beneath a remnant overstory has created a two-storied effect on much of the park section. Scattered homesteads have until recently dotted the more accessible and fertile country, and about them are the small and large clearings which are now restocking. Adjacent wooded portions have been repeatedly thinned, while the more remote have been a source of saw timber, tan bark, and other products to the lumberman up to the time of Government acquisition.

TYPES AND ASSOCIATED SPECIES

Red Oak: The stunted and weather-beaten trees comprising the stands on the higher slopes of the type consist of red oak (pure or with hickory), white oak (on gentler slopes), black birch, and striped maple. Chestnut and bear oak are significant associates on lower slopes of southern aspect, while on northern and eastern exposures are found basswood, sugar maple, hornbeam, butternut, white ash, locust, serviceberry, witch hazel, red maple, crataegus, and wild black and choke berries.

Chestnut Oak: Mountain laurel is characteristically abundant beneath the pure stands of chestnut oak found in the northern half of the Park section. So dense that penetrability is often extremely difficult, the laurel is keeping out all young growth, producing a layered effect beneath the commonly even-aged overstory. On other areas red oak is the principal associate with laurel continuing to make up a good portion of the understory. Scarlet and bear oak, red maple, black gum, pitch pine, and serviceberry are found with chestnut oak in the flatter upland country of the Hazel River watershed. Still other species noted in the type are striped maple, locust, white pine, witch hazel, table mountain pine, and tulip poplar. The Chestnut Oak, 1-20, stand on lower Corbin Mountain, as is sometimes the case in the type following severe burns, consists mainly of locust and sassafras growth with sprout chestnut oak as the major associate of climax type species.

Cove Hardwoods: Hemlock, a predominant species throughout the Cove Hardwood type, sometimes asserts itself as a subtype. These subtype areas of hemlock are usually found as small stands along the more gentle upland streams where, in swamp-like conditions, yellow and black birch and white ash are the main associates. There are exceptions where the subtype extends well up rough ravines of northern exposure, as is the case east of Stony Man. Here the associates are red oak, black birch, and white ash. Other species representative of the Cove Hardwood type are, in approximate order of prominence: tulip poplar, basswood, sugar maple, red maple, hophornbeam, white pine, mountain maple, locust, black gum, shagbark hickory, redbud, american elm. Red maple and redbud are confined more to the lower thinned areas.

Pitch Pine: Minorly associated with pitch pine are table mountain pine, virginia pine, chestnut oak, and bear oak.

Bear Oak: Found with bear oak are chestnut oak, mountain laurel, red oak, chestnut, and pitch pine. The area near Sexton Shelter is the result produced in a chestnut stand following severe burns.

White Pine: Among the numerous associates of white pine are bear oak, chestnut oak, hemlock, laurel, red maple, locust, black birch, pitch pine, shadbush, black gum, red and white oaks.

Open - Restocking: The numerous open areas are in various stages of restocking, some of them being hardly recognizable as once having been a clearing. Locust, sassafras, and smooth sumac are the more prevalent species, followed by persimmon, virginia pine, hickories, white and pitch pines, oaks, black birch, and flowering dogwood. Other species noted were ailanthus, redbud, butternut, red maple, tulip poplar, black alder, sycamore, juniper, and crack willow.

REPRODUCTION

Mountain laurel is seriously preventing reproduction from becoming established throughout large acreages of the Chestnut Oak type. Locust and sassafras make up a big percentage of the new growth on the harder burned slopes, at times shutting out all other species.

INSECTS AND DISEASES

Several insect attacks were observed. On the eastern side of Robertson Mountain ovipositing scars of cicada were noted on twigs of all species, causing an incomplete and unnatural leaf development and a conspicuously light foliage. On this same area and in Broad Hollow an insignificant damage resembling the witches broom of hackberry was observed on several chestnut oaks. Heartrot is prevalent in the remnant stands of the harder burned slopes and at the higher elevations, where sleet damage is severest, is common in the upper boles of the trees as well.

FIRE HAZARD

A high fire hazard exists on areas of dense laurel undergrowth. Not only are these areas highly inflammable and difficult to penetrate, but the laurel keeps herbaceous growth from the forest floor, lengthening the period of disintegration of litter. At the same time the laurel tends to check falling trees, snags, etc., from reaching the ground. Other areas of high hazard are found on the middle western side of Catlett Mountain and vicinity and on Corbin Mountain where recent fires have caused an accumulation of debris.

COMMENTS

Mountain laurel, while generally associated with the Chestnut Oak type, is rarely seen to be as abundant as it is in the upper Hazel River, Beech Spring, and Buck Hollow watersheds, where at times it becomes so dense as to be most easily penetrated by crawling on hands and knees. Hazel Mountain and vicinity with its numerous streams, springs, and trails should become one of the foremost developments off the Drive. Annual sleet damage is considerable on the upper slopes and ridge tops, causing considerable breakage. Among the rarer trees were trembling aspen on The Pinnacle and Hot Mountain and short leaf pine near Hazel Mountain.

PARK SECTION VIII

CENTRAL SECTION

White Oak Canyon, Cedar Run, Old Rag Mountain

GENERAL

Park Section VIII, lying in the central section of the Park on the eastern side of the ridge, consists of two widely different portions separated by Robertson River. That portion on the main ridge, underlain by greenstone, is quite characteristic of the forested slopes of the eastern side of the Blue Ridge, except that, having been less exploited, the wood stands are more uniformly extensive. A good mixture of oak and hickory is the dominant cover. Old Rag Mountain, isolated from the main ridge, is unique in its rugged formations and geologic structure. Consisting of hard granodiorite and diabasic rock, it presents a bold, rugged crown almost void of vegetation. The forest cover, with the exception of a small yet interesting association of plants on the summit of the mountain, the several Coves, and minor forest types, is uniformly Chestnut Oak. The location of the mountain has favored repeated fires and cuttings, although in the remote regions some virgin timber is to be found.

HISTORY

The northern portion of Old Rag was burned disastrously in 1930. Upward from the coves and open areas of the lower slope, all cover was consumed except that on the more rugged upper slopes and in the side draws the badly scorched remnant trees are now gradually dying and falling. To the south, fires of earlier date have severely burned the cover on some of the slopes of southwestern aspect. There are indications that cutting operations have extended well over the Park section. From upper White Oak Canyon thousands of feet of saw timber have been removed, including some of the valuable and irreplaceable red spruce. Nevertheless, the present stand on the main ridge represents some of the best in the Park. The brim of Old Rag Mountain, and in particular Weakley Hollow, have been exploited much more intensively. Fire, cutting, and tan-bark operations and fuel wood cuttings have overlapped each other until Government acquisition of the land.

TYPES AND ASSOCIATED SPECIES

Red Oak: Some beautiful and extensive stands of the Red Oak type are found in the Park section. White oak and hickory are common associates at the higher elevations where the trees are poor of form and broken. Chestnut, once prevalent on these upper slopes, is rapidly disappearing. Off the crests the quality of the stands is much improved.

Hickory, chestnut, and white oaks are good associates throughout and each dominate portions of the type. Other associates are black birch, basswood, sugar maple, witch hazel, locust, hornbeam, red maple, yellow birch, butternut, white ash, wild black cherry, crataegus, chokecherry, beaked hazelnut, and laurel. As a result of widespread cuttings of several decades ago, the 21-40 age class is most prevalent. Several areas lying adjacent to open areas now restocking are believed to have been formerly open and contain such a variety of species as to make designation as Red Oak type somewhat prophetic.

Chestnut Oak: The Chestnut Oak type is found largely on Old Rag Mountain. The disastrous fires which have burned this mountain have reduced large acreages to the 1-20 age class and have made it the most prevalent age class throughout the type. Locust and sassafras make up the highest percentage of the younger stands and have chestnut oak, staghorn sumac and black gum as associates. This young growth is often so thick and the fire-killed debris so dense that penetrability is extremely difficult. On the more rugged, and for this reason more protected, upper slopes of the type, as in the older, less recently burned stands, the Chestnut Oak type is quite pure with such associates as red oak, black birch, red maple, pitch pine, scarlet oak, tulip poplar, white pine, serviceberry, table mountain pine, and white ash. On the lower eastern slopes of southern exposure of the main ridge, mountain laurel is an important associate often making up a dense undercover.

Scarlet Oak: Off the east slope of Old Rag Mountain on a site formerly occupied by several dwellings and their immediate open areas is a stand most closely associated with the Scarlet Oak type. The transition from the Chestnut Oak type above is very gradual. The presence of several water courses in the vicinity favor a variety of species in the type, among them being scarlet oak, red oak, chestnut oak, tulip poplar, hickory, white oak, red maple, dogwood, virginia pine, locust, white pine, and black oak.

Cove Hardwoods: Long, narrow stands of the Cove Hardwood type extend along the major stream courses of the main ridge, frequently varying but little in composition from the adjacent Red Oak stands. The remnant type following a heavy cutting in the Limberlost in which irreplaceable veteran hemlock and red spruce were removed, consists of a broken stand of hemlock, red oak, red maple, black birch, black gum, yellow birch, chestnut oak, and red spruce. Chestnut was formerly dense here. In the coves and more fertile stream courses of Old Rag Mountain and in particular off the north slope in Weakley Hollow, are other Cove Hardwood stands varying little from that above. All have been intensively exploited and severely damaged by fires. Magnolia is common in Weakley Hollow.

Black Locust: The Black Locust type has reclaimed several of the earlier abandoned open areas. These areas, having a deep, rich soil, bear in addition to the predominant locust, flowering dogwood, chestnut oak, black birch, sassafras, red oak, scarlet oak, hickory, tulip poplar, and red oak.

Pitch Pine: The lone Pitch Pine stand occupies a very dry ridge crest. Table mountain pine and chestnut oak are minor associates.

Bear Oak: On top of Old Rag is found an unique association of plants. While containing little bear oak, the association resembles the Bear Oak more closely than it does any other recognized type. Almost surrounded by rugged, barren rocks, this island of vegetation consists of chestnut oak, laurel, sweet fern, locust, red oak, bear oak, and virginia pine. Large tooth aspen, crack willow, and fire cherry are also present. Just over the north brink mountain ash is common.

Virginia Pine: Dense reproduction of virginia pine is reclaiming a portion of the open areas at Old Rag. Intermingled sassafras, black gum, staghorn sumac, locust, pitch, white, and table mountain pine are found.

Open - Restocking: Open areas returning to a forest condition are being claimed by such species as virginia pine, locust, sassafras, white pine, black birch, laurel, smooth sumac, persimmon, staghorn sumac, hickories, tulip poplar, red maple, white oak, crataegus, and sycamore. Those areas less recently abandoned are yet in a grassland state.

REPRODUCTION

Except for local conditions within the Park section, such as (1) the barren areas and minor rock outcroppings which present little if any growth on these areas, (2) a laurel understory which shuts out all reproduction within several of the chestnut oak stands on the main ridge, (3) severely burned Chestnut Oak type of southwestern aspect on Old Rag Mountain; natural regeneration occurs generally through the types. This is more fully true of the main ridge, which is largely of eastern aspect, than of Old Rag Mountain, a large portion of which is of drier south and western exposure. The fires which have swept over Old Rag, together with cutting operations, have seriously reduced the percent occurrence of the previously dominant species. This is especially so in the younger Chestnut Oak types where locust and sassafras dominate the new stands. Excellent pitch pine reproduction is coming in beneath the badly burned stands of this type.

FIRE HAZARD

The burned slopes of Old Rag Mountain present some very hazardous conditions. Throughout the new growth the natural suppression of species along with the fire-killed material including chestnut sprouts and falling trees combine to create highly inflammable conditions. Former woods operations, particularly the tan bark cuttings in which the chestnut oak trees were left stripped, create local conditions both on Old Rag and on the main ridge. Density of laurel in the Chestnut Oak type of the main ridge materially increases the hazard and makes penetrability difficult. The general cone-like structure of Old Rag, its relative isolation from the Park proper (three-fourths of its base is bordered by private lands), and relative inaccessibility of its interior combine to give the mountain a high fire risk.

INSECTS AND DISEASES

The more common insect infestations of the Park, such as the locust borer and the locust leaf miner, are likewise common in the Park section. The gall aphid, *Chermes Abietes*, was observed attacking young red spruce in the vicinity of the Limberlost in White Oak Canyon, creating a grazed effect to the trees. Sporadic occurrences of the fall webworm have been seen on wild black cherry. White pine at Spitler Hill has been severely attacked by the white pine blister rust.

COMMENTS

Old Rag Mountain is as fascinating close at hand as it is spectacular from a distance. On its summit are found numerous interesting rock formations and an association of plants unlike that found elsewhere in the Park. Among the less common plants found here are sweet fern, largetooth aspen, crack willow, pussy willow, and fire cherry. Papaw is found on the lower western slope, and cucumber magnolia is common throughout Weakley Hollow. Paulonia was observed in Ragged Run. The streams of the main ridge, notably White Oak Canyon, are well known for their waterfalls and cascades. A huge tulip poplar, measuring eight feet d.b.h. and almost one hundred feet in height, was observed in the small cove just west of Old Rag.

PARK SECTION IX

Extending from

Hawksbill Mountain South to Bearfence Mountain, West Side

GENERAL

Park Section IX includes that portion of the western side of the Blue Ridge extending from Hawksbill Mountain on the north to Bearfence Mountain on the south and includes the arm-like projection which takes in portions of Long Ridge, Devils Tanyard, and Fultz and Stony Runs. Within this area are found a diversity of physiographic and ecological features. The main ridge, underlain by Catoclin greenstone, supports a forest cover predominantly Red Oak on the more rugged locations, while expansive open, formerly pastured areas cleared by man occupy the more gentle slopes. Chestnut Oak dominates the western edge of the above greenstone base and the succeeding granodiorite, quartzite, and shale formations whose longitudinal axis crosses the projective part of the Park section at right angles. Here again, as in preceding and in succeeding Park sections underlain by the above formations, the dryland types, Chestnut Oak, Pitch Pine, Bear Oak, and Scarlet Oak, are dominant. Severe fires and repeated cuttings have kept many stands within the lower age brackets and have disturbed the composition of reproductive cover.

HISTORY

Thousands of acres of the more gentle upland portion of the Park section, having been cleared by man and used for generations as pasture, are reverting to a wooded condition at a rapid rate. Other minor open areas found about the former farmsteads are rapidly restocking. Before the blight, chestnut was a principal species on the gentler, more fertile slopes of the main ridge. Probably reaching its maximum position in the Park in this and adjoining Park Section X, the species was favored for its fruit by natives as an important source of income. The wooded portion has been extensively cut and burned. The forested area adjoining the large opens on the main ridge and the Long Ridge and Powell Mountain extensions, has been heavily cut for all types of material up to within recent years. The last major cutting is reported to have been in the vicinity of Lewis Spring and occurred about 1928 following a burn. White pine, as evidenced by remnant stumps, was at one time plentiful through this section. There remains a light scattering on the more inaccessible slopes. In the Fultz and Stony Run country fires have overlapped cuttings to such an extent that most of the cover is in poor condition. The year 1930 was a disastrous fire year in that all but the more protected areas were severely burned. Of these, upper Stony Run probably contains the better wooded stand

in this vicinity. Several other severe fires have occurred since, only the larger of which are shown on the accompanying map. On the main ridge the Blackrock - Franklin Cliff fire of 1930 destroyed most of the younger and damaged the older growth. Smaller and less severe fires ranged over Powell Mountain in 1930, 1934, and 1937.

TYPES AND ASSOCIATED SPECIES

Red Oak: Red Oak is the principal cover on the ragged upper slopes. Found here in relatively pure stands, its associate species include pignut hickory, black locust, basswood, black birch, witch hazel, hop-hornbeam, striped and sugar maples, and white ash. White oak forms an important associate on the upland flats in the vicinity of Blackrock, while on the lower portions of south and west aspect chestnut oak is prevalent. Black locust has been favored in the new growth following burns and cuttings, similarly hickory and black gum, which were left untouched by lumbermen. White pine remains an associate on less accessible locations. Isolated stands of the type located on the branches of Naked Creek have a more even distribution of oaks.

Chestnut Oak: Chestnut Oak is the predominant type off the main ridge. It blankets the rough outlying ridges and extends well up south and west exposures of the main ridge. The type is found purest on northern aspects tending to Bear Oak on ridge crests, where such additional associates as pitch, virginia, table mountain pine and locust are common. In intervening draws of similar aspect, red oak is common, also black birch, black gum, basswood, red maple, and butternut. Remnant white pine dot the upper slopes. On other exposures, particularly southern, there is a greater percentage of subordinate species in pignut hickory, black locust, virginia, pitch, and table mountain pines, blackjack, bear, and scarlet oaks, black gum, and sassafras. The type tends to Scarlet Oak at lower elevations.

Scarlet Oak: Stands of Scarlet Oak extend along the streams of the lower country and well up on south and southeastern slopes. The numerous associates include chestnut and white oak, pitch pine, pignut hickory, black locust, red maple, virginia pine, blackjack oak, black gum, table mountain pine, flowering dogwood, black oak, white and short-leaf pine, red oak, and sycamore.

Pitch Pine: Pitch Pine dominates the extreme western face of the Park section where the pine forms a general overstory to a blackjack oak undercover. On other aspects composition may change by the substitution of bear oak in the understory, or, as is the case in the irregularly shaped stand on the steep, rocky southern slope of middle Fultz Run, blackjack oak is predominant over pitch pine. Other species are table mountain, virginia, and some shortleaf pines, bear and chestnut oaks. On several of the harder burned slopes of Fultz and Stony Runs where the pine has been killed, bear oak has succeeded the pine.

Bear Oak: The Bear Oak type occupies less rough exposures of shale base. Associate species include chestnut oak, pitch pine, black-jack oak, and mountain laurel. Fire has definitely favored Bear Oak at the expense of Pitch Pine and Chestnut Oak types in Fultz and Stony Runs.

Cove Hardwoods: Cove Hardwood stands are confined to headwaters of streams arising in the main ridge. Representative species are basswood, white ash, sugar maple, black and yellow birch, red oak, and hemlock.

White Pine: The sole stand of White Pine is practically pure, having Cove Hardwood species as minor associates.

Black Locust: Black Locust has asserted itself on several restocking areas northwest of Franklin Cliffs. Less pure in composition than stands of the type in other Park sections, it has among its associates sassafras, flowering dogwood, red maple, chestnut, and red and scarlet oaks.

Gray Birch: A small portion of the Gray Birch stand located at Big Meadows (Park Section X) extends into this Park section.

Open - Grassland: The extensive open, formerly pastured land of the main ridge which is still grassland or in initial stage of succession comprises this type.

Open - Restocking: Crataegus, black locust, gooseberry, hazelnut, black birch, red maple, and butternut are the more typical of the initial species restocking former pasture land on the crest of the Blue Ridge. Other species found here and on other minor restocking areas are witch hazel, hickories, flowering dogwood, smooth sumac, white and red oak, white pine, ailanthus, sassafras, chokecherry, and gray birch (at Big Meadows).

Open - Cultivated: The large open - cultivated area on Naked Creek (Harris Cove) had been cultivated up to within a year of time of mapping.

Barren: The rugged Franklin Cliffs on which there is a meagre vegetative cover represents the type.

REPRODUCTION

New growth within the extremely variable forest cover of the Park section as produced by fire and cutting presents probable ecological changes. In the Fultz Run, Stony Run country following severe burns there are indications of a change in composition: Pitch Pine and Bear Oak have benefited at one another's expense and also at the expense

of Chestnut Oak and other hardwood types killed back or retarded by fire. Following the fire of 1930 below Blackrock and Franklin Cliffs, there is a decided increase in the amount of black locust and sassafras.

FIRE HAZARD

Bear Oak presents a common fire hazard wherever stands of the type are found. In Stony Run hazardous conditions exist over much of the watershed, being particularly high on eastern aspects and flatter portions of ridges of the Chestnut Oak and Scarlet Oak types where fire-killed debris is in a hanging position. In Fultz Run, fire-killed debris presents a hazard particularly in the Chestnut Oak type of northern aspects. Bracken (*Pteridium aquilinum*) presents a serious hazard through the lower portions of this and adjoining watersheds. Within the burn of 1930 north of Blackrock fire-killed debris and subsequent reproduction, including chestnut sprouts, masses of grape vines, briars, and other brushy growth materially increase the hazard. The dense, brushy cover replacing the upland pasture fields is not only transforming them from areas of insignificant hazard to areas of temporarily high hazard, but is making accessibility more difficult. At the present time the Fultz, Stony Run country is one of the most inaccessible areas of the Park. Fire records, substantiated by proximity of the railroad and illegal liquor manufacture, label it as an area of high to extreme risk.

INSECTS AND DISEASES

The expansive open areas of restocking species favor the attacks of certain insects and forest tree diseases. *Nectria* on black birch and the white pine weevil are examples noted. White pine blister rust, prevalent at the northern end of this Park section on Hawksbill Mountain, has been noted as far south as Bootens Gap. Berkeley Oak Twig Blight, *Sphaeropsis malorum*, on chestnut oak, was observed on the Gordonsville Turnpike below Franklin Cliffs. A shelf fungus, *Fomes* sp., was found to be quite prevalent on a variety of fire-damaged trees below Blackrock. Locust borer and locust leaf miner are of course prevalent wherever black locust occurs.

COMMENTS

Overgrown pits indicate prospective mineral ventures in the western portion of the Park section, probably for iron and manganese. Relative isolation of this same section has favored the manufacture of illegal liquor. Several old charcoal pits were encountered in the section. Several attractive though small waterfalls were observed in the East Branch of Naked Creek and near Peters Point. Isolated individuals or groups of gray birch (from the stand at Big Meadows) were observed on the west side of Devils Tanyard and in Fultz Run.

PARK SECTION X

Extending from

Hawksbill Mountain South to Hazeltop, East Side

GENERAL

Park Section X, lying in the geographical center of the Park area, is representative of the eastern slope of the Blue Ridge as found within the Park. The rounded slopes, although extensively exploited, retain large and excellent stands, and the streams are among the most picturesque and typical of the Park area. The depletion of american chestnut has left a gap in the present forest cover not likely to be completely refilled for some time, particularly at the higher elevations. The stony but fertile slopes of the main ridge probably explain the development of this area for grazing rather than for other uses.

HISTORY

As stated in the description of adjacent Park Section IX, chestnut formerly occupied a predominant position in the forest cover and probably attained maximum occurrence in these Park sections. As in Park Section IX, the extensive man-made open areas of the main ridge are reverting to forest. There are several formerly open areas which are now completely reforested by successional types. Thousands of feet of lumber have been removed from the Park section, most of it previous to 1920. The portion extending southeastward from the Sag, having been acquired more recently (1937) than the remainder of the Park section, has experienced more recent cutting, grazing, and other use than the main ridge. This Park section has not been subject to any major fires of recent date, other than the two burns shown. The 1936 burn at Fishers Gap was severe enough to cause change in species composition. Other minor fires have occurred on Stony Mountain (about 1929) and near McDaniel Hollow (in 1932), the latter causing a complete change of type from Oak to a dense stand of Black Birch.

TYPES AND ASSOCIATED SPECIES

Red Oak: Persistent chestnut sprouts continue as a major associate of the Red Oak type on the high flats and fertile slopes. These sprouts at times constitute more than 80 percent of the poorly formed and stunted stands of the higher elevations. Red oak is found purest on the steeper, rugged slopes in association with black birch, striped and red maple, and witch hazel. White oak is a common associate on gentler aspects. White ash and basswood are common on north and east aspects, where the Red Oak and Cove Hardwood types often run well together. On Hawksbill Mountain at the extreme north end of the Park section, the rare Blue Ridge fir with red oak is found as a subtype.

Chestnut Oak: Chestnut Oak occurs in unusually pure stands in the Park section, often comprising 80 and sometimes 90 percent of the dominant cover. Before the blight, chestnut seems to have been the chief associate if not the dominant species on the better sites, but with its passing, laurel has assumed the codominant position. Occurring in dense, impenetrable layers beneath the chestnut oak overstory, sometimes towering over a man's head and in one instance below Bear Church Rock attaining a height of 18 feet, the laurel has a preference for exposures other than eastern. Beneath this dense understory there is little if any other plant growth, and decomposition is correspondingly slow. Through many of the older stands in which laurel is the ground cover there is a conspicuous absence of tree life in the 1-20 and 21-40 age classes. One would gather that with the death of the chestnut, the laurel immediately sprang into position and thereby shut out subsequent normal reproduction. Minor associate species of the type include red oak, red maple, locust, black birch, black gum, white pine, and scarlet oak.

Cove Hardwood: At Laurel Prong, black and yellow birch, 1-20 and 21-40, predominate where, it is believed, chestnut formerly was the principal species. Much of the dead chestnut remains in comparatively sound state of preservation. The Cove Hardwood and Red Oak types run well together on the east slope of Hazeltop where the birches, white ash, basswood, red oak, and witch hazel are common species to both types, but on the east side of Laurel Prong the type differentiations are more clear-cut. Hemlock is prevalent along the more sluggish portions of the stream and is found as a pure subtype just northwest of The Sag and again in upper Staunton River to the southeast of The Sag, though under slightly different conditions. The birches, chestnut, white ash, red maple, and laurel are common associates, and in swampy locations ground hemlock and several varieties of mosses and ferns are commonly found covering the matted tree roots, rocks, and fallen logs. Laurel Prong is the only place within the Park where *Rhododendron maximum* is found to any extent. The Cove Hardwood types found along other streams are much the same as the type in other Park sections. In addition to the aforementioned species, tulip, butternut, striped maple, bitternut hickory, hornbeam, blue beech, sycamore, spicebush, and magnolia are also found.

White Pine: The lone stand of the type occupies a slope, much of which was formerly open and grazed. Associate species are white ash, juniper, black birch, virginia pine, butternut, red and white oak, and flowering dogwood.

Black Locust: The stands of Black Locust along the lower Rapidan River are quite pure, having for the most part claimed former open areas. Minor species are chestnut oak, flowering dogwood, and tulip poplar.

Gray Birch: A pure stand of Gray Birch is found in a swampy depression at Big Meadows, elevation 3500 feet. Minor associates are crataegus, pitch and white pines, and hazelnut.

Open - Restocking: The more frequent of the species restocking the upland formerly pastured fields are crataegus, black birch, white oak, locust, smooth and staghorn sumac, red maple, red oak, butternut, gray birch, alder, and gooseberry. Additional species found on the lower areas are virginia pine, persimmon, sassafras, juniper, white a and pitch pines, tulip poplar, ailanthus, sycamore, and flowering dogwood.

Open - Grassland: Fields slower in restocking by natural regeneration comprise the type. Some of these are being kept open artificially.

REPRODUCTION

Throughout hundreds of acres of dense laurel understory there is little or no reproduction. Hemlock and occasionally white pine are coming through near streams, the former in excellent stands. The opening of the forest through the death of the chestnut, through cuttings, and as a result of fire has favored a marked increase of black birch, locust, red maple, and black gum.

FIRE HAZARD

Chestnut and mountain laurel present a general fire hazard. The stunted, twisted chestnut of the ridge tops, which appears to sprout more prolifically, creates a more serious condition than the sound, straight-boled chestnut of the lower slopes. The fallen chestnut is often prevented from reaching the ground by laurel thickets, thereby increasing the fire hazard and resistance to control. Special hazardous areas are: (1) Fire of 1936 east of Fishers Gap because of dense, tangled growth of locust, briars, and fallen and broken fire-killed trees. (2) Lower Rose River following heavy cutting of hemlock and oak and subsequent hemlock reproduction. (3) Upper Hogcamp Branch near Dark Hollow Falls due to dense hanging fire-killed debris. The restocking open areas present a more hazardous condition than either the open or open woodland condition.

INSECTS AND DISEASES

Hawksbill (Heywood) Mountain is the site of severe white pine blister rust infection. Fire-damaged trees at Fishers Gap are being severely attacked by fungus. Nectria is common on sleet-damaged black birch on the crest of the Blue Ridge.

COMMENTS

The Gordonsville Turnpike (Rose River Road) is of particular historic interest, for this was one of the earlier means of access to the Shenandoah Valley.

The President's Camp and Community School for mountaineer children were established by President Hoover.

The site of a railroad used by the West Virginia Lumber Company in logging the lower Staunton River is plainly evident. There remains a portion of a lightly elevated tranway used in the logging of Laurel Prong. Below Fishers Gap on upper Rose River are old copper pits.

Some of the largest oak and chestnut trees to be found in the Park are located here, as well as some of the rarer species in red mulberry, magnolia, and american beech. This is the one area in the Park where *Rhododendron maximum* and canadian yew are found profusely. The stand of gray birch at Big Meadows and Blue Ridge fir on Hawksbill are of ecologic interest.

PARK SECTION XI

Extending from

Hazeltop South to Upper Pocosin Mission, East Side

GENERAL

Park Section XI embraces that portion of the eastern side of the Blue Ridge drained by Conway River. Confined more to the upper ridge, the area has been exploited less than most park sections, and there remain some excellent forests. Chestnut was formerly prevalent through here. The enclosure of mountains on all sides creates an air of solitude about the area.

HISTORY

While there are still large areas of unbroken forest on the higher slopes, certain portions of the park section have been subjected to intensive use. By the time of acquisition most of the openings were farmed out, and nearby slopes had been heavily thinned for local consumption. No extensive cuttings except the removal of chestnut have been made for more than a decade, when the area above Pocosin Mission was heavily thinned. Chestnut, formerly the predominant species in the headwaters of the various streams, has, with the exception of Bush Mountain Stream and upper Conway River, been largely removed. Remnant chestnut on these latter areas is as sound as any left within the Park.

TYPES AND ASSOCIATED SPECIES

Red Oak: Excellent stands of Red Oak are found off the wind-swept crests in Bush Mountain Stream and upper Conway River country. South of Lewis Mountain the stands have been much more widely exploited. In the more heavily thinned flats and slopes above Pocosin Mission, remnant hickories, black birch, and poorly formed oaks are dominant in 1-20 and 21-40 aged stands. Chestnut formerly was predominant on the better sites. Consistent with the Red Oak cover all along the main ridge, the type is purest at the higher elevations.

Chestnut Oak: Chestnut Oak is found relatively pure except in the proximity of stands of Red Oak, where the two species are well mixed. Hickory, locust, and sometimes sassafras and white pine are minor associates in the above mixture. Laurel is a general undercover sometimes reaching large size but seldom occurring in the dense thickets common to other park sections. Black gum and black birch are additional associates, also bear oak and pitch pine on the drier portions of the type. Chestnut was formerly prominent in the type.

Cove Hardwoods: In addition to the several stands shown on the accompanying map, stands of Cove Hardwoods extend along the larger water courses but are too narrow to map. Representative species are hemlock, tulip, basswood, black and yellow birch, white ash, bitternut hickory, and, in the lower country, magnolia.

Bear Oak: The stand of Bear Oak is unique in its position on top of the Blue Ridge. About 50 to 60 percent pure, associate species are pitch pine, laurel, chestnut sprouts, red oak, locust, serviceberry, chestnut oak, sassafras, trembling aspen, and chokecherry.

Black Locust: The lone stand of Black Locust occupies a portion of a former clearing restocking with this species.

White Pine: The stand of White Pine near Shiloh Church is also a former clearing which has restocked chiefly to white pine.

Open - Restocking: Black locust, sassafras, and smooth sumac are the more frequent of the restocking species. Black birch and crataegus are common to the higher ground, while tulip, magnolia, and sycamore are seen on the lower slopes. Other species are persimmon, white pine, flowering dogwood, pignut hickory, and ailanthus.

Open - Grassland: There are several areas which, having been pastured until a more recent date, are still meadows.

REPRODUCTION

Black birch is rapidly filling in openings left by the chestnut at the higher elevations, notably on Lewis Mountain where it has formed several small pure stands. Fair white pine reproduction was seen in upper Conway River beneath a moderately dense laurel cover and on the lower south-facing slope of Pocosin Hollow. Burns have affected an increase in the numbers of black gum, locust, and sassafras.

FIRE HAZARD

Local severe hazards exist on the upper southeast slope of Cliff Mountain because of the mountain laurel, dense reproduction following a burn, and the density of falling and dying suppressed growth, and also on portions of the north slope of Pocosin Hollow because of fire-killed laurel and fallen chestnut. The general distribution of laurel through the Chestnut Oak type and the stand of Bear Oak present areas of higher inflammable conditions as well as more difficult penetration.

INSECTS AND DISEASES

The locust leaf miner was prevalent throughout the park section at the time of typing (1938). Sporadic occurrence of walking stick was observed in Pocosin Hollow.

COMMENTS

Numerous arrowheads and other Indian artifacts have been picked up in the vicinity of Upper Pocosin Mission. A mountain cemetery of some forty or fifty graves, each marked by an unengraved stone or marker, is located in Pocosin Hollow.

Mountain laurel six to eight inches in diameter was observed on the north-facing slope of Pocosin Hollow. Magnolia is prevalent at the lower elevations.

PARK SECTION XII

Extending From

Lewis Mountain South to Spotswood Trail, West Side

GENERAL

Geologic structure again results in two decidedly different site conditions within the same park section. The basic greenstone of the main ridge with but minor variations retains the Red Oak cover characteristic of the Blue Ridge. The Piney and Abrams Mountain projection, underlain by Erwin quartzite and associated formations, presents a much drier type of forest cover represented by the Pitch Pine, Scarlet Oak, and Chestnut Oak types. The park section, with the exception of Piney and Abrams Mountains portion, is less rough and more fertile than most others and has been more intensively used.

HISTORY

General fertility of the land brought about the clearance of many acres for farming purposes and the heavy thinning of adjacent forest to meet the local demands. Large scale demands, chief of which was by the former tannery at Elkton, consumed many feet of chestnut, chestnut oak, and other species from the more remote slopes extending to the mountain top. Abrams and Piney Mountains have been heavily cut and burned. A ravaging fire in 1930 sweeping both mountains was followed in 1932 by another on the south slope of Abrams Mountain. On the main ridge fires have been much less severe.

TYPES AND ASSOCIATED SPECIES

Red Oak: The characteristically pure Red Oak cover of the main ridge continues through the park section, merging well with the Cove Hardwood type off the upper slopes. Black birch, white oak, hickories, witch hazel, and crataegus are associates of the ridge top; basswood, hophornbeam, and striped maple in proximity with the Cove Hardwood type.

Cove Hardwoods: From narrow strips bordering the lower streams, the individual stands broaden out on ascent, fingering well up the numerous draws, and merge with Red Oak. The type is represented by some beautiful stands including sugar, red, and mountain maple, white pine, black locust, tulip poplar, and hemlock (both of these are sparse on the west side of the ridge) and flowering dogwood.

Pitch Pine: The dominant position held by the Pitch Pine on Abrams and Piney Mountains is due in no small part to its surviving the frequent past fires and cuttings at the expense of the hardwoods. Throughout the type, the species more often overtops its hardwood associates in varying degrees of density, creating a mixed age condition. Scarlet and blackjack oaks are the commonest associates, the latter being found on the drier locations sometimes in pure stands. Other species are bear and chestnut oaks, laurel, black gum, locust, and chinquapin. Huckleberries are generally abundant.

Scarlet Oak: Scarlet oak dominates the stream courses of Piney and Abrams Mountains in association with chestnut oak, pitch pine, blackjack, bear, and white oaks, red maple, black gum, serviceberry, and pignut hickory. Young white pine is plentiful along Naked Creek and in Crow Hollow.

Chestnut Oak: The Chestnut Oak type is found under two sets of conditions within the park section. On the main ridge it occurs in broken stands of south and southwestern aspects. Its associates are red oak, laurel, pignut hickory, virginia pine, and red maple. In the Abrams and Piney Mountains section, it occurs on north and north-eastern exposures in close association with scarlet oak. Other species here are bear oak, pitch pine, blackjack oak, and pignut hickory.

Black Locust: In several larger abandoned clearings, black locust has come in to form almost pure stands.

Virginia Pine: Like black locust, the species has taken hold of earlier abandoned fields in pure stands.

Open - Restocking: Clearings not yet claimed by any one type are being rapidly filled in by the following species: Locust, virginia pine, sassafras, smooth sumac, persimmon, pignut hickory, white pine, dogwood, chestnut oak, and ailanthus.

Open - Grassland: Fields which are yet in a grassy condition comprise the type.

REPRODUCTION

Excellent reproduction is found throughout the wooded slopes of the main ridge. Except for the cleared areas, which are rapidly restocking, cuttings or fires have nowhere noticeably retarded reproduction. In portions of the burned Pitch Pine type, black gum, red maple, black locust, and sassafras make up 50 percent of the new growth.

FIRE HAZARD

Severe hazard conditions are encountered in the Piney and Abrams Mountains country within the burned Chestnut and Scarlet Oak types. Fire-killed material is dense, particularly on northern aspects. Clumps of chestnut sprouts, persistent fire-killed lower limbs on living trees, the density and natural suppression of reproduction, and the difficult penetration throughout much of the area further increase the hazard. On the main ridge remnant chestnut, including tops and limbwood left after cuttings, presents local hazard, as do the densely restocking openings.

INSECTS AND DISEASE

The locust borer, prevalent throughout the section, has killed a small stand of locust of several acres on a flat southwest of Field Hollow.

Many fire-damaged chestnut oaks are gradually dying and falling on the north face of Abrams Mountain. The locust leaf miner damage, severe throughout the park section during 1936, 1937, and 1938, has decreased. Recurrent attacks of catalpa sphinx have been observed on a few planted catalpa trees in lower Swift Run.

COMMENTS

Several attractive waterfalls are located in this section. Sheet erosion has been noted on several of the open areas. Cucumber magnolia is common at Swift Run Gap. Several small honey locusts were observed in lower Field Hollow, elevation 1800 feet.

PARK SECTION XIII

Extending From

Upper Pocosin Mission to Swift Run, East Side

GENERAL

Included within the park section are the two isolated parcels at the headwaters of South River and Entry Run. Red Oak cover dominates the rougher terrain, the gentler slopes having been cleared of forest. South River Falls, one of the major waterfalls within the Park, is located here. The Spotswood Trail which crosses this section is of historical interest.

HISTORY

Most of the open areas were farmed out or eroded and were evidencing signs of forest reclamation at the time of government acquisition. As in other park sections, adjacent wooded areas have been repeatedly thinned, while the more remote slopes retain forest cover. There are remains of a former shingle mill above South River Falls which probably removed the heavy stand of chestnut from the north slope of Saddleback Mountain some twenty-five years ago. Chestnut salvage cuttings in the vicinity of Upper Pocosin Mission have continued up to 1939. The only burns noted were on the slope south of South River Falls.

TYPES AND ASSOCIATED SPECIES

Red Oak: From the exposed, uneven-aged stands of the upper slope where red oak comprises at least 75 percent of the cover, the type changes further down to include a greater proportion of hickories (as much as 40 percent), other oaks, white pine, and minor associates. On the north slope of Saddleback Mountain, in the absence of the formerly abundant chestnut a light scattering of remnant oaks and dead chestnut now overtop the young even-aged (1-20 and 21-40) stand of locust, black birch, sassafras, and dense growth of chestnut sprouts. A stand of Red Oak approaching an all-age class exists on the upper south slope of Saddleback Mountain.

Chestnut Oak: The Chestnut Oak type assumes dominance on the drier southern and southwestern aspects. Laurel, always a common associate, exists as a dense understory in the isolated parcels near Entry Run. Other associates are red oak, pignut hickory, black gum, white pine, serviceberry, locust, and dogwood.

Cove Hardwoods: Cove species represented in the area include tulip poplar, basswood, white ash, black and yellow birch, red oak, striped and sugar maple, hemlock, white pine, hornbeam, and such unusual species as umbrella, magnolia, and pawpaw.

Scarlet Oak: An association approaching Scarlet Oak composition characteristic of the western slopes of the Park is found bordering streams on the lower southern slope of Saddleback Mountain near the Park line. Representative species are white, scarlet, chestnut, and red oaks, sycamore, hickory, and minor associates.

Open - Restocking: The numerous open areas reverting to a forest condition are being restocked by a variety of species, most of them temporary in nature. Locust is the most prolific successional species, followed by sassafras, smooth sumac, hickory, persimmon, black birch, crataegus, redbud, witch hazel, ailanthus, wild black cherry, staghorn sumac, virginia and white pines, ash-leafed maple, and tulip poplar.

Open - Grassland: These opens comprise areas artificially maintained as open meadowlands and areas of dense, heavy sod which are more slowly reclaimed by shrub and tree species.

REPRODUCTION

Reproduction within the forested types is generally good. Laurel is possibly obstructing new growth in the Chestnut Oak type. On the north slope of Saddleback Mountain following the removal of the once abundant chestnut, a thick young stand of chestnut sprouts, locust, black birch, and sassafras together with red oak sprouts make up the new growth.

FIRE HAZARD

Fire hazard for the section is moderate. The dense new growth on the north slope of Saddleback Mountain, mentioned above, and on the restocking areas constitute the greatest hazard. Except for the spotty distribution of the remaining large chestnut, most of the hazard from this source has been materially reduced by extensive fire hazard reduction work and other cutting measures in this area.

INSECTS AND DISEASES

No significant insect or plant disease damage was observed other than the widespread locust borer and leaf miner. Heavy winter breakage in the lower coves creates conditions favorable for future attacks.

COMMENTS

This is one of the few areas within the Park where cucumber magnolia is found to any extent.

PARK SECTION XIV

Extending From

Swift Run Gap to Simmons Gap

GENERAL

South of Swift Run Gap, the Park narrows to a strip a mile or two wide on the main ridge as far south as Simmons Gap. To the west a long ridge projects northeast of Rocky Mount, joining the main ridge south of Simmons Gap. These two portions comprise Park Section XIV. The projection, underlain by dolomite, quartzite, and shales, is covered by the dry forest types, whereas the main ridge, with its base of greenstone, is represented by the fresher types more characteristic of the high ridge. History of the area has varied with the physical features.

HISTORY

The fertile main ridge has been much more intensively used as indicated by the heterogeneity of the types on the accompanying map. Nearly half of the area was cleared for pasture or farming. Adjacent woodland supplied timber requirements by continuous heavy thinnings. The soil has been lost from many of these open or overcut slopes and limited sheet erosion has set in in places. Chestnut was formerly common to abundant throughout the ridge. Fires have played an important role in the recent history of the adjoining ridge, the last major burn being in 1930. They have materially reduced any extensive cuttings in the last three or four decades.

TYPES AND ASSOCIATED SPECIES

Red Oak: The broken wooded stands of the main ridge are essentially Red Oak. Type composition varies with the site, and the purer types are found on the upper slopes. On north slopes black birch, basswood, striped maple, hophornbeam, and witch hazel are common, while on south or west slopes chestnut oak and hickories hold codominant positions. The passing of the chestnut, formerly abundant in the type, and heavy thinnings have left significant openings in the stands.

Chestnut Oak: The Chestnut Oak type dominates the western projection on the rougher slopes of quartzite base. Talus slides are numerous. Associates run to the drier type species with pignut hickory often predominant along the ridge crests. The broken, heavily thinned stands of the main ridge include associates common to this area, notably black birch.

Scarlet Oak: Dense young stands of Scarlet Oak occupy the moister sites of the western side ridge in mixture with other oaks, pines, hickory, dogwood, black gum, and locust. White pine is common in lower Hawksbill Creek.

Pitch Pine: Pitch Pine dominates the dry western faces fronting the valley in even and mixed aged stands. It more often forms broken overstories of one or several age classes older than the young understory which consists of blackjack, bear, scarlet, and chestnut oaks, laurel, chestnut, and black gum.

Cove Hardwoods: Broken stands of Cove Hardwoods occupy the deeper wooded draws of the main ridge. The large 1-20 area at the foot of Swift Run, east, was mostly open pasture before the present stand of alder, spicebush, black and yellow birch, blue beech, etc., came in. A near all-age stand exists near Simmons Gap Mission. *Magnolia tripetala* is prevalent through the type.

Bear Oak: Dense stands of Bear Oak occupy the drier aspects of shale base along upper Hawksbill Creek.

Virginia Pine: On lower Hawksbill Creek at the Park boundary a small stand of virginia pine, 1-20, with intermixed white pine has claimed a former field.

Black Locust: Several formerly open areas are now dense stands of Black Locust, 1-20.

Open - Restocking: The numerous restocking areas of the main ridge are rapidly being claimed by locust, smooth sumac, sassafras, persimmon, virginia pine, hickories, oaks, crataegus, butternut, red maple, dogwood, and red cedar.

Open - Grassland: Many of the open areas at the time of mapping (1938) were still largely meadowland.

REPRODUCTION

Sprout reproduction is good throughout the wooded types on burned and unburned slopes. Gaps left by the death of the chestnut, cutting, and to some extent grazing, in the sooded stands of the main ridge are slower to fill in, and it will probably be some time before the vacancies created where chestnut was densest, as on Flattop and Hightop, are completely restocked. Eroded slopes are retarding reproduction of seed origin.

FIRE HAZARD

The density of reproduction presents a greater hazard through the drier types on the western ridge projection than fire-killed material. Only on the ridge flats and certain northeastern exposures is there significant debris. Chestnut hazard on the main ridge has greatly been reduced by fire hazard reduction and wood salvage work. The most serious existing hazard lies on the northeastern flat of Hightop in the abundance of chestnut and chestnut sprouts.

INSECTS AND DISEASE

No insects or pathological observations of note were found beyond normal occurrences.

COMMENTS

Hawksbill Creek at its source flows in the clift between the Unicoi quartzite to the east and Hampton shale to the west. *Magnolia tripetala* is found scattered over the lower portions of the main ridge.

PARK SECTION XV

Extending From

Rocky Mountain South to Austin Mountain, Western Side

GENERAL

Big Run, one of the major streams of the Park, and adjacent watersheds lying on the western side of the Blue Ridge comprise the park section. This rugged expanse is characterized by steep, rambly side ridges engulfing V-shaped hollows. The general sharpness of the terrain, rock outcrops, and talus slopes interrupt an otherwise unbroken forest. The forest cover, made up almost entirely of the drier forest types of which Chestnut Oak predominates, has been greatly affected by ravaging fires.

HISTORY

The severe fires of 1930 sweeping almost the entire park section did considerable damage to the forest resources of the area. As a result, much history has been lost. The area, unsuited to intensive use, has been but little developed. Old ore pits at the mouths of Lower Lewis and Big Runs indicate minor mining activity. Several widely scattered home sites and log shelters formerly used during the transporting of cattle on and off Big Flat Mountain are the only indications of habitation. Years of profitable grazing have been practiced on Big Flat Mountain. Trails, now mostly overgrown and washed, lead up the larger streams, and it is known that the area has been heavily fished, trapped, and hunted, as the present dearth in wild life indicates. Old fire-scarred stumps indicate past logging operations, although there is an absence of mill sites within the area. It may have been that most of the timber was hauled out of the Park to be processed as was the chestnut oak bark.

TYPES AND ASSOCIATED SPECIES

Chestnut Oak: Chestnut Oak is the major cover type of the park section. From the ridge crests the type extends well down the rocky draws and rough side ridges, reaching its best stand development on the slopes of north and east aspect, giving way to the drier forest types on the barren south and west exposures. In the better stands where the burns have been much less severe, chestnut oak is more than 80 percent pure in uneven association with red oak; black birch, scarlet oak, striped maple, black locust, and white pine. On the drier sites when the break in topography is not too abrupt the type fuses

well into the Scarlet Oak, Pitch Pine, and Bear Oak types. Pignut hickory is a common associate along the ridge crests. In the rocky draws so characteristic of this country, too rugged to be burned appreciably, scant, veteran, weather-beaten chestnut oaks and black birch are the only cover.

Scarlet Oak: Scarlet Oak dominates the flatter, lower slopes in 1-20 aged stands, fingering up the draws and extending for considerable length along the broader stream valleys usually in mixed aged stands. The type ties in well with the Chestnut Oak and Pitch Pine types, breaking off into stands predominantly blackjack oak on the more exposed sites. The soil on which the type occurs is largely shale. In the open stands representative species are scarlet, chestnut, blackjack, and bear oak, pignut hickory, pitch pine, white oak, chestnut sprouts, black gum, red maple, chinquapin, laurel, and huckleberries. Along the streams white oak is more often the dominant species; red oak, virginia pine, and hemlock are sparsely present. Shortleaf pine and post oak are sporadically found on the lower western face.

Pitch Pine: Slopes of south and west aspect and especially those fronting the valley are predominantly Pitch Pine. Underlain by dolomitic and quartzite formations, the topography is characteristically rough to rugged, the soil is thin and porous, and the site is exposed and arid. The pine has gained position by having survived fires and cuttings at the expense of hardwoods, creating more or less mixed aged stands with the pine topping subsequent hardwood reproduction in varying degrees of density. Blackjack oak is the most prominent of the associate species sometimes found in small pure stands. Other associates are scarlet, bear, and chestnut oaks, laurel, black gum, locust, and chinquapin.

Bear Oak: Stands of Bear Oak are prevalent through the central portion of the park section on southern slopes underlain by Hampton shale. Generally pure in composition, associates of the type are chestnut oak, pitch pine, scarlet and blackjack oak, and table mountain and white pines.

Red Oak: In the southern corner of the park section a portion of the Red Oak type, characteristic of the main ridge, extends downward off Big Flat Mountain. This area is underlain with Unicoi quartzite. In descent the type changes rapidly from a nearly pure Red Oak cover through an association with chestnut oak and then hickory to a fusion with the Scarlet Oak type extending up the Big Run bottom land and representative Cove Hardwood species found along the upper stream courses.

Cove Hardwoods: Off Big Flat Mountain in the upper regions of Big Run (Eppert Hollow) lies the only stand of Cove Hardwood in the Park section. Representative species of the type, which include basswood, tulip poplar, white pine, hemlock, red oak, sugar maple, black and yellow birch, extend for some distance down the hollow.

REPRODUCTION

The severe fires which have burned through the park section have definitely retarded subsequent reproductive growth on many areas but seem to have improved that on others. On some of the slopes the reproduction is scant and slow-growing, while on others it is dense and vigorous. There seems to be an increase in the percentage of locust, sassafras, and such species. Chestnut has been eliminated from the cover through numerous areas as a result of fires, the sprouts having been killed back for the last time.

FIRE HAZARD

All factors considered, conditions are such within the park section as to make the fire hazard for this area one of the highest in the Park. Dense growing stock on the lower northwestern faces including bracken, laurel, huckleberries, sprout oak, and pine together with varying amounts of debris create a high fuel content. Fire-killed material in the form of hanging and tangled masses is greater on slopes of north aspect, usually in the Chestnut Oak type.

INSECTS AND DISEASES

The burned stands are subject to severe fungus attacks on both living and dead trees and to wind throw and breakage. Damage to pitch pine by what is believed to be the red turpentine beetle, *Dendroctonus valens*, has been noted to a small extent on open grown trees. Pignut hickory along the ridge crests is being attacked by the hickory bark beetle, *Scolytus quadrispinosus*.

COMMENTS

Perhaps the most outstanding feature of the area is the topography. It has a certain vastness and ruggedness unlike any other section of the Park. Deep Run is one of the few places in the Park where *Rhododendron maximum* is found.

PARK SECTION XVI

Extending From

Simmons Gap South to Browns Gap, East Side

GENERAL

The park section includes the Ivy Creek watershed and Loft and Big Flat Mountains. The fertile, mountaintop flats, cleared of their forest cover in generations past, have afforded excellent grazing lands for hundreds of head of cattle up to the time of Park acquisition. Red Oak is the chief cover type of the forested slopes.

HISTORY

The large acreages converted from forest to pasture are now being reclaimed by the forest. Little cutting has been done for two or three decades except for the salvage removal of dead chestnut, once plentiful on the upper slopes, and local thinnings. As a result, good wooded stands remain on unburned portions, particularly in the headwaters where limited large, veteran trees occur in near virgin conditions. The widespread fires of 1930 extended into the park section in upper Ivy creek and Doyles River burning clear most of the area covered. The fire on the lower eastern slope, though not of uniform severity, did intensive damage on exposed locations.

TYPES AND ASSOCIATED SPECIES

Red Oak: Hickories (and formerly chestnut) form important associates in the upper stands of the type. On lower, sunnier slopes chestnut oak, white pine, and white oak are leading associates. In some of the upland eastern draws the trees reach large, overmature size, forming in association with Cove Hardwoods excellent stands of wooded growth. Basswood, white oak, and black birch replace the above species on more northern aspects. On the lower eastern, commonly very steep slopes rock outcroppings are numerous on which are found such growth as redbud, juniper, white ash, pasture rose, and virginia pine. The soil is generally thin on these lower slopes.

Cove Hardwoods: Some beautiful and excellent stands of the type occur in the park section including a variety of species, the more representative ones being basswood, tulip poplar, white ash, red oak, shagbark, mockernut and bitternut hickories, hemlock, hophornbeam, butternut, black and yellow birch, and sugar maple. Less common species are slippery elm, magnolia, and papaw. In upper Ivy Creek there is a small, near virgin stand of hemlock.

Chestnut Oak: Following the fires of 1930 and 1934 the stands in upper Ivy Creek are resprouting to almost pure Chestnut Oak. Associate species here are mountain laurel, chestnut sprouts, bear oak, black birch, pitch pine, black gum, and red maple. Most of the fertile topsoil on this area has been lost. Other stands on the south slopes of Loft Mountain too have been burned, though not so disasterously. Most of the understory and some of the overstory was destroyed. Wind throw is common within these burned sections. New Jersey tea is found in abundance.

White Pine: The several White Pine stands of the park section are all found on south exposures on thin, rocky soil. Red and chestnut oaks and pignut hickory are principal associates with flowering dogwood and hemlock found in fewer numbers. The largest area in Rocky Bar Hollow was swept by fire in 1930, scorching many of the 41-60 aged pine and killing most of the understory. Large sections of this burn are restocking to locust.

Bear Oak: The Bear Oak stand in upper Ivy Creek is pure with chestnut oak and pitch pine associates.

Open - Restocking: The formerly pastured lands are in various stages of restocking. Several areas still classed as Open - Grassland are showing first signs of reclamation by the presence of scattered individuals or clumps. Other areas have been reclaimed by pure stands of locust, persimmon, and virginia pine. Intermediate areas usually contain a wide range of brush and tree species, of which the following are common in addition to the above named: Smooth sumac, flowering dogwood, red cedar, sassafras, ailanthus, crataegus, butternut, and sweet cherry.

Open - Grassland: The more recently grazed areas, particularly the larger ones on the mountain tops, are slower in restocking and were at the time of typing (1939) in a grassland state.

Black Locust: Dense young stands of pure black locust are to be found on formerly grazed lands.

REPRODUCTION

Grazing which had extended from the open into adjacent wooded areas has caused a deficiency in the younger age classes in these forested stands. New growth is generally poor on the burned sites, except in stands of sprout oaks and hickories. White pine and hemlock reproduction is doing very well on numerous areas.

FIRE HAZARD

Forest reclamation of the large areas of former pasture fields presents changing hazardous conditions from the time a field become closed with new growth until the forested stand is well established. At the present time those areas of black locust are probably of highest hazard. The chestnut hazard has largely been taken care of by fire hazard reduction work, wood salvage, or by natural means. Conditions are moderate for the remainder of the park section.

INSECTS AND DISEASES

The burned stands are subject to heavy fungus attacks and wind and sleet damage. Cedar apple rust is generally distributed on eastern red cedar. White pine blister rust control work is maintained on all of the pine areas.

COMMENTS

The clift between the Unicoi and Hampton rock formations is clearly indicated in upper Ivy Creek. The formations distinctly divide the Chestnut Oak and Red Oak types. Numerous springs are found through the park section.

PARK SECTION XVII

Extending From

Browns Gap to Blackrock Gap, Both Sides of Ridge

GENERAL

Park Section XVII includes portions on both sides of the Blue Ridge by enveloping Madison and Paine Runs and intervening watersheds on the west and most of Doyles River on the east. Physiographical influences are not as diverse as would seem between the east and west sides of the ridge, inasmuch as the rock formations supporting the drier forest types extend well over on the east side with little change in cover composition. The western side of the ridge is very rough through the central portion with frequent barren areas and rock slides but flattens out to include some gentle, sloped low land. Frequent fires and cutting have reduced most of the wooded slopes to young stands which predominate the park section.

HISTORY

The area has been burned repeatedly up through the year 1930. The fires overlapped and burned with such varying intensities that delineation of burned areas proved extremely difficult. Other small fires have occurred since. The park section has been heavily cut over with the result that new growth is predominant, and remnant stands are found only on the most remote slopes. Comparatively recent lumbering operations removed most of the merchantable material from Madison and White Oak Runs (about 1930) and from Doyles River and upper Cedar Mountain several years before this area was burned (about 1926). On the latter area much of the hemlock and hickory was left. The country is too rugged and infertile to have encouraged development beyond a few former homesteads, fields cleared for pasture, and cultivated plots in the Browns Gap, Via Gap environs.

TYPES AND ASSOCIATED SPECIES

Chestnut Oak: Chestnut Oak is the major cover type of the park section, extending well down the side ridges, particularly on north aspects. In composition the type varies somewhat between the upper and lower elevations, being found purest on the better sites. Along the western ridge crest the chestnut oak, in mixture with red oak, black birch, white and pitch pines, and lesser species, is mostly remnant and poorly formed, while at lower elevations the age classes are young and in proximity with more types associate species are numerous. On Cedar Mountain and the upper southeastern slope of Trayfoot Mountain hickory and chestnut oak predominate. The removal of quantities of

chestnut oak and chestnut off the upper slope of Cedar Mountain has favored the hickory and caused a serious depletion in the overstory. Chestnut was formerly profuse, and the remnant stock is falling rapidly.

Scarlet Oak: Scarlet Oak is found along the broader stream courses and lower gentle slopes on the western side of the park section. In the better portions of the type white oak is dominant, blackjack oak occasionally assuming dominance over small areas on poorer sites. Of the numerous other associates, chestnut oak, laurel, bear oak, pitch pine, black gum, pignut hickory, locust, red maple, red oak, and chinquapin are the most common. Other species encountered are post oak, black oak, and shortleaf pine.

Pitch Pine: Pitch Pine dominates the dry western ridge faces. In mixture with hardwoods, the pine frequently forms a pure overstory through having survived past cuttings or fires. As in the Scarlet Oak type, blackjack oak occasionally assumes dominance over small areas on the poorer sites. Bear oak and laurel are the more common associates, followed by chestnut oak, blackjack oak, scarlet oak, virginia pine, table mountain pine, and black gum.

Bear Oak: Bear Oak like Pitch Pine is found on the drier west and southwest exposures. It is confined more to the main ridge, probably adhering to the Hampton shale formation. It is found in mixture with pitch pine, chestnut oak, blackjack and scarlet oaks, chestnut sprouts, locust, table mountain pine, laurel, and black gum.

Cove Hardwoods: The Cove Hardwood type within the park section is limited to Doyle's River. Having been heavily cut over about two decades ago and then burned shortly afterward, remnant hemlock, hickories, and unmerchantable Cove Hardwood species make up the overstory. In addition to the prevailing species of the type, sugar maple is common, and black birch and sassafras are coming in freely in the understory. Along the streams in the steep-sided hollows of the western slope are found the following cove species: Black birch, basswood, sycamore, black gum, white pine, hemlock, and a few tulip.

Red Oak: In the limited stands of Red Oak on the eastern side of the ridge hickories, shagbark, mockernut, and pignut make up a large portion of the type and at times are predominant. Chestnut and white oaks and white pine are also found.

Open - Restocking: The former pasture fields, orchards, and limited garden plots of the park section are restocking with locust, sumac, red cedar, sassafras, persimmon, and numerous other species. Red cedar forms small pure groups in places. In Dundo Hollow several acres of eroded slopes have been treated.

Barren: Through the park section are scattered barren areas bearing little or no cover because of the extreme rockiness.

REPRODUCTION

Throughout the oak and pine stands the present cover is generally reproducing satisfactorily, with a possible increase in the amount of locust and sassafras. Beneath the depleted overstory of upper Cedar Mountain dense stands of locust is the chief reproduction. After the cutting in lower Doyles River black birch is coming in profusely, and reproduction of oak, hickory, and sugar maple is good.

FIRE HAZARD

The worst areas of the park section have been treated. Remaining hazardous conditions exist in the densely stocked areas of new growth in remote areas. The low lying extension of the park section between Miller and Stull Runs is an area of possible high risk, considering its position and the fact that a county road passes through it.

INSECTS AND DISEASES

Insect and tree disease damage is insignificant within the section.

COMMENTS

The remains of an old iron furnace is located in lower Madison Run, and charcoal pit sites have been seen farther up the valley. Attractive waterfalls and cascades are to be found in Doyles River, upper White Oak Run, and on the east side of Cedar Mountain. Black-rock Springs is the site of a former hotel and spa. This country was famous for its quantities of illegal liquor, and old abandoned still sites are evident. Among the rarer species seen are dwarf sumac, shortleaf pine, post oak, and black oak.

PARK SECTION XVIII

Extending From

Calvary Rocks to Southern End of Park, West Side

GENERAL

Park Section XVIII consists of the southwestern corner of the Park. The forested slopes, which have been repeatedly cut and burned, are predominantly young, even-aged stands of drier types. The soil is gone from most of the slopes, and the fire hazard for the area is high. Grimora mine nearby, a source of manganese, has not been operating since World War I.

HISTORY

Intermittent fires and cuttings have occurred over the entire area of the Park section. The most severe fires occurred during 1930. Remnant cover is generally fire scarred, depending upon its location in respect to protective features. Heavy selective thinnings of 1930-31 are apparent on both the east and west sides of Sawmill Ridge and older cuttings within Cold Spring Hollow (south of Thorofare Ridge) and Riprap Hollow of about 1900 are evident.

TYPES AND ASSOCIATED SPECIES

Chestnut Oak: Chestnut Oak dominates the rough upper slopes, particularly on north and northwestern aspects in generally pure stands. Because of the greater protection afforded by the terrain on which the type is found, the overstory has been damaged less by fire than that of other types. In addition to the usual associates, black birch, red maple, serviceberry, striped maple, table mountain pine, purple azalea, and catawba rhododendron are commonly found.

Scarlet Oak: The type occurs on the less rugged southern slopes of quartzite or shale base and along the lower stream courses. Chestnut oak, pitch pine, bear oak, pignut hickory, blackjack oak, laurel, white oak, black gum, chestnut sprouts, chinquapin, sassafras, black oak, dwarf sumac, post oak, and shortleaf pine are associate species. Additional trees and shrubs found along the streams are red maple, spicebush, black alder, hemlock, black birch, striped maple, greenbrier, and catawba rhododendron.

Pitch Pine: As usual the Pitch Pine type dominates the rough, dry western ridge faces underlain by the porous Shady dolomite. There is little humus or leaf litter on these slopes. Blackjack oak predominates over large areas on the more exposed sites. The type runs to Chestnut Oak above and to Scarlet Oak on the lower slopes.

Bear Oak: As in some of the other Park sections, the Bear Oak type is inclined to adhere to the southern slopes of the Erwin quartzite and Hampton shale strata which are generally confined to the main ridge. The type is characteristically pure except on the steeper slopes where there is scant cover of mostly mixed virginia, pitch, and table mountain pines topping scrubby oak growth.

Red Oak: Stands of Red Oak are found along the upper slope and ridge flats through the central portion of the Park section in mixture with chestnut oak, hickory, white oak (on flats), black birch, locust, and striped maple. The remnant cover, though bearing basal scars has, like stands of Chestnut Oak, been burned to a less degree than other types.

Open - Restocking: The several former open areas located in the southern end of the Park section are restocking to pitch pine, bear oak, hickory, laurel, chinquapin, sumac, white oak, and white pine.

REPRODUCTION

The cuttings and severe fires have influenced new growth, although sprout reproduction assures a more or less static composition in the majority of the stands. In Cool Spring Hollow (south of Thorofare Ridge) and in the Scarlet Oak type of eastern Sawmill Ridge there has been noticed an insufficient amount of oak sprouts and consequent increase in the numbers of locust, sassafras, black gum, and red maple reproduction.

FIRE HAZARD

There are various factors which make this an area of high fire hazard. Being the southwestern corner of the Park, it is exposed to the prevailing dry southwest winds. There is a high percentage of bear oak and similar stands of dense scrubby cover. There is a tremendous amount of hanging fire-killed debris on certain areas, but particularly on the lower western slope of Turk Mountain on the northern aspects. Miles of trails have been constructed through the Park section, making the area more accessible for fire and administrative protection.

INSECTS AND DISEASE

Fire-weakened trees are being attacked by fungi, though no insect attacks have been noted. The trees are subject to wind throw.

COMMENTS

Rhododendron catawbiense, which has not been found elsewhere in the Park, is common along streams and on the fresher slopes between Wildcat Ridge and Riprap Hollow.

PARK SECTION XIX

Extending From

Blackrock Gap South to Jarman Gap, East Side

GENERAL

Park Section XIX embraces the badly burned slopes of the main ridge and areas lying on Bucks Elbow and Pasture Fence Mountains all within the watershed of the picturesque North and South Forks of Moormans River. The drier forest types extend well over the ridge from the west side almost down to the stream courses and as a result of fires consist mostly of 1-20 aged stands.

HISTORY

Most of the main ridge was burned between 1925 and 1930 (grouped on the accompanying map under fire year 1930). The damage from these fires was severe except in some of the ridge top flats and lower north slopes. Remnant trees are fire scarred and are dying and breaking off. The position formerly held by chestnut on the harder burned slopes cannot be ascertained, but through other areas it averaged 30 to 40 percent of the cover. Both the North and South Forks of Moormans River have been frequently thinned of oak, chestnut, and Cove Hardwood species. This has resulted in a predominance of hickory over much of the area. The open areas have been intensively grazed, resulting in significant loss of soil by erosion. Preventive treatment has been applied to the more seriously eroded lands in the upper North Fork.

TYPES AND ASSOCIATED SPECIES

Chestnut Oak: Chestnut Oak with a good mixture of hickory dominates the slopes of the main ridge. Hickory has been favored in the stands through having been excluded from selective cuttings in which much of the oak was removed. On some of the ridge top flats occur veteran stands of oak and hickory, including white oak. On the slopes beneath badly scarred remnant stands there is an abundance of dogwood, locust, and redbud in addition to good sprout oak and hickory. The steep slopes have numerous outcrops on which is such growth as white ash, redbud, persimmon, crataegus, blackhaw, and pasture rose. The soil on south and east aspects is thin but on north slopes is frequently deep and fertile.

Red Oak: Red oak in close association with hickory and chestnut oak dominates slopes on Moormans River and upper slopes and flats on the main ridge. As in the Chestnut Oak type, hickory has been left in cutting where the oaks have been removed. Chestnut was formerly common through the type.

Bear Oak: Extensive stands of pure Bear Oak are found on some of the flatter middle and upper slopes of the main ridge. The Bear Oak stands of this and adjoining Park Section XVIII are the largest of the type in the Park.

Cove Hardwoods: Broken stands of Cove Hardwoods extend along both forks of Moormans River. Some of the younger stands have reclaimed former open areas. Aside from the common species of the type, black walnut, red mulberry, hackberry, Paulownia, papaw, and american elm are seen.

Scarlet Oak: Scarlet oak in association with bear oak, chestnut oak, and pitch pine forms some large stands in the north portion of the Park section.

White Pine: White pine found throughout both forks of Moormans River forms pure stands in the upper North Fork in association with oak, hickory, hemlock, laurel, dogwood, virginia pine, butternut, and redbud. Small portions of the stands occupy formerly open ground.

Virginia Pine: In the extreme southeastern corner of the Park section is a formerly grazed area restocked to virginia pine.

Open - Restocking: Former orchards, garden plots, and pasture lands found throughout the forks of Moormans River are closing in with pitch, virginia, and white pines, persimmon, sassafras, dogwood, locust, smooth sumac, red cedar, laurel, spicebush, ailanthus, sycamore, and other species.

REPRODUCTION

Following the fires, dense reproduction is coming in on all sites. There is an abundance of dogwood, sassafras, locust, and other species mixed in with the sprout oak and hickory through the oak types. Grazing has withheld reproduction in woodlands adjacent to the open areas.

FIRE HAZARD

The Park section presents little hazard other than the dense reproduction on burned areas. Fuel wood cuttings has aided in reducing the hazard through the hollows.

INSECTS AND DISEASES

In some of the fire-damaged locust, the locust borer seems to be abnormally active. Fungii on fire-damaged trees is prevalent.

COMMENTS

Several attractive waterfalls have been noted on Pasture Fence Mountain, one of about 60 feet and the other about 25 feet. Both forks of Moormans River are splendid trout streams.

TABLE I

Shenandoah National Park
Acreage - Forest Types by Park Sections

Forest Types	Park Sections																			Total
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	
Chestnut Oak	1809	1322	2287	4320	3975	2455	7990	5266	3733	2775	1514	517	281	2768	6530	837	5655	3074	3082	60,190
*Red Oak	4098	5539	4202	1841	3415	3418	3544	4331	2667	5911	2922	2283	2903	3251	779	1613	1367	456	1190	55,730
Scarlet Oak	65	70	1936	2247		376		187	1170			446	21	1799	2740		2082	1869	502	15,510
*Cove Hardwood	540	423	234	461	1786	460	1925	920	403	1136	222	793	209	426	130	423	493		406	11,390
Pitch Pine			530	1013	7	41	40	32	1257			766		811	2456	9	3164	1296	18	11,440
Bear Oak				98	10	5	60	17	180		108			245	2421	28	1373	1249	916	6,710
Black Locust	235	20	26	12	298			231	69	150	37	41	22	81		209	39			1,470
White Pine				24	119	84	39		7	12	6		8		108	11			92	510
Virginia Pine	35	5	176		7		8	30				9		10					30	310
Grey Birch									10	50										60
Open Grassland	226	15	379	197	768	183	171	106	1535	860	116	922	349	1748	210	983	112			8,880
Open Restocking	772	236	445	1185	3748	748	2983	569	1444	1860	520	477	947	1759	100	970	771	92	574	20,200
Open Cultivated				72	87				83	56	5	16		6			45			370
Barren			35					271	12					26	124		218	34		720
Total	7780	7630	10250	11470	14220	7770	16760	11960	12570	12810	5450	6270	4740	12930	15490	5180	15330	8070	6810	193,490

*Red Oak - Fir Subtype - 38 Acres

Cove Hardwood - Hemlock - 224 "

These subtypes are included in general type acreage figures

TABLE II

Summary of Total Acreages and Net Burned Acreages
By Each Forest Type

<u>Forest Type</u>	<u>Total Acreage</u>	<u>Net Burned Acreage</u>
Chestnut Oak	60,190	32,301
Red Oak	55,730	8,091
Open	29,450	402
Scarlet Oak	15,510	9,446
Pitch Pine	11,440	9,421
Cove Hardwoods	11,390	649
Bear Oak	6,710	6,158
Black Locust	1,470	130
Barren	720	0
White Pine	510	57
Virginia Pine	310	0
Grey Birch	60	0
Total	193,490	66,655

TABLE III

Summary - Acreage by Age Classes

<u>Age Class</u>	<u>Acres</u>
1-20	36,700
21-40	10,140
41-60	950
81-100	40
Mixed Age	113,340
All Age	2,150
No Class	30,170
Totals	193,490

TABLE IV

Area Burned by Forest Fires

<u>Forest Type</u>	<u>Burned Prior to 1933</u>	<u>1933-1940</u>	<u>Gross</u>	<u>Net</u>
Chestnut Oak	31,942	897	32,839	32,301
Red Oak	7,608	483	8,091	8,091
Cove Hardwoods	584	65	649	649
Scarlet Oak	9,291	232	9,523	9,446
Pitch Pine	9,339	671	10,010	9,421
Bear Oak	6,149	56	6,205	6,158
Black Locust	130		130	130
White Pine	57		57	57
Open - Grassland		22	22	22
Open - Restocking	320	60	380	380
Totals	65,420	2,486	67,906	66,655

TABLE V

NET BURNED AREA - AGRS
By Forest Type by Park Section

Park Section	Chest. Oak	Red Oak	Scarlet Oak	Cove Hdws.	Pitch Pine	Bear Oak	Black Locust	White Pine	Open Grass.	Open Restock	Totals
1	980	1,640		118							2,738
2	300	496	60								856
3	1,100	975	675		380						3,130
4	3,180	220	1,060	10	985	60					5,515
5	745	333		180			30			210	1,498
6		6									6
7	2,197	683		154		40		5		30	3,109
8	2,745	93		41	30	15					2,924
9	2,085	660	791	10	999	147					4,692
10	524	126		94			100			26	870
11		1									1
12	170	7	440		750						1,367
13	3	12								17	32
14	1,960	86	1,320	8	640	240			22	4	4,280
15	6,220	500	2,350	24	2,456	2,420					13,970
16	837	433		10		28		52			1,360
17	3,735	950	694		1,923	1,092				80	8,474
18	2,950	450	1,580		1,240	1,200				13	7,433
19	2,570	420	476		18	916					4,400
Total	32,301	8,091	9,446	649	9,421	6,158	130	57	22	380	66,655

TABLE VI

NET BURNED AREA 1933-40 INCLUSIVE
BY TYPES AND PARK SECTIONS

	Chest. Oak	Red Oak	Cove Hdwds.	Scarlet Oak	Pitch Pine	Bear Oak	Open Grass.	Open Rest.	Totals
I			8						8.0
II		236							236.0
III				65.5	40				105.5
IV				50					50.0
V		3							3.0
VI		6							6.0
VII	212.3	72.7	4						289.0
VIII		3	1						4.0
IX	340			31	337	32			740.0
X	64	126	44					26	260.0
XI		.7							0.7
XII		7							7.0
XIII	2.5	12.2						16.5	31.2
XIV	56	16.5	8	3	17		22	4	126.5
*XV	15			15	97				127.0
*XVI	180					20			200.0
XVII	10			44	31.2	3.8			89.0
XVIII				24	100			13	137.0
XIX	7								7.0
	886.8	483.1	65	232.5	622.2	55.8	22	59.5	2426.9
									Gross Total
									2485.9

*Park Section XV, Pitch Pine less 49 acres overlap Gum Springs (1939) on Lam Hollow (1937)

Park Section XVI, Chestnut Oak less 10 acres overlap Ivy Creek #2 on Ivy Creek (1934)

TABLE VII
Area Burn by Years

Year	Acreage	
	<u>Gross By Years</u>	<u>Net Accumulative By Years</u>
* 1925-1930	19,640	19,640
1925	1,560	21,200
1926	610	21,810
1929	1,440	23,250
1930	38,810	62,060
1931	2,930	64,990
1932	80	65,070
1933	468	65,528
1934	1,134	66,161
1935	105	66,266
1936	764	66,524
1937	186	66,603
1938	56	66,652
1939	119	66,654
1940	<u>4</u>	<u>66,655</u>
Totals	67,906	66,655

*Includes all burns mapped within extreme south end of Park could not be delineated by year of occurrence.

CHECK LIST OF TREES

Taken from the Check List of the Forest Trees of the United States by Sudworth

<u>Botanical Name</u>	<u>Common Name</u>	<u>Type Numbers</u>	<u>Habitat</u>	<u>General</u>
<i>Abies intermedi</i>	Blue Ridge Fir	2	Range in Park limited to top of Hawksbill Mtn., Crescent Rock, and to plantings.	Species recently separated (Fulling) from <i>A. frazari</i> .
<i>Acer negundo</i>	Box Elder	4, 11	Sparse; fertile soils.	
<i>pennsylvanicum</i>	Striped Maple	1, 2, 4	Common to rocky north slopes.	
<i>rubrum</i>	Red Maple	1, 11	General distribution.	
<i>saccharum</i>	Sugar Maple	2, 3	Best cove sites below 2500 ft.	
<i>saccharinum</i>	Silver Maple	1	Former homesteads; probably not native.	
<i>spicatum</i>	Mountain Maple	2, 4	Sporadic on rocky north slopes.	
<i>Ailanthus altissima</i>	Ailanthus	4, 11	Introduced; spreading into open.	
<i>AmaXlanchier canadensis</i>	Serviceberry	1, 11	Frequents all types.	
<i>Amygdalus persica</i>	Peach	1, 4	Introduced, but dying out.	
<i>Aralia spinosa</i>	Devils Walkingstick	2, 4	Rare; fertile sites.	
<i>Asimina triloba</i>	Papaw	4	Coves and along streams at lower elevations; east side of ridge.	
<i>Betula lenta</i>	Sweet Birch	1,2,4,7, 8,11	General through moist types, rocky draws of drier upland types.	Attacked by <i>Nectria</i> , particularly in north section; fall web worm.
<i>lutea</i>	Yellow Birch	2, 4	Very moist sites.	
<i>populifolia</i>	Gray Birch	10	Pure stand in swamp at Big Meadows, elevation 3500 ft. Otherwise rare on northwest slopes.	
<i>Carpinus caroliniana</i>	Blue Beech	4	Lower elevations along streams.	
<i>Castanea dentata</i>	Chestnut	1, 2, 3, 4, 5, 6, 7, 8, 9.	Formerly abundant on main ridge. Sprout growth more persistent in drier types.	Only remnant sprout growth exists following blight. Fertile nuts rare.
<i>pumila</i>	Chinquapin	1, 3, 5, 6, 11	Common to drier types at lower elevations, west side of ridge.	

Check List - Page 2

<u>Botanical Name</u>	<u>Common Name</u>	<u>Type Numbers</u>	<u>Habitat</u>	<u>General</u>
<i>Celtis occidentalis</i>	Hackberry	4	Infrequent; fertile sites.	
<i>Cercis canadensis</i>	Redbud	1,2,4,7, 8,9,11	Common on old fields, fringing open streams up to 2500 ft.	
<i>Cornus alternifolia</i>	Blue Dogwood	2, 4	Infrequent; fertile soils.	
<i>florida</i>	Dogwood	1,2,3,4, 7,8,9,11	General, fertile soils below 3000 ft.; common to old fields.	
<i>Crataegus</i> sp.	Hawthorn	2, 8, 10, 11	Common to open types above 3000 ft.	<i>Gymnosporangium germinale</i> and <i>G. globosum</i> have been observed on the species.
<i>Diospyros virginiana</i>	Persimmon	4,7,9,11	Common to old fields below 2500 ft.	
<i>Fagus grandifolia</i>	Beech	4	Rare; fertile soils along lower streams.	
<i>Fraxinus americana</i>	White Ash	1, 2, 4	Common; coves, moist sites.	
<i>nigra</i>	Black Ash	2, 4	Same, less common <i>F. americana</i> .	
<i>Gleditsia triacanthos</i>	Honey Locust	2, 4	Rare; good soils, lower elevations.	
<i>Hamamelis virginiana</i>	Witch Hazel	1, 2, 4, 8, 11	Common; rocky moist soils of main ridge.	
<i>Hicoria alba</i>	Mockernut Hickory	1, 2, 4	Common; fertile sites.	
<i>cordiformis</i>	Bitternut Hickory	2, 4	Common; rugged draws, north slopes, and other moist locations.	
<i>glabra</i>	Pignut Hickory	1,2,3,4, 5,6,7,8, 9,11	Common to drier slopes, thin soil.	Defoliated by <i>Diapheromera femorata</i> through portions of north end of Park. Fall web worm locally common.
<i>ovata</i>	Shagbark Hickory	1, 2, 4, 8, 11	Common; fertile flats, gentle slopes.	
<i>Ilex montana</i>	Mountain Holly	4	Sparse in swampy open types.	
<i>Juglans cinerea</i>	Butternut	1, 2, 4, 8, 11	Common; rugged moist slopes, draws, stream courses.	<i>Gnomonia leptostyla</i> , a disease of the leaves, and <i>Melanconis juglandis</i> common to species.
<i>nigra</i>	Black Walnut	4	Richer bottomland.	
<i>Juniperus virginiana</i>	Eastern Red Cedar	1,2,4,7, 8,9,11	Intermittently common to old fields, granodiorite and greenstone outcrops.	
<i>Kalmia latifolia</i>	Mountain Laurel	1,2,3,4, 5,6,8,11	General; common to abundant on drier sites.	

Check List - Page 3

<u>Botanical Name</u>	<u>Common Name</u>	<u>Type Numbers</u>	<u>Habitat</u>	<u>General</u>
<i>Liriodendron tulipifera</i>	Yellow Poplar	1, 2, 4, 8, 11	Common; moist rich soils below 2500 ft.	
<i>Magnolia acuminata</i>	Cucumber Magnolia	2, 4, 11	Intermittently common to good, moist soils below 2500 ft.	
<i>tripetala</i>	Umbrella Magnolia	2, 4, 11	Habitat same.	
<i>Malus coronaria</i>	Sweet Crab Apple	2, 4	Sparse medium to good soils.	
<i>pumila</i>	Wild Apple	2, 4, 11	About former homesteads.	Being suppressed.
<i>Morus alba</i>	White Mulberry	4	Occasionally found about old homesteads.	
<i>rubra</i>	Red Mulberry	2, 4	Rare; on moist fertile sites.	
<i>Nyssa sylvatica</i>	Black Gum	1,2,3,4, 5,6,7,8, 9,11	Frequents all types below 3000 ft.	
<i>Ostrya virginiana</i>	Hophornbeam	2, 4	Common; north slopes of main ridge.	
<i>Oxydendrum arboreum</i>	Sourwood	3	Rare; lowermost western slopes.	
<i>Paulownia tomentosa</i>	Royal Paulownia	4	Introduced; old homesteads.	
<i>Picea rubra</i>	Red Spruce	2	Swamplike Limberlost, crest of Hawks- bill Mtn., planted sites above 3000 ft.	Spruce gall aphid damage is common.
<i>Pinus echinata</i>	Shortleaf Pine	3	Rare; medium soils, western ridges, and bottomlands.	Believed to have been much more common.
<i>pungens</i>	Mountain Pine	1, 2, 3, 5, 6, 8, 9, 11	Sparsely distributed poor, dry, soils, upper slopes; frequents some open areas.	Slight damage by a twig attacking insect, Pity- ophthoris puberulus.
<i>rigida</i>	Pitch Pine	1,2,3,5, 6,8,9,11	Common to the driest sites.	<i>Cronartium cerebrum</i> is occasionally found on the species.
<i>strobus</i>	Northern White Pine	1-11	General except drier sites.	<i>Cronartium ribicola</i> com- mon through central and northern portions of Park. White pine weevil damage common in open stands.
<i>virginiana</i>	Virginia Pine	1,2,3,4, 5,6,7,8, 9, 11	Locally abundant on some old fields; otherwise sparse drier sites.	<i>Cronartium cerebrum</i> occasionally found on the species.
<i>Platanus occidentalis</i>	Sycamore	2, 3, 4, 11	Along lower stream courses.	The leaf disease, <i>Gno- monia veneta</i> , is rather common.

Check List - Page Four

<u>Botanical Name</u>	<u>Common Name</u>	<u>Type Numbers</u>	<u>Habitat</u>	<u>General</u>
<i>Populus alba</i>	White Poplar	3, 11	Occasionally about old homesteads; going wild.	
<i>deltoides</i>	Eastern Cottonwood	4, 11	Occasionally about old homesteads.	
<i>grandidentata</i>	Large-toothed Aspen	1, 2, 6	Rare; poorer sites.	
<i>tremuloides</i>	Aspen	1, 2, 6	Sporadic; poor sites.	
<i>Prunus americana</i>	Wild Plum	2, 4, 11	Sparse; fertile sites.	Tent caterpillar,
<i>avium</i>	Sweet Cherry	2, 4	Introduced old homesteads.	<i>Malacasoma americana</i> ,
<i>cerasus</i>	Sour Cherry	2, 4	" " "	common to the genera.
<i>pennsylvanica</i>	Pin Cherry	1, 2, 5, 6	Sparsely distributed dry slopes.	
<i>serotina</i>	Black Cherry	2, 4, 8	Sparsely distributed through fertile sites.	
<i>virginiana</i>	Chokecherry	1, 2	Intermittently common to dry rocky slopes.	
<i>Pyrus communis</i>	Pear	2, 4	Introduced; old homesteads.	Dying out.
<i>Quercus alba</i>	White Oak	1, 2, 3, 4, 8, 11	Common; medium to good soils, main ridge flats, gentle slopes, lower western slopes.	A disease of the leaves, <i>Gnomonia veneta</i> , is common to the species.
<i>borealis</i>	Red Oak	1, 2, 3, 4, 8, 11	Dominant main ridge, medium to good soils.	Partial to complete defoliation by <i>Diapheromera femorata</i> on scarlet, red, chestnut oaks in portions of north end of Park.
<i>coccinea</i>	Scarlet Oak	1, 2, 3, 4, 5, 6, 8, 11	Common below 2000 feet gentle western slopes, along streams.	
<i>ilicifolia</i>	Bear Oak	1, 2, 3, 5, 6, 8, 9, 11	Common shale soils, dry slopes between 1500 and 3000 ft.	
<i>marilandica</i>	Blackjack Oak	1, 3, 5, 6, 11	Common limestone, quartzite soils, driest slopes below 2000 ft.	
<i>montana</i>	Chestnut Oak	1, 2, 3, 5, 6, 8, 11	Predominant dry, rocky, granodiorite and quartzite soils.	A twig blight, <i>Sphaerospora malorum</i> , locally common.
<i>rubra</i>	Southern Red Oak	3	Lower western flats below 1500 ft.	
<i>stellata</i>	Post Oak	3	Habitat same.	
<i>velutina</i>	Black Oak	3	Uncommon; drier soils.	
<i>Rhododendron maximum</i>	Great Rhododendron	4	Rare; The Laurels and Deep Run, moist fertile soils.	
<i>catawbiense</i>	Catawba Rhododendron	1, 4	Rare; vicinity Wildcat Ridge on northwest slopes.	

Check List - Page 5

<u>Botanical Name</u>	<u>Common Name</u>	<u>Type Numbers</u>	<u>Habitat</u>	<u>General</u>
<i>Rhus copallina</i> <i>glabra</i>	Dwarf Sumac Smooth Sumac	1, 3, 11 7, 9, 11	Rare; dry, fertile soils. Abundant on old fields.	Partial to complete defoliation by a leaf beetle common to limited areas.
<i>hirta</i>	Staghorn Sumac	1, 7, 9, 11	Less common than smooth sumac; dry woods, old fields.	
<i>Robinia pseudoacacia</i>	Black Locust	1,2,3,4, 5,6,7,8, 9,11	Common to all types, abundant in old fields.	Generally infested with <i>Cyllene robiniae</i> , <i>Chalepus dorsalis</i> prevalent; <i>Diaperomera femorata</i> prevalent in north end.
<i>Salix nigra</i> <i>discolor</i>	Black Willow Pussy Willow	4 1, 6	Sparse along streams, about springs. Rare; poor soils.	
<i>Sorbus americana</i>	Mountain Ash	2	Limited to precipitous upper northwest slopes.	
<i>Sassafras variifolium</i>	Sassafras	1,2,3,4, 5,6,7,8, 9,11	Common drier sites main ridge below 3000 ft. and particularly to old fields.	
<i>Tilia glabra</i>	Basswood	2, 4, 8	Common most fertile sites.	
<i>Tsuga canadensis</i>	Eastern Hemlock	2,4,8,11	Along streams, in swamps, moist slopes.	
<i>Ulmus americana</i> <i>fulva</i>	American Elm Slippery Elm	4 4	Sparse, lower streams, coves. Sparse; fertile lower slopes, along lower streams, coves.	
<i>Viburnum prunifolium</i>	Blackhaw	2, 4, 11	Infrequently found on fertile soils at lower elevations.	

ADDITIONAL SHRUBS MORE OR LESS INDICATIVE OF RECOGNIZED WOODED TYPES

Names are in Accordance with Standardized Plant Names

<u>Botanical Name</u>	<u>Common Name</u>	<u>Type Numbers</u>	<u>Habitat</u>	<u>General</u>
<i>Alnus rugosa</i>	Hazel Alder	4	In clumps along streams.	
<i>Azalea nidiflora</i>	Pinxterbloom	1	Dry, fertile sites.	
<i>Bensoin aestivale</i>	Spicebush	4	Along streams.	
<i>Ceanothus americanus</i>	Jersey Tea	1, 6	Dry, not too rocky soils.	
<i>Comptonia asplenifolia</i>	Sweetfern	6	In clumps; dry, not too rocky soils.	
<i>Corylus americana</i>	American Hazelnut	2	Open types at higher elevations; greenstone soils.	
<i>rostrata</i>	Beaked Hazelnut	2	Same.	
<i>Gaylussacia baccata</i>	Black Huckleberry	5, 6	Dry, other than greenstone soils.	
<i>Physocarpus opulifolia</i>	Common Ninebark	2, 4	Moist, rocky slopes of main ridge.	
<i>Ribes rotundifolium</i>	Roundleaf Gooseberry	2	Rocky sites above 1500 feet, particularly in openings.	Alternate host of <i>Cronartium ribicola</i> .
<i>Vaccinium vacillans</i>	Dryland Blueberry	5, 6	Dry, other than greenstone soils.	

FOREST COVER TYPE MAP
SHENANDOAH NATIONAL PARK

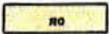
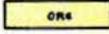
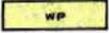
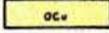
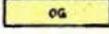
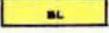
July, 1939

LEGEND

General

Park Boundary - - - - -
Forest Cover Type Line ~~~~~

Forest Cover Types

Chestnut Oak		Virginia Pine	
Red Oak		Cove Hardwoods	
Red Oak--Blue Ridge Fir		Hemlock	
Scarlet Oak		Grey Birch	
Pitch Pine		Open - restocking	
White Pine		Open - cultivated	
Bear Oak		Open - grassland	
Black Locust		Barren	

Age Classes

All Age	AA
Mixed Age	MA
1 - 20 years	1 - 20
21 - 40 years	21 - 40
41 - 60 years	41 - 60, etc.

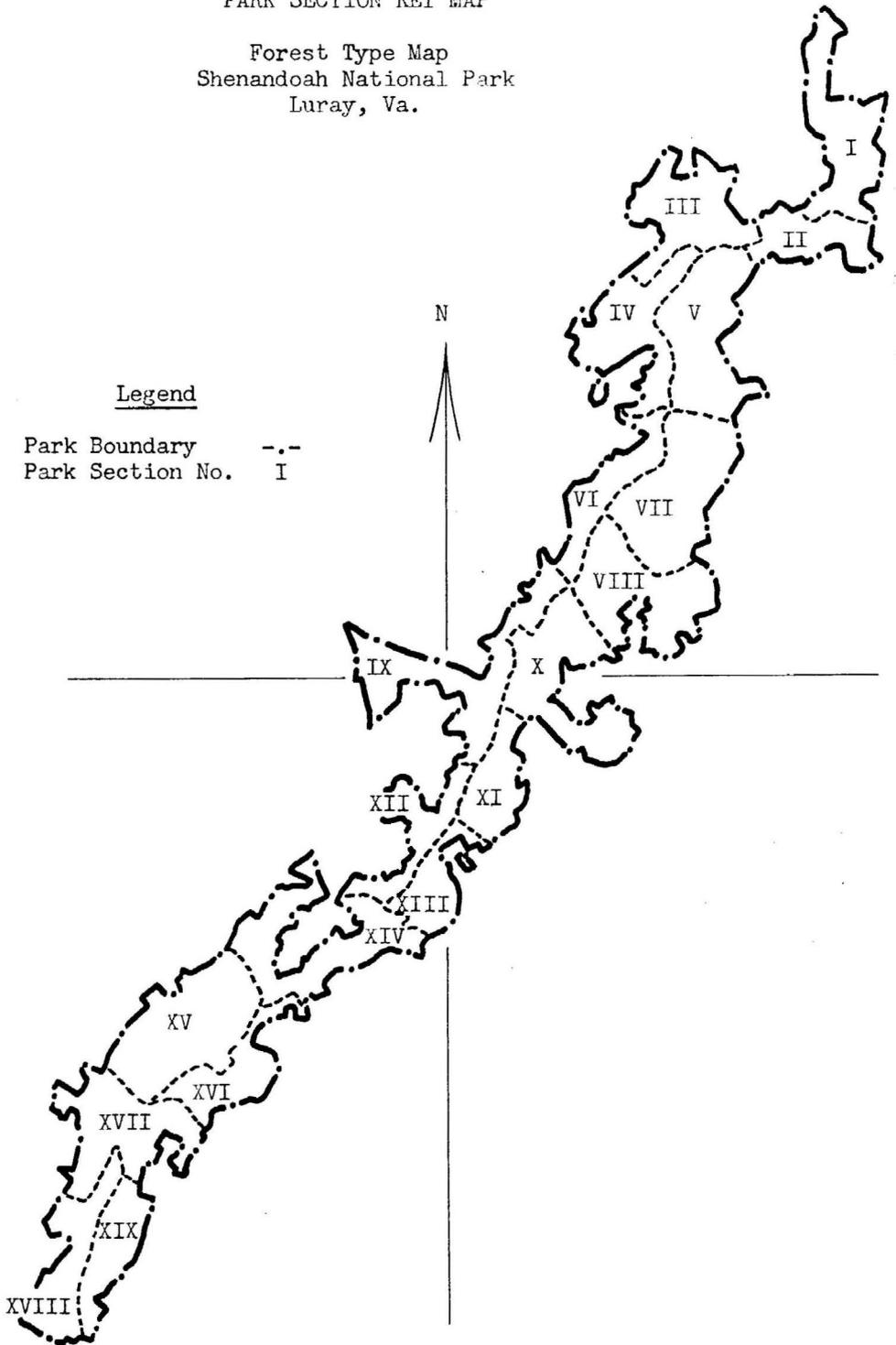
Burns

Year shown red



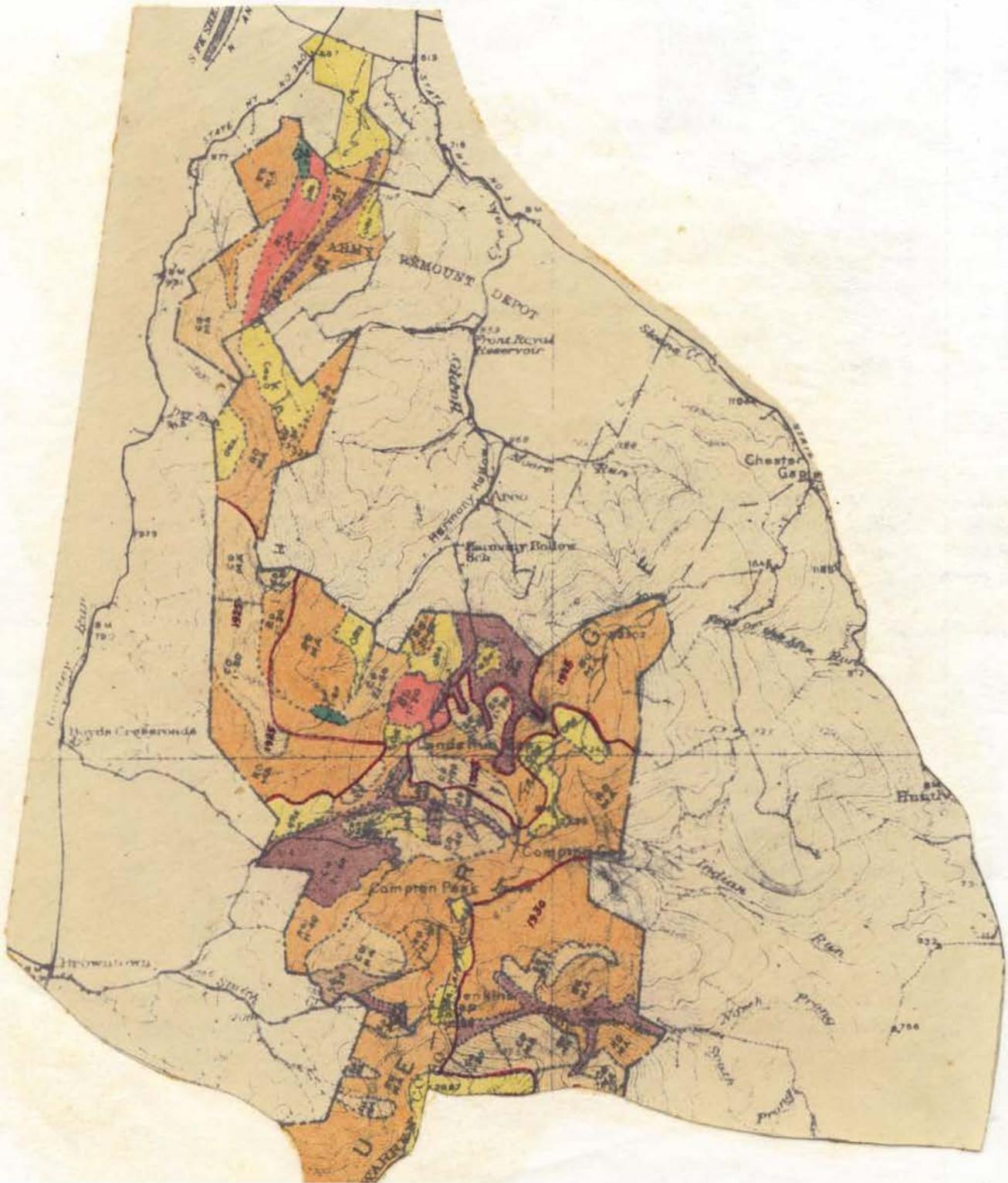
PARK SECTION KEY MAP

Forest Type Map
Shenandoah National Park
Luray, Va.



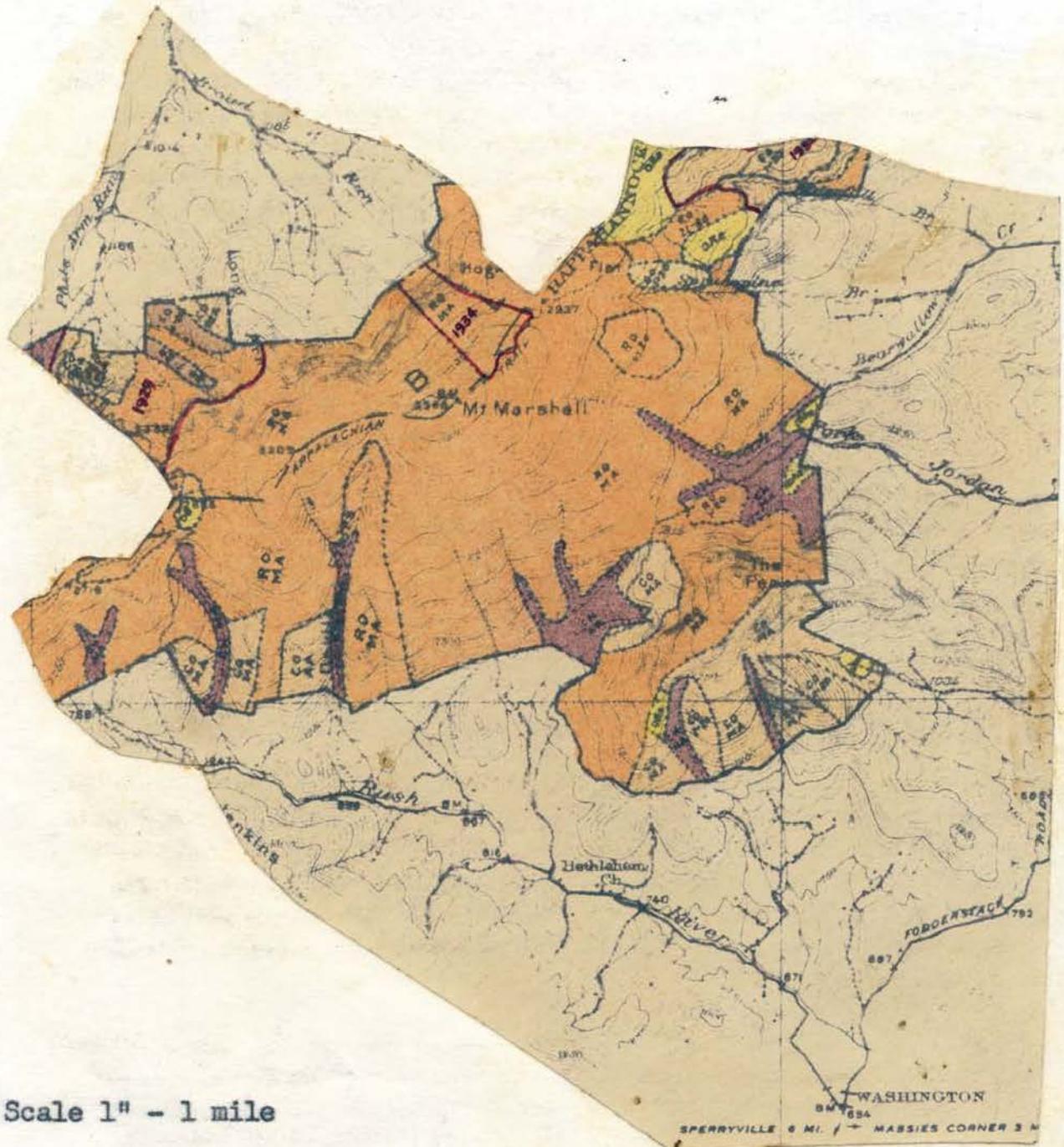
PARK SECTION I

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	1,809	980
Red Oak	4,098	1,640
Scarlet Oak	65	
Cove Hardwoods	540	118
Black Locust	235	
Virginia Pine	35	
Open-Grassland	226	
Open-Restocking	772	
Total	7,780	2,738



PARK SECTION II

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	1,332	300
Red Oak	5,539	496
Scarlet Oak	70	60
Cove Hardwoods	423	
Black Locust	20	
Virginia Pine	5	
Open-Grassland	15	
Open-Restocking	236	
Total	7,630	856

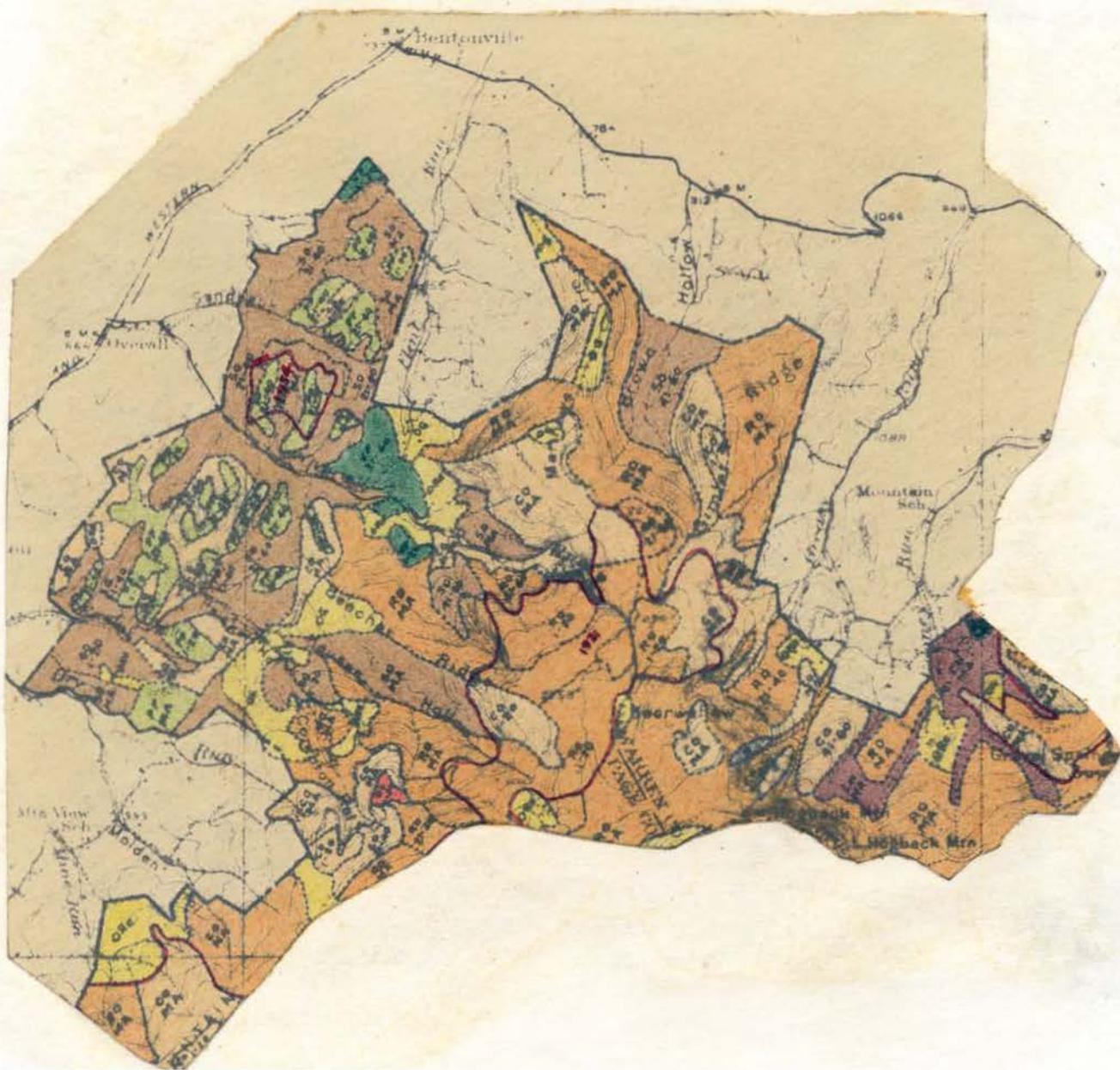


Scale 1" - 1 mile

WASHINGTON
 BM 634
 SPERRYVILLE 6 MI. / MASSIES CORNER 3 MI.

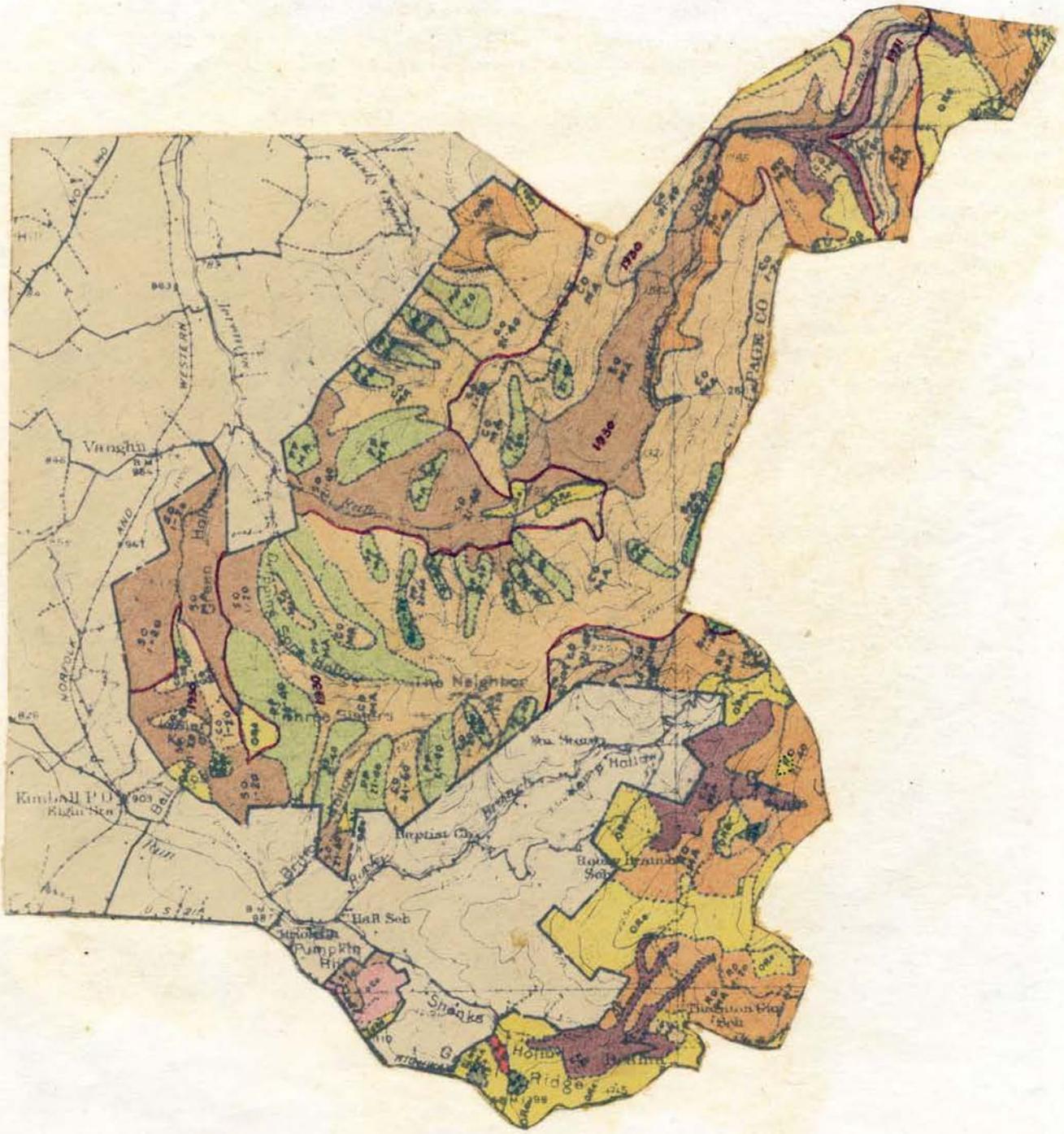
PARK SECTION III

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	2,287	1,100
Red Oak	4,202	975
Scarlet Oak	1,936	675
Cove Hardwoods	234	
Pitch Pine	530	380
Black Locust	26	
Virginia Pine	176	
Open-Grassland	379	
Open-Restocking	445	
Barren	35	
Total	<u>10,250</u>	<u>3,130</u>



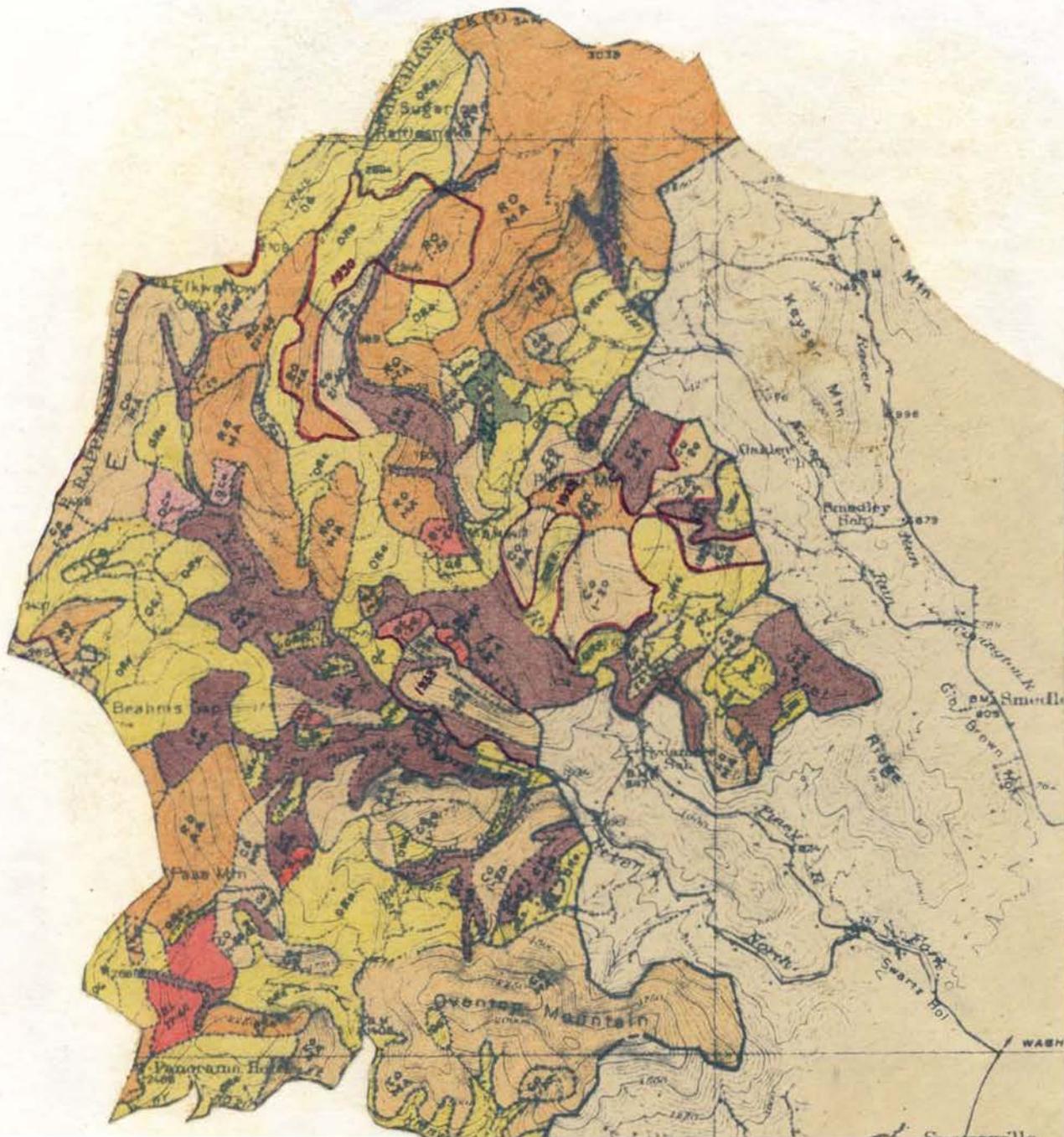
PARK SECTION IV

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	4,320	3,180
Red Oak	1,841	220
Scarlet Oak	2,247	1,060
Cove Hardwoods	461	10
Pitch Pine	1,016	985
Bear Oak	98	60
Black Locust	12	
White Pine	24	
Open-Grassland	197	
Open-Restocking	1,185	
Open-Cultivated	72	
Total	11,470	5,515



PARK SECTION V

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	3,975	745
Red Oak	3,415	333
Cove Hardwoods	1,786	180
Pitch Pine	7	
Bear Oak	10	
Black Locust	298	30
White Pine	119	
Virginia Pine	7	
Open-Grassland	768	
Open-Restocking	3,748	210
Open-Cultivated	87	
Total	17,220	1,498



PARK SECTION VI

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	2,455	
Red Oak	3,418	6
Scarlet Oak	376	
Cove Hardwoods	460	
Pitch Pine	41	
Bear Oak	5	
White Pine	84	
Open-Grassland	183	
Open-Restocking	748	
Total	<u>7,770</u>	<u>6</u>



PARK SECTION VII

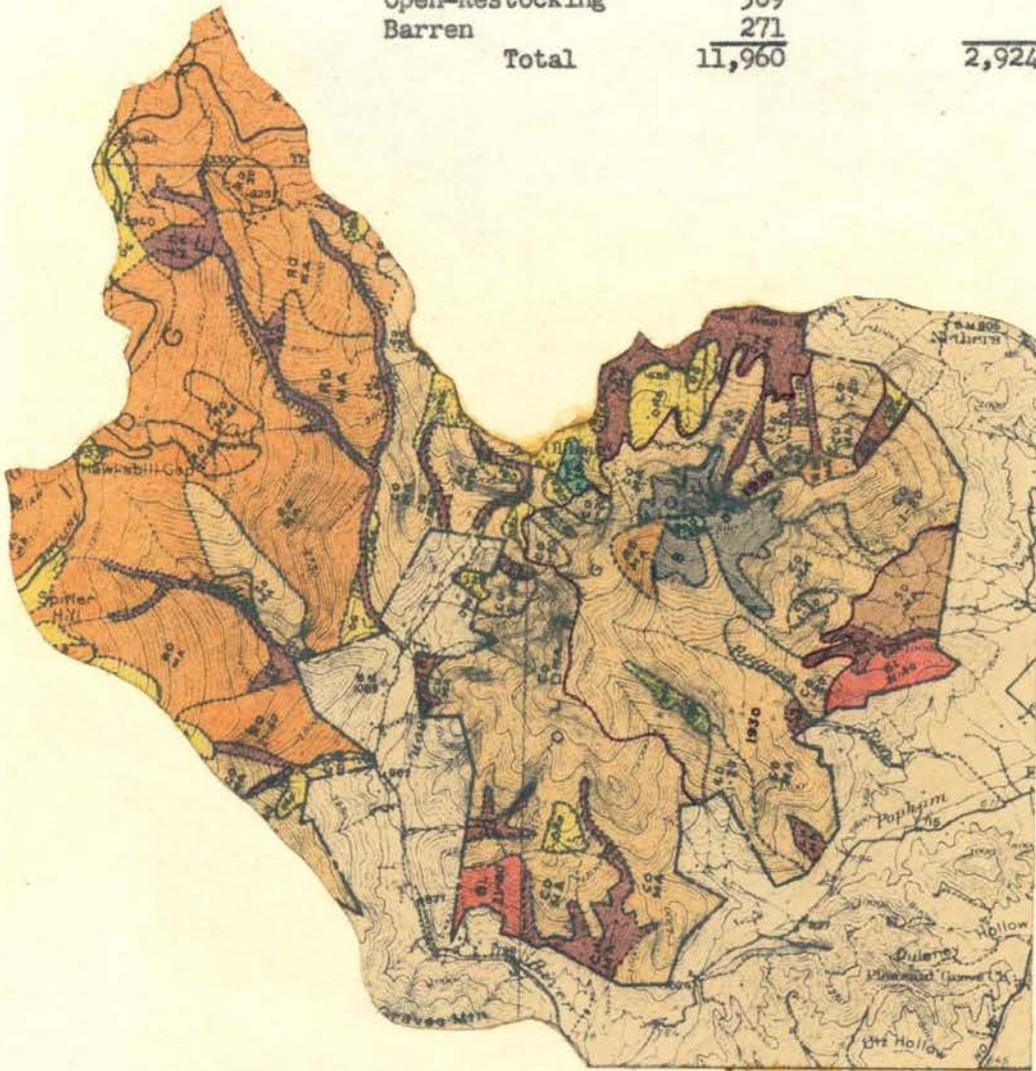
<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	7,990	2,197
Red Oak	3,544	683
Cove Hardwoods	1,925	154
Pitch Pine	40	
Bear Oak	60	40
White Pine	39	5
Virginia Pine	8	
Open-Grassland	171	
Open-Restocking	2,983	30
	<u>16,760</u>	<u>3,109</u>



Scale 1" - 1 mile

PARK SECTION VIII

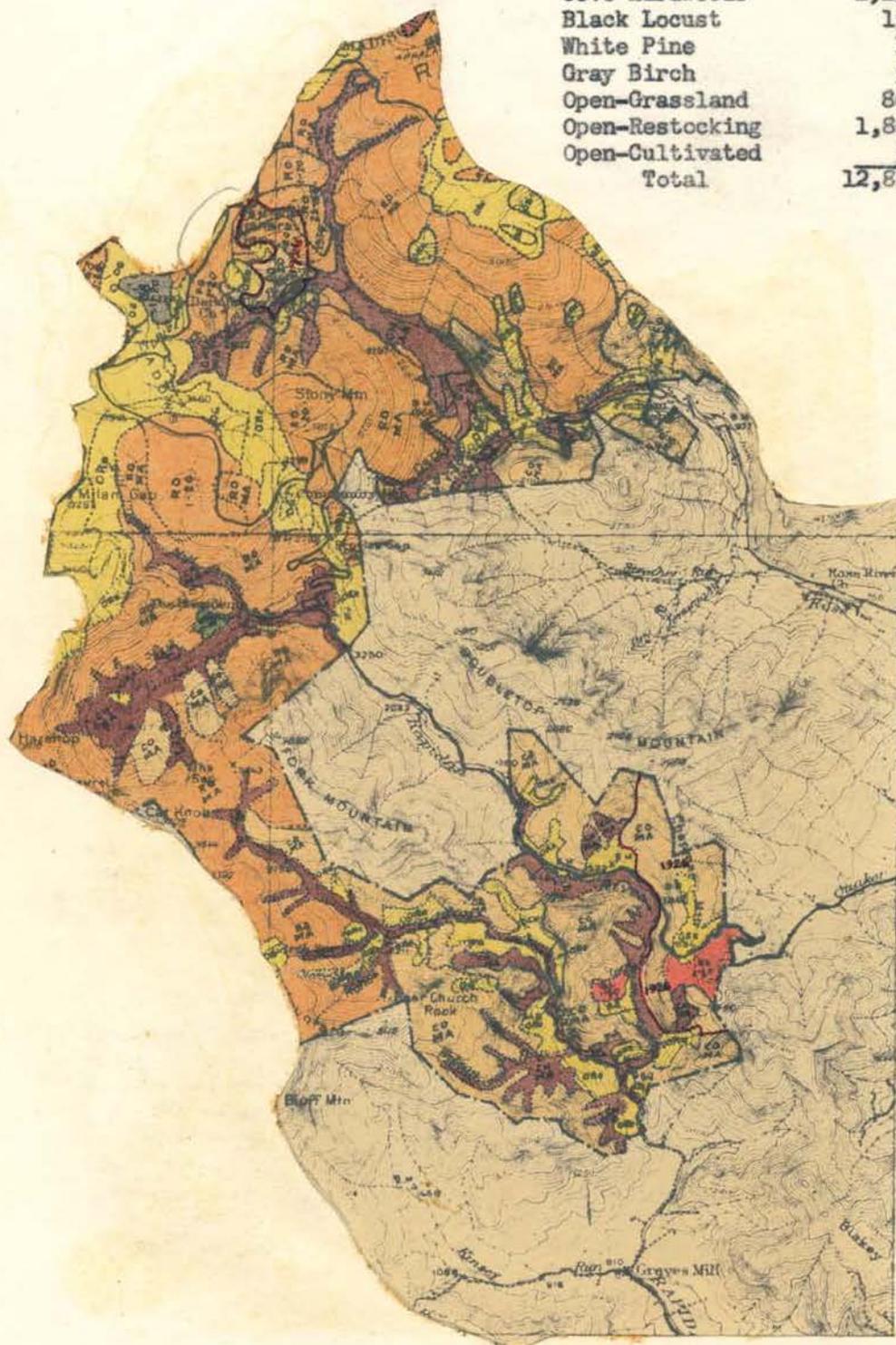
<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	5,266	2,745
Red Oak	4,331	93
Scarlet Oak	187	
Cove Hardwoods	920	41
Pitch Pine	32	30
Bear Oak	17	15
Black Locust	231	
Virginia Pine	30	
Open-Grassland	106	
Open-Restocking	569	
Barren	271	
Total	11,960	2,924



Scale 1" - 1 mile

PARK SECTION X

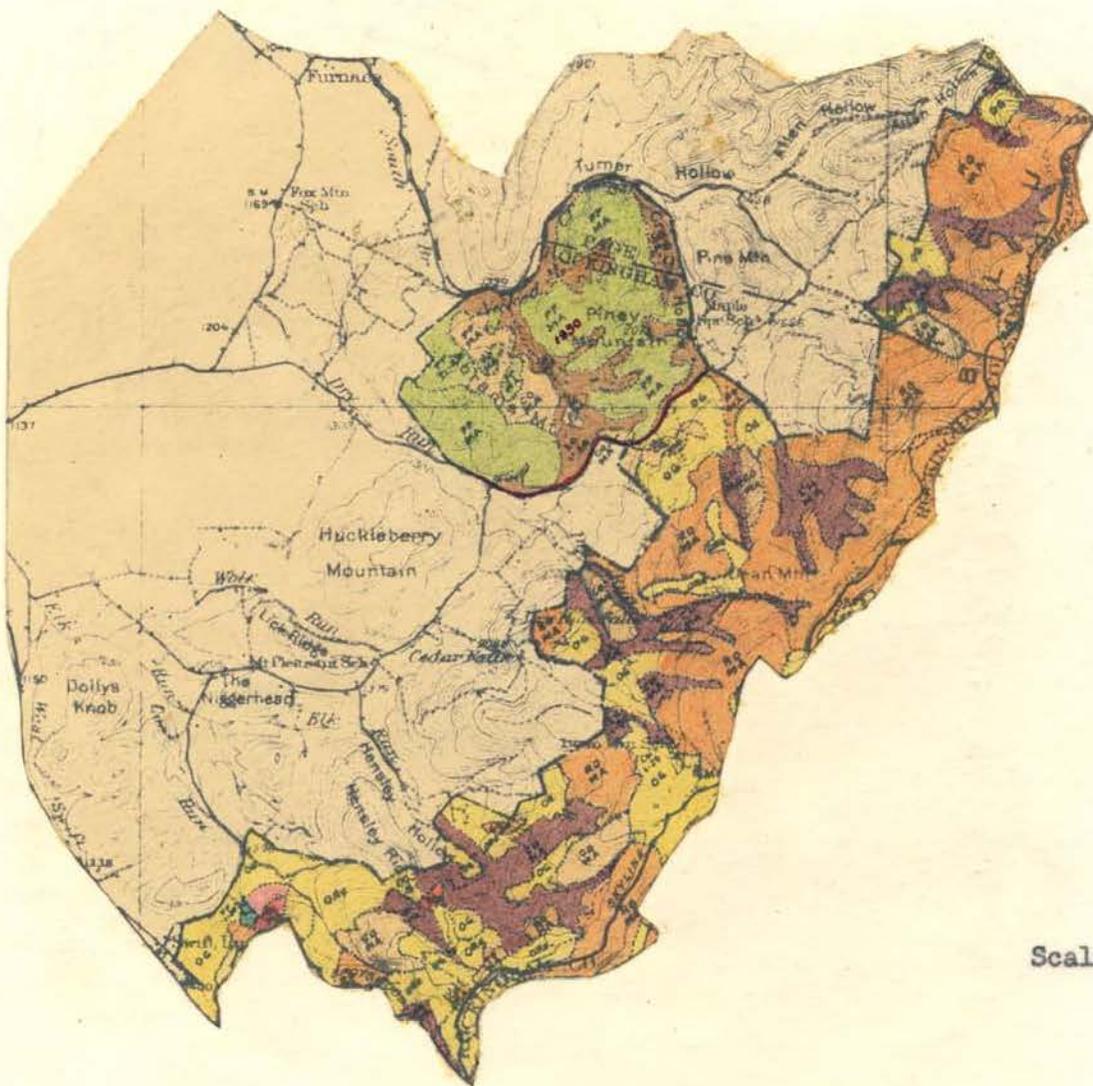
<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	2,775	524
Red Oak	5,911	126
Cove Hardwoods	1,136	94
Black Locust	150	100
White Pine	12	
Gray Birch	50	
Open-Grassland	860	
Open-Restocking	1,860	26
Open-Cultivated	56	
Total	12,810	870



Scale 1" - 1 mile

PARK SECTION XII

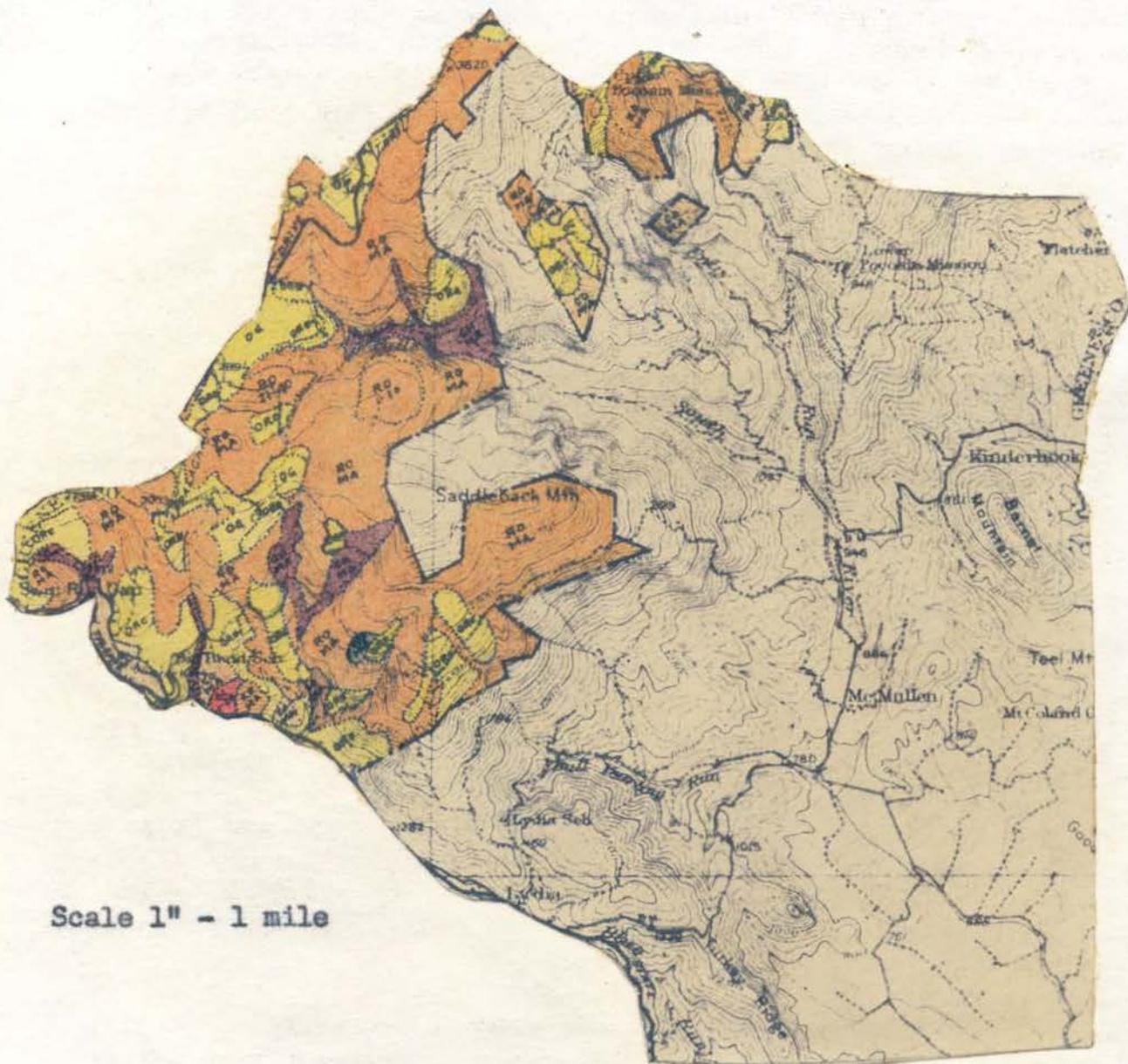
<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	517	170
Red Oak	2,283	7
Scarlet Oak	446	440
Cove Hardwoods	793	
Pitch Pine	766	750
Black Locust	41	
Virginia Pine	9	
Open-Grassland	922	
Open-Restocking	477	
Open-Cultivated	16	
Total	6,270	1,367



Scale 1" - 1 mile

PARK SECTION XIII

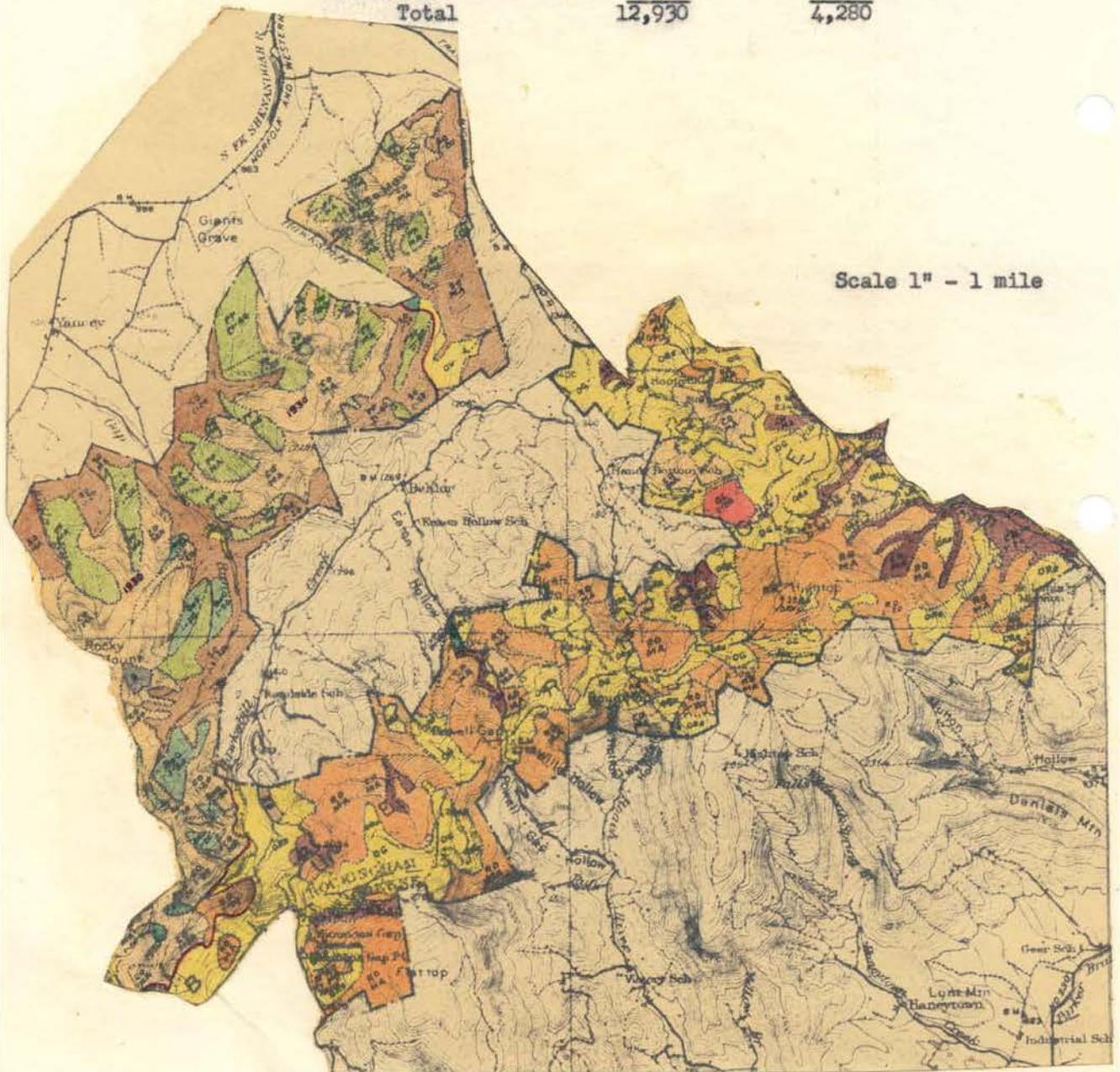
<u>Forest Type</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	281	3
Red Oak	2,903	12
Scarlet Oak	21	
Cove Hardwoods	209	
Black Locust	22	
White Pine	8	
Open-Grassland	349	
Open-Restocking	947	17
Total	4,740	32



Scale 1" - 1 mile

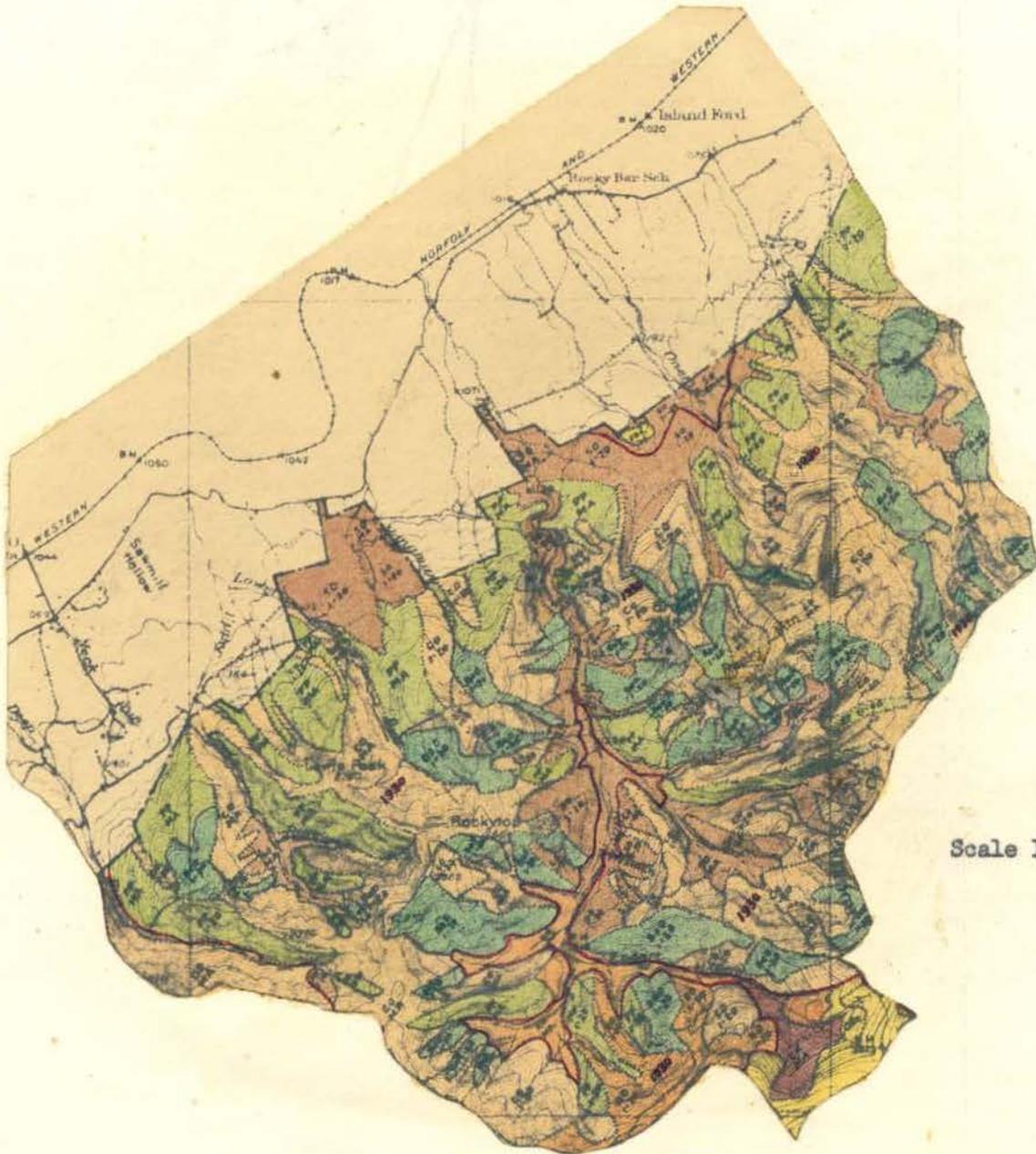
PARK SECTION XIV

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	2,768	1,960
Red Oak	3,251	86
Scarlet Oak	1,799	1,320
Cove Hardwoods	426	8
Pitch Pine	811	460
Bear Oak	245	240
Black Locust	81	
Virginia Pine	10	
Open-Gras land	1,748	22
Open-Restocking	1,759	4
Open-Cultivated	6	
Barren	26	
Total	12,930	4,280



PARK SECTION XV

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	6,530	6,220
Red Oak	779	500
Scarlet Oak	2,740	2,350
Cove Hardwoods	130	24
Pitch Pine	2,456	2,456
Bear Oak	2,421	2,420
Open-Grassland	210	
Open-Restocking	100	
Barren	124	
Total	15,490	13,970



Scale 1" - 1 mile

PARK SECTION XVI

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	837	837
Red Oak	1,613	433
Cove Hardwoods	423	10
Pitch Pine	9	
Bear Oak	28	28
Black Locust	209	
White Pine	108	52
Open-Grassland	983	
Open-Restocking	970	
Total	5,180	1,360



Scale 1" - 1 mi.

PARK SECTION XVII

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	5,655	3,735
Red Oak	1,367	950
Scarlet Oak	2,082	694
Cove Hardwoods	493	
Pitch Pine	3,164	1,923
Bear Oak	1,373	1,092
Black Locust	39	
White Pine	11	
Open-Grassland	112	
Open-Restocking	771	80
Open-Cultivated	45	
Barren	218	
Total	15,330	8,474



PARK SECTION XVIII

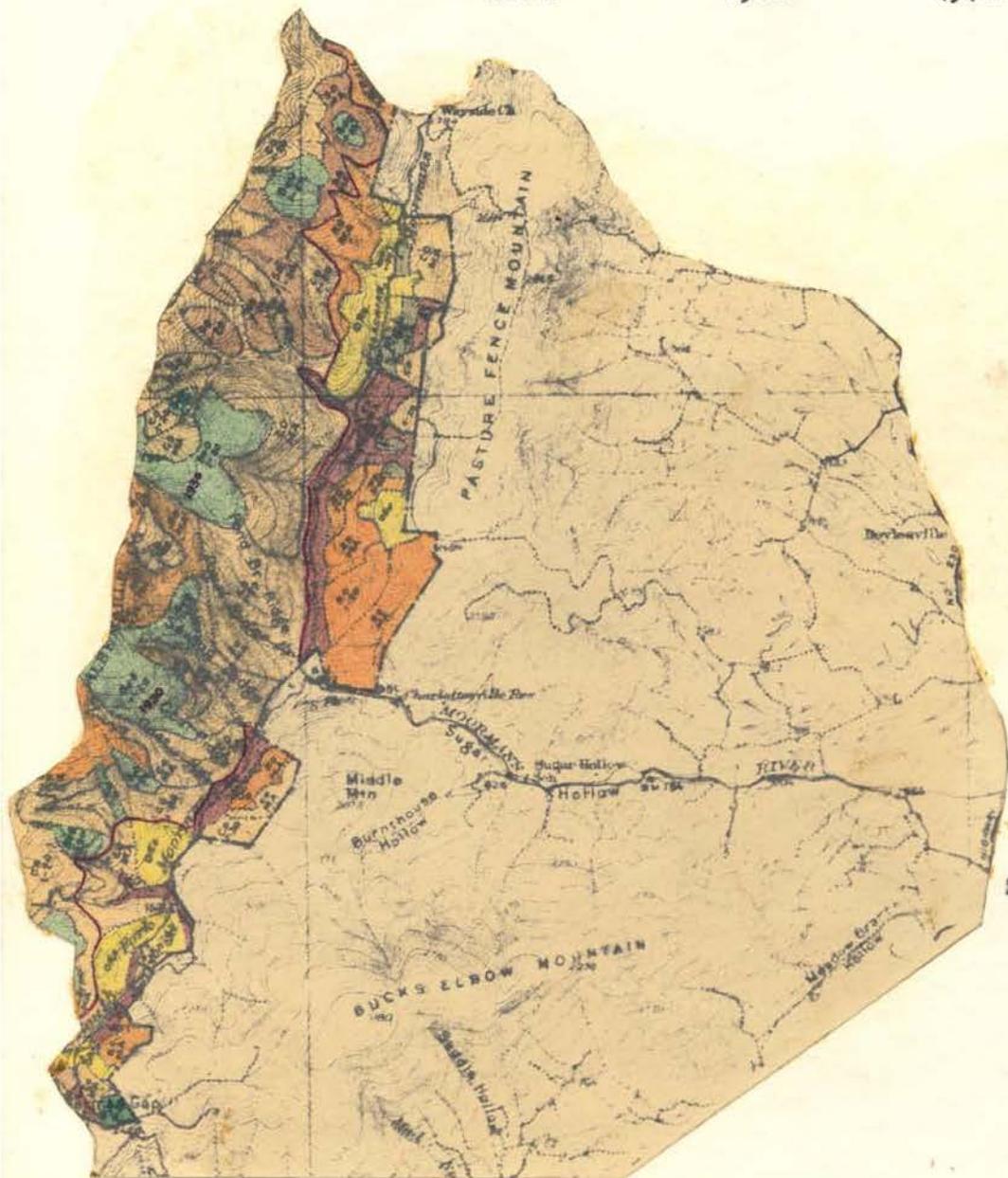
<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	3,074	2,950
Red Oak	465	450
Scarlet Oak	1,869	1,580
Pitch Pine	1,296	1,240
Bear Oak	1,249	1,200
Open-Restocking	92	13
Barren	34	
Total	8,070	7,433



Scale 1" - 1 mile

PARK SECTION XIX

<u>Forest Types</u>	<u>Acreage</u>	<u>Burn</u>
Chestnut Oak	3,082	2,570
Red Oak	1,190	420
Scarlet Oak	502	476
Cove Hardwoods	406	
Pitch Pine	18	18
Bear Oak	916	916
White Pine	92	
Virginia Pine	30	
Open-Restocking	514	
Total	6,810	4,400



Scale 1" - 1 mile

GEOLOGIC MAP

Of

NORTHERN DISTRICT
SHENANDOAH NATIONAL PARK

Scale 1" - 4 Miles



LEGEND

Cambian:

Watauga Shale, Shady dolomite,
and undifferentiated limestones - Grey

Erwin Quartzite - Brown

Unicoi formation including
quartzite and Hampton shale - Yellow

Pre-Cambian:

Hypersthene granodiorite - Orange

Catoctin greenstone - Green

GEOLOGIC MAP

Of

CENTRAL DISTRICT
SHENANDOAH NATIONAL PARK

Scale 1" - 4 Miles



LEGEND

Pre-Cambian:

Catoclin greenstone - Green
Hypersthene granodiorite - Orange

Cambian:

Watauga Shale, Shady dolomite,
and undifferentiated limestone - Grey
Erwin quartzite - Brown
Unicoi formation including
quartzite and Hampton shale - Yellow

GEOLOGIC MAP
Of
SOUTH DISTRICT
SHENANDOAH NATIONAL PARK

Scale 1" - 4 Miles



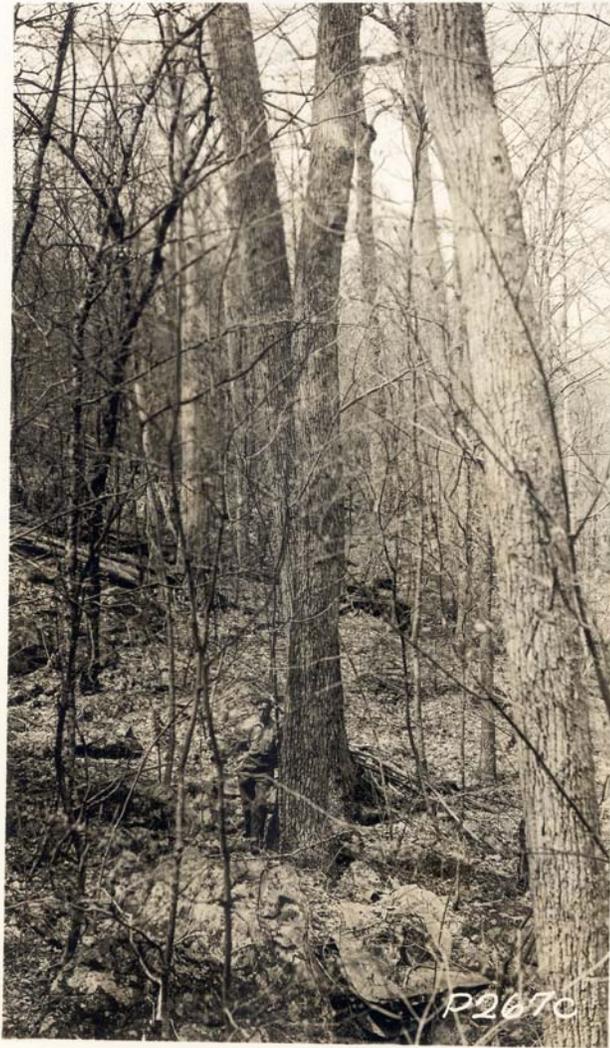
LEGEND

Pre-Cambian:

- Hypersthene granodiorite - Orange
- Catoctin greenstone - Green
- Marshall granite - Blue

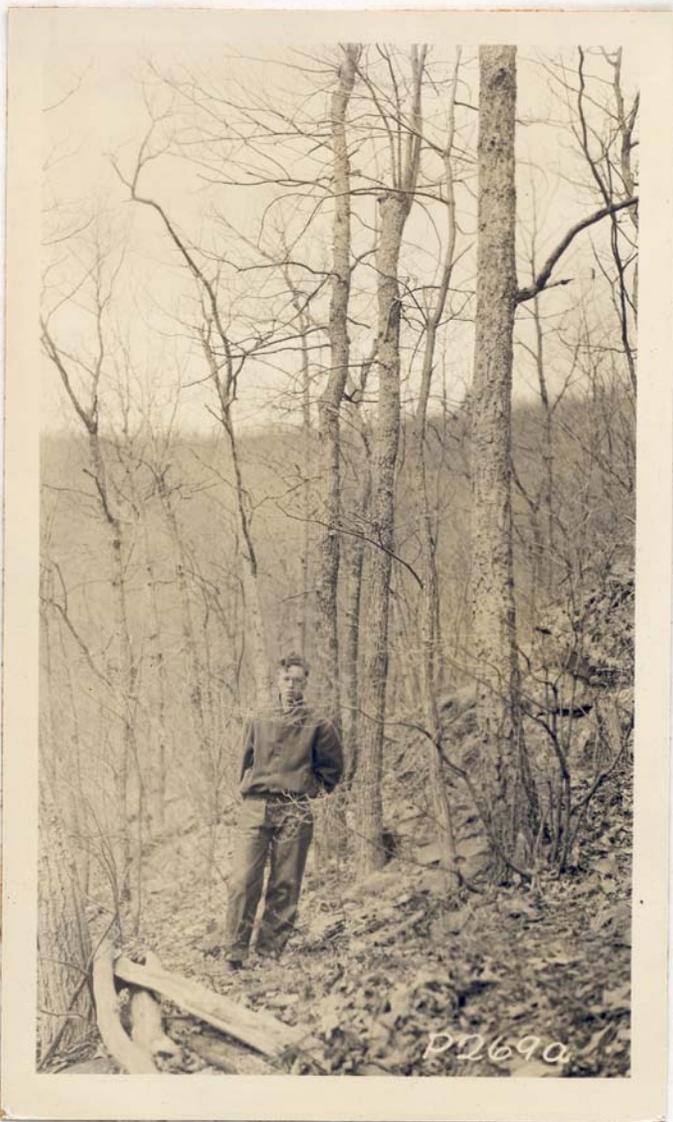
Cambian:

- Watauga Shale, Shady dolomite, and undifferentiated limestone - Grey
- Erwin Quartzite - Brown
- Unicoi formation including quartzite and Hampton shale - Yellow



Cove Hardwoods

Basswood and tulip poplar are codominant
in this typical cove stand.



Chestnut Oak

Chestnut oak in association with red oak
and pignut hickory.



Red Oak

A red oak mixed aged stand of the main ridge. Associates: hickories, hop-hornbeam, black birch



Red Oak - Blue Ridge Fir

The rare subtype as seen at Crescent Rock.



Scarlet Oak

A 1-20 aged stand of scarlet oak in association with chestnut, bear and white oaks, pignut hickory, dogwood and numerous other species as typical of lower western slopes.



White Pine

White pine forms small, sporadic, pure stands throughout the Park, frequently on old fields.



Bear Oak

Bear oak is predominant
with scattered topping
pitch pine.



Pitch Pine

A pure 21-40 aged stand of pitch pine. Although this stand was recently burned, the fire-resisting quality of the species is evident.

52680



F96J

Virginia Pine

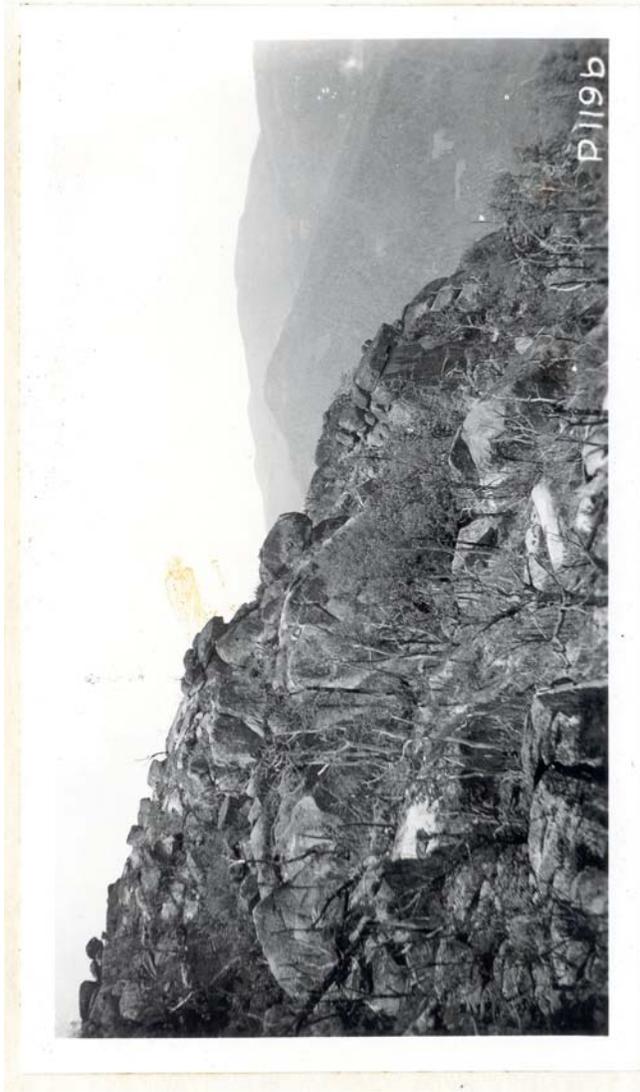
Virginia pine often forms dense pure stands on abandoned fields.



Black Locust

A rapid encroacher, black locust quickly establishes itself in dense pure stands on many fields. This 1-20 aged stand is typical.

F 96 C



Barren

A barren ridge top on which there is little tree growth. The slope has been severely burned.



F 96a

Gray Birch

A portion of the gray birch stand at Big Meadows. This is the only stand of the type in the Park.



Open-Grassland

A former pasturefield on which woody growth has begun to appear.



Open-Restocking

Former pasture and cultivated lands on which brush and tree growth has become well established.



F-4f

Burn

General view of fire damage on a harder-burned slope. Reproduction has since appeared.



Burn

A more typically burned area in which the understory and ground cover have been destroyed but most of the overstory remains. Basal scars will appear on the remnant trees and a portion of them will probably die.

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

REGION ONE

RICHMOND, VIRGINIA



August 8, 1941

Cobb

BRANCH OF FORESTRY	
Answered	
File	
F. C.	
AUG 11 1941	
Coffman	C
Cook	
Shanklin	<i>MS</i>
Thompson	<i>MS</i>
Barrow	
Gibbs	
McLaughlin	
De Lucia	

Cook

Memorandum for the Superintendent,
Shenandoah National Park:

Attention: Assistant Forester Moore

As transmitted by you under date of August 1 we have received two copies of the narrative description of forest cover types of Shenandoah National Park. Although we have not as yet had opportunity to read the report in its entirety we have reviewed each of its pages, noting the contents, organization, completeness of detail, and quality of the work.

We believe that this is the finest piece of work of its kind that we have ever seen. It appears to be a thoroughly masterful presentation in every respect, marking the culmination of a study which, begun in the summer of 1933, has been fraught with many difficulties, setbacks and extenuating circumstances during the intervening eight years.

Together with the excellent type map which was completed in 1940 the completion of this comprehensive study is a technical achievement for which you and Senior Foreman (Forester) Berg may well take great pride. We wish to compliment both of you on the high technical quality, thoroughness and clearness of description, orderly arrangement, skilful draftsmanship, neatness and general excellence of this completed work.

That the type map and narrative description will serve many useful purposes in the conduct of the park forestry program and in furthering the knowledge and interpretation of the vegetation of the Blue Ridge Mountains will become more and more evident with the passing of time.

(Sgd.) F. H. ARNOLD

Fred H. Arnold,
Regional Forester.

cc: The Director
Superintendent, Shenandoah, attention Senior
Foreman (Forester) Berg

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
SHENANDOAH NATIONAL PARK
LURAY, VIRGINIA

BRANCH OF FORESTRY		
	Answered	
	File	
	P. C.	
AUG 4 1941		
✓	Coffman	C
✓	Cook	
✓	Shanklin	S
✓	Thompson	
	Barrows	
	Gibbs	
	McLaughlin	
	De Lucia	

OFFICE OF
SUPERINTENDENT



August 1, 1941

Memorandum for the Regional Director, Region One:

Attention: Regional Forester

There is enclosed herewith two copies of report on Forest Cover Types of Shenandoah National Park. One copy is complete with park section maps and photographs.

In final review of the report, it was found that no reference is made as to the breakdown of total acreage shown in summary tables. The total of 193,490 acres includes approximately 183,330 acres Park lands and approximately 10,160 acres of Shenandoah National Park extension.

J. R. Lassiter
Superintendent

By

R. B. Moore
Assistant Forester

Enclosures

cc: Chief of Forestry, w/copy ✓

RBM/zta