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THE VASCULAR FLORA OF FORT DARLING

by

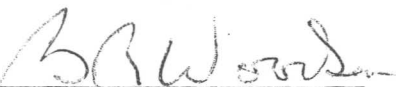
Majida Akhtar Rashid

A Thesis Submitted To The Faculty Of
The Graduate School
Of The Virginia State College
In Partial Fulfillment
Of The Requirements
For The Degree Of
Master of Science

December 12, 1974

Major Subject: Biology

Approved:


Major Professor

Minor Professor

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B.R. Woods
Major Professor

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BIOGRAPHICAL SKETCH

The author, Mrs. Majida Akhtar Rashid, was born at Bahawalpur, Pakistan. She received her high school education from Government Girls High School, Jhelum, Pakistan, graduating in 1950. She completed her undergraduate studies in 1956 from Gordon College, Rawalpindi, Pakistan, the major subjects being botany, chemistry and English. She also received a B. A. degree in history from Punjab University in 1967. The author, during her college time, remained a distinguished student of botany and was President of "Stewart Biological Association."

She was employed by Virginia Department of Agriculture and Commerce as "Seed Analyst" in 1969. She continues to serve the Department of Agriculture. She entered Virginia State College in 1970 for her graduate studies.

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ABSTRACT

Fort Darling in Chesterfield County was selected as a study area for a survey of Vascular Flora Specimen Collection.

A total of two-hundred and twenty-seven specimens were collected and identified. The collection of the plants represents the three seasons of the year, that is from Spring 1972 to Spring 1973.

One-hundred and fifty-seven specimens are reported new for Chesterfield County flora. Seventeen specimens are added as new records for the State of Virginia.

The physical characteristics of the related area were discussed. A complete catalogue of the researched flora is made. The plants were dried, mounted, fumigated and placed in the Herbarium of Virginia State College.

It is hoped that this research will render useful information for the following: (a) those interested in systematic botany of Virginia, and (b) those interested in the life of National Battlefield Parks.

In the Herbarium of Virginia State College at Petersburg, Virginia, 227 species will be housed.

The same process was repeated for summer and fall blooming flora.

All specimens were collected in large sized plastic bags (plants stayed natural and moist and in original condition even after two or three days). The plants were collected in duplicates--one plant of the set was pressed and dried and the second was used for immediate identification. The plants were numbered and identified in individual sets.

The plant analysis/identification was carried out in the laboratories of Virginia State College and seed laboratories of the Virginia Department of Agriculture and Commerce. Their Herbaria were used as references.

The plants were processed and fumigated at the end of three collection seasons -- i.e. spring, summer and fall flora.

REVIEW OF SYSTEMATIC BOTANY OF VIRGINIA SINCE 1668

During the Colonial Days, Virginia was an important center of American Botany. Attention was paid to botany by Banister, Mitchell and Clayton from 1668 to 1773 (Paul R. Merriman - 1930).

In 1762 John Clayton made extensive collections of plants in Virginia for the first published flora of America, "The Flora of Virginia" of the Dutch botanist Gronovious. Clayton's collections were the main source of American plants in Linneaus's "Species - Plantarium" of 1753. This was the beginning of systematic botany in a modern sense. In more recent years, very few reports have been recorded of the flora of Virginia.

E. J. Grimes and wife collected plants on the peninsula of Virginia in the early 1920's. He was a professor at the College of William and Mary, and contained his study to the William and Mary area. The prominent botanists of that time were: B. S. Barton, Fredrick Pursh, Asa Gray, N. L. Britton, John K. Small, Anna Vail and A. A. Heller. Most of their efforts were confined to the Blue Ridge and western Virginia regions.

Baird, J. Rex. Clinch Valley College, working on Tazewell County, Virginia.

Bodking, Narlyn. Madison College (Harrisonburg), working on Rockingham County, Virginia.

Freer, Ruskin S. Lynchburg College, working on Amherst, Augusta, Bedford, Botetourt, Nelson and Rockbridge Counties of Virginia.

Carrol, R. M. Millbora, Virginia. Area unknown.

Harvill, A. M. Longwood College (Farmville), working on remaining Piedmont and Coastal Plain Counties of Virginia.

Johnson, F. Miles. Virginia Commonwealth University, working on Amelia, Chesterfield, Goochland and Powhatan Counties of Virginia.

Mazzeo, Peter M. U. S. National Arboretum (Washington, D. C.), working on Shenandoah National Park.

Mitchell, Richard S. Virginia Polytechnical Institute and State University, working on Alleghany, Craig, Floyd, Giles, Montgomery, Pulaski and Roanoke Counties of Virginia.

Morrow, L. O. Mathematic and Science Center, working on Hanover and Henrico Counties of Virginia.

Ramsey, Gwynn W. (Chairman of Committee), Lynchburg College, working on Amherst, Appomattox, Bedford, Buckingham, Campbell,

1. GEOGRAPHY AND HISTORY OF THE AREA

The site selected for the study in Chesterfield County on the western bluffs of the James River is approximately seventeen acres of woody area, which have man-made trails and trenches. This area is situated on a hill, and its southwestern end has a creek which is quite deep. This area is called Fort Darling at Drewry's Bluff and lies between the coordinates of $37^{\circ} 25' - 13''$ north latitude and $77^{\circ} 25' - 15''$ of west longitude (Virginia Map 1974). The study area is located on the west side of the James River. South of this area is DuPont's Sulphuric Acid Plant west of Interstate U. S. 95.

By studying the "Civil War Times" 1964, it is found that Fort Darling at Drewry's Bluff was the key point in defending the Confederate capital of Richmond ten miles away towards the north. The guns at Fort Darling, manned by Chesterfield farmers, stood off powerful Union monitors and saved Richmond from capture in 1862. Fort Darling is now a part of the Richmond Battlefields although still badly in need of an appropriate approach by land. Civil War batteries and earth works are to be found nearly intact in the wooded area.

FIGURE 1

GENERAL DEVELOPMENT MAP OF FORT DARLING

Issued by: National Battlefield Park Services

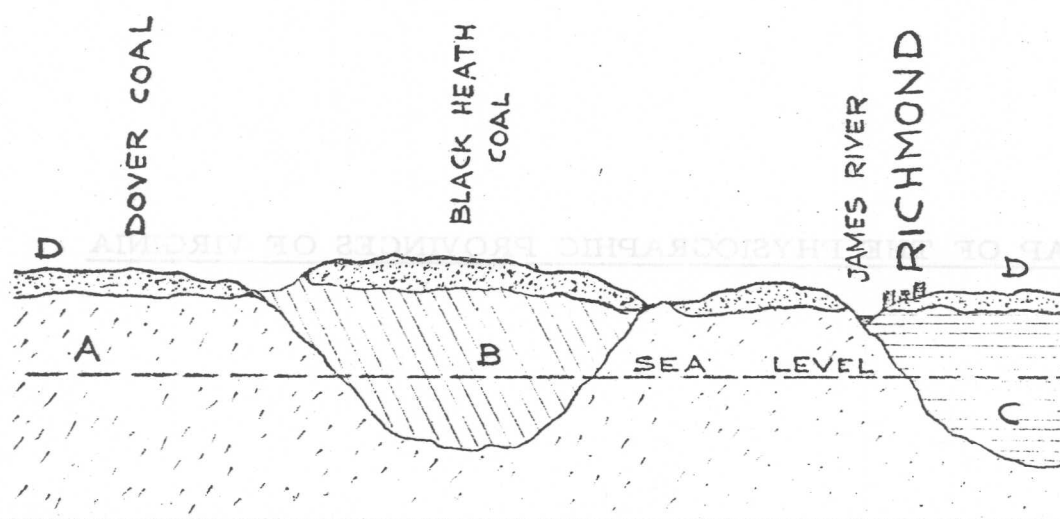
2. GEOLOGY

Richmond and Chesterfield County are situated on two distinct geological provinces, the Piedmont Plateau and the Atlantic Coastal Plains, which are separated by an irregular boundary called the "fall line." The study area lies within the eastern Coastal Plain, which is on the fall line (Richard L. Hoffman - 1969).

The Coastal Plain

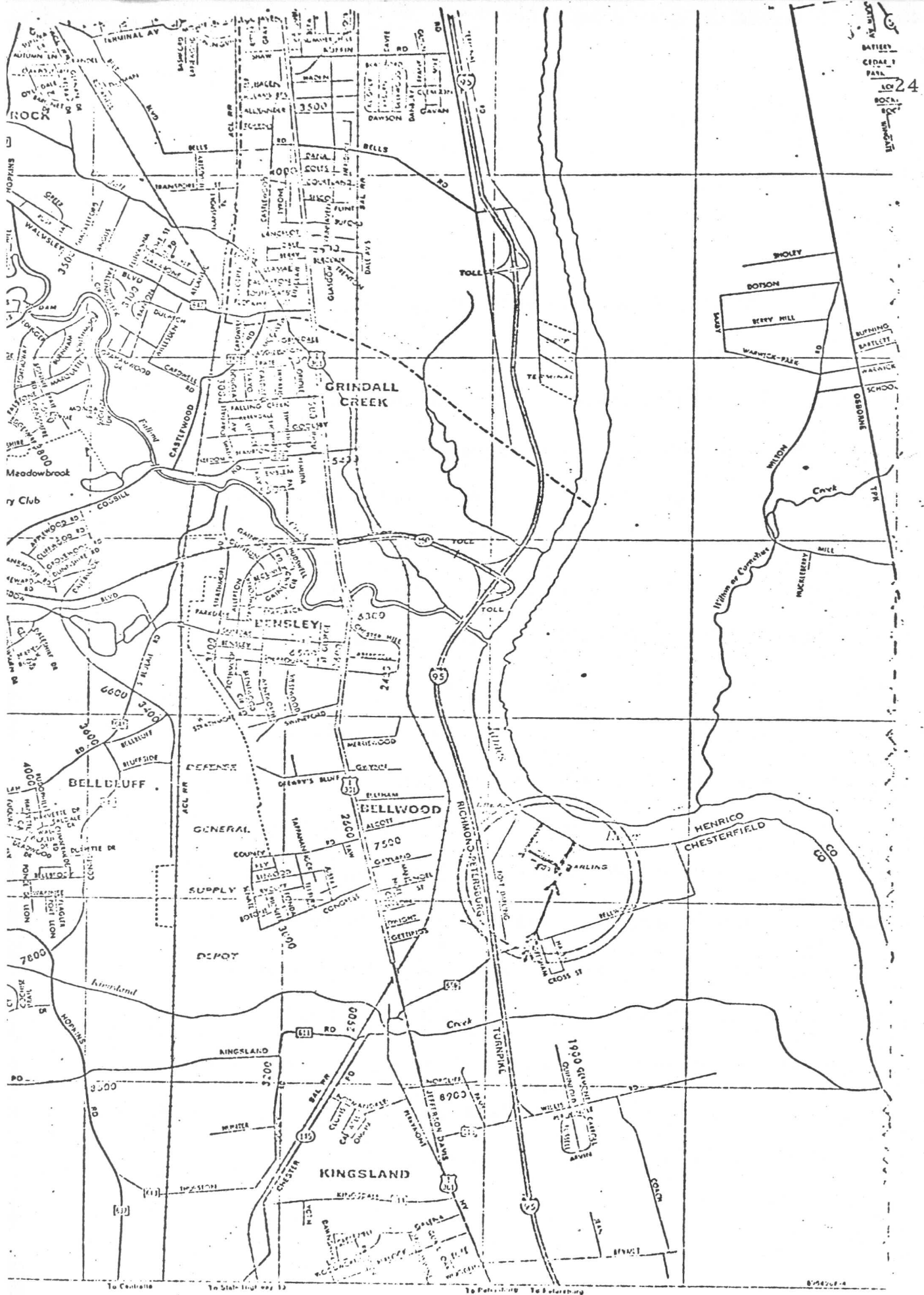
The Coastal Plain is an essentially flat lying region of sands and poorly-consolidated beds of clay, marls, and gravel. It corresponds very closely to the gravels of the part of Virginia known as "Tidewater" since most of the larger streams that cross the Coastal Plain are essentially at base level and are subject to tidal movements. Geologically the region consists of sediments ranging in age from cretaceous to upper Tertiary laid down unconformably upon a basement of crystalline rocks extending eastward from the Piedmont. During the Quaternary glacial periods, an appreciably lower sea level caused a greater seaward extension of the Coastal Plain than is now evident, this fluctuation

GEOLOGICAL CROSECTION
OF THE
RICHMOND BASIN



- A -- GRANITE & GNEISS
 B -- COAL MEASURES
 C -- NEWER MESOZOIC STRATA
 D -- DRIFT

of the formation is not accurately determinable, but may be provisionally stated as 100 feet. The bluffs on the western border of the James River are relatively more liable to decay and erosion. Only here and there is it possible for even the trained observer to trace any very distinct topographic indication of the contact between sedimentary deposits contained in the trough and cretaceous and crystalline rocks of the surrounding country.



13

14

15

16



171C1 loamy and clayey sediments 2-12% slopes: - A

deep to very deep, moderately well-to-well drained land type; developed from loamy and clayey sediments of the Coastal Plains; occupies narrow, gently sloping ridge tops and rolling side slopes on eastern one-third of the county where the study area is situated.

Surface soil: - Light yellowish-brown, sandy loam to loam, six to twenty inches thick; texture ranges from sand to clay loam.

Subsoil: - Yellowish-red to gray, loose to firm sand to clay, usually about twenty-four inches thick; ranges from six to sixty inches or more in thickness.

Substratum: - Yellowish-brown to gray stratified Coastal Plain clays, sands, and gravel; sedimentary beds vary in thickness from a few inches to fifteen feet or more; depth to hard rock twenty to fifty feet or more; depth to water table twenty to forty-five feet.

Supporting properties: - Strongly to very strongly acid and low in organic matter content and natural fertility; permeability: rapid to moderate in topsoil and moderately rapid

FIGURE 5

SOIL SURVEY MAP OF CHESTERFIELD COUNTY

Issued by: Glen Richardson, Chesterfield Soil
Scientist.

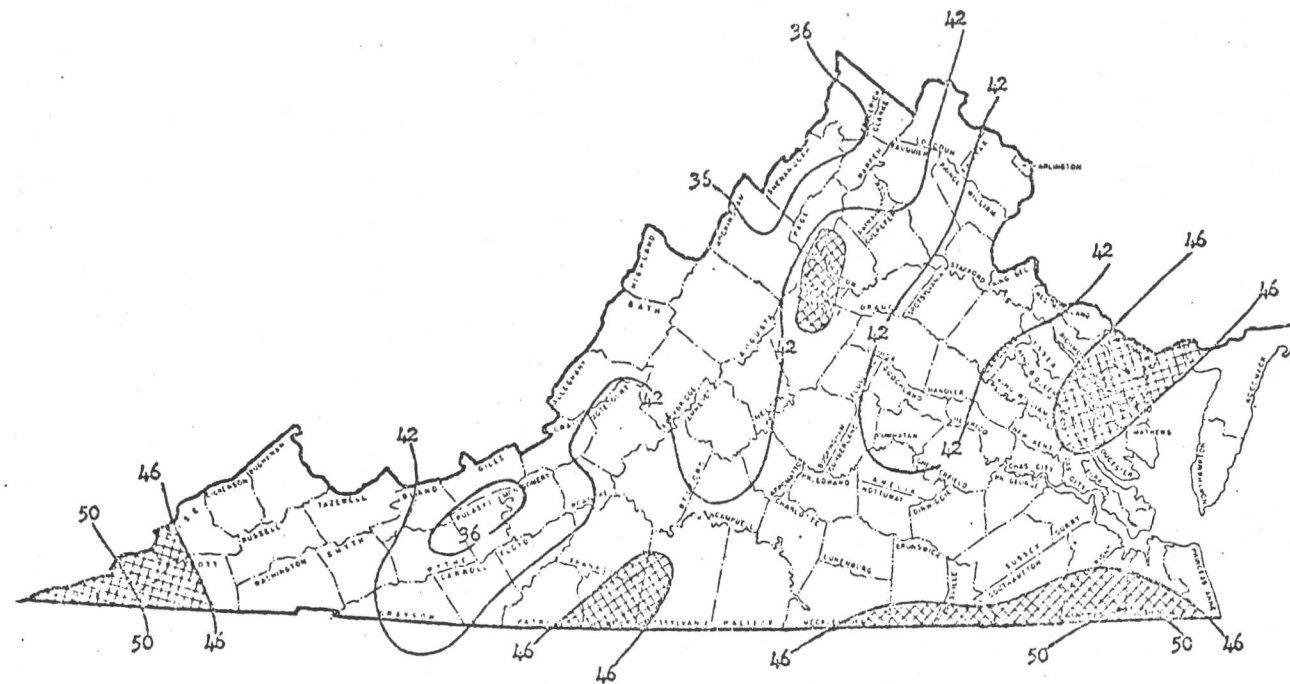
5. CLIMATIC FACTORS

The study area lies on the southeastern Coastal Plain of Chesterfield County. The records show it receives the least amount of snow fall, and so this part receives a relatively greater rain fall as compared to other regions (Richard L. Hoffman - 1969).

The summers are humid and hot; winters are mild as compared to the other parts of Virginia. This part is protected by the mountains on the west from the cold spells.

The waters of the Tidewater region, the Atlantic Ocean and Chesapeake Bay, add to the humid weather in summer and mild temperatures in winter. The temperature rarely falls to zero; the lowest was recorded up to the upper forties. The coldest weather is usually observed in late December and early January, particularly the first of January.

This area usually experiences a snow fall of four inches (average) once or twice a year. Sometimes ice storms in severe winters break off few trees, which are not harmful, as this area is unattended.



Average annual precipitation in Virginia. For clarity, only arbitrarily selected isophenes are mapped. Areas receiving over 46 inches of precipitation are shaded.

FIGURE 7

DISTRIBUTION OF THE GROWING SEASONS IN VIRGINIA

Taken from: "The Biotic Regions of Virginia",
by Richard L. Hoffman (1969 Bulletin).

FIGURE 8

DISTRIBUTION OF FOREST REGIONS IN VIRGINIA

Taken from: "The Biotic Regions of Virginia",
by Richard L. Hoffman (1969 Bulletin).

DISTRIBUTION OF FLORA

The study area lies on the fall belt. The vegetation of this area is a typical mixture of plants belonging to two physiographic provinces, such as: Piedmont Province and Atlantic Coastal Plain, which are represented by oak pine forest and southeastern evergreen respectively (Braun - 1950).

The oak-pine forest is correctly considered by Braun as a transitional between Appalachian forest and the evergreen region of the southeast. The soil of the study area is good for timber production and evergreen forest. Piedmont elements are represented within Coastal Plain vegetation by Cornus amomium and Quercus rubra. The evergreens are mixed with hardwood forest in this region. Adapted forest species are loblolly pine, scrub pine, short leaf pine, red oak, white oak, yellow poplar, tulip poplar, elms, birch, tree of heaven, dogwood and American holly.

There are more plants around the trails than in the thicket of the forest. The lowlands are dominated by the profuse growth of honeysuckle vine and the ledges are covered with Rubus spp.

The presence of the James River in this area creates a micro-climate. Transition in flora on the wet bluffs from one season to the next is not distinct.

Dry Bluffs

Dry bluffs exhibit a number of different stages in plant succession. Lichens, mosses, annual and perennial plant growth is evident in this region. This situation grades into deeper soil and true upland forest composed largely of Carya spp. and Quercus spp. The most dominant flowering species are: Amelanchier spp., Prunus spp., and Cornus florida. Dry bluffs can be divided into a number of categories.

(a) Hardwood Forest -- The major part of the present natural vegetation of the upland forest consists of hardwood forest such as Carya spp., Quercus spp. Less frequently occurring are Liquidamber styraciflua, Quercus rubra. The trees are variously spaced, and the canopy is somewhat open.

(b) Mixed Pine and Hardwood Forest -- Hardwood, mostly oaks, mixed with pine forest is a typical representation of the Atlantic Coastal Plain.

This area has a variety of habitats on moist to dry site. The plants found are Pinus taeda, Quercus spp., Cornus

A CATALOGUE OF VASCULAR FLORA

Aceraceae

*Acer pensylvanicum L. 4/29/72

*Acer rubrum L. 6/7/72

Aizoaceae

*Mollugo verticellata L. 7/23/72

Amaranthaceae

*Amaranthus spinosus L. 6/20/72

Anacardiaceae

*Rhus copallina L. 8/15/72

Annonaceae

*Asimina parviflora (Michx.) Dunal. 8/20/72

Apocynaceae

*Appocynum androsaemifolium L. 8/4/72

Appocynum cannanbium L. 5/29/74

*Vinca minor L. 4/13/73

*New County record

**New State record

Celastraceae

Euonymus americanus L. 6/3/72

Chenopodiaceae

*Chenopodium album L. 5/9/72

*Chenopodium ambrosoides L. 8/15/72

Cletheraceae

Clethra alnifolia L. 6/11/72

Commelinaceae

*Tredescantia virginiana L. 5/30/72

Compositae

*Archillea millefolium L. 5/29/72

*Ambrosia artemisiifolia L. 9/3/72

*Antenaria plantaginifolia (Richards) L. 4/29/72

*Aster ericoides L. 8/29/72

*Aster infirmus Michx. 7/9/72

**Aster solidagineus Michx.

*Baccharis halimifolia L. 10/1/72

*Bidens bipinnata L. 8/20/72

*Chonodrophora nudata Michx. 6/2/72

Chrysogonum virginianum L. 5/7/72

**Solidago serotina Ait. 12/12/72

Teraxacum officinale Weber 1/12/72

**Thelsperma trifidum (Poir) 6/11/72

*Verbesina occidentalis (L.) Walt. 8/15/72

*Verbesina virginica L. 8/15/72

Veronica noveboracensis Willd. 8/22/72

*Xanthium stumarium L. 7/15/72

Convolvulaceae

*Ipomea coccinea L. 10/2/72

*Ipomea hedraceae Jacq. 8/22/72

*Ipomea locunosa L. 8/30/72

*Ipomea purpurea (L.) Roth. 8/22/72

Cornaceae

*Cornus amomium Mill. 6/3/72

*Cornus florida L. 4/29/72

Corylaceae

*Alnus serrulata (Ait.) Willd 12/5/72

*Betula nigra L. 7/11/72

*Caprinus caroliniana Walt. 6/20/72

*Ostrya virginiana (Mill.) K. 12/5/72

Fabaceae

- *Albizia julibrissin Durrantzini 8/12/72
- Cassia fasciculata Michx. 8/12/72
- *Cassia nictitans L. 7/31/72
- Cercis canadenses L. 6/20/72
- *Desmodium glabellum (Michx.) Dc. 8/15/72
- *Lespedeza violaceae (L.) Persh
- *Lespedeza virginica (L.) Britt. 9/17/72
- *Melilotus alba Desv. 9/2/72
- **Psoralea penduncata (Mill.) Vail. 7/20/72
- *Robinia pseudoacacia L. 5/19/72
- Stylosanthes riparia Kear. 7/20/72
- *Trifolium arvense L. 5/18/72
- *Trifolium dubium Sibth. 6/5/72
- *Trifolium pratense L. 6/3/72
- *Trifolium procumbens L. 5/23/72
- *Vicia angustifolia Richard 5/18/72
- Vicia hirsuta L. 4/24/72

Fagaceae

- *Quercus alba (L.) White 8/16/72
- *Quercus coccinia Muench 9/28/72

Iridaceae

*Sisyrinchium arenicola Bickm. 6/22/72

Jugalandaceae

*Carya aquatica (Michx.) Nutt 9/23/72

Carya ovata (Mill.) K. Koch. 5/6/72

Juucaceae

*Juncus tenuis Willd. 6/31/72

Labiataeae

*Lamium amplexicaule L. 4/3/73

*Prunella vulgaris L. 7/31/72

*Pycnanthemum flexuosum (Walt.) BSP 6/11/72

Liliaceae

*Allium ampeoloprasm L. 5/29/72

*Allium canadensis L. 6/4/72

*Asparagus officinalis L. 6/26/72

Hemerocallis flava L. 2/21/72

Polygonatum biflorum (Walt.) Ell. 7/16/72

*Smilacena racemosa (L.) Desf. 6/3/72

Smilex herbaceae L. 2/21/72

*Smilex hispida Muhl. 3/5/72

Phrymaceae

*Phryma lapostachya L. 8/15/72

Phytolacacea

*Phytolaca americana L. 6/11/72

Pinaceae

*Pinus rigida Mill. 5/23/72

*Pinus serotina Michx. 5/23/72

*Pinus taeda L. 9/6/72

*Pinus virginiana L. 4/29/72

Plantaginaceae

*Plantago lanceolata L. 8/2/72

*Plantago virginica L. 4/29/72

Plantanaceae

*Platanus occidentalis L. 9/23/72

Polygonaceae

*Polygonuum aveculare L. 7/28/72

*Polygonuum caespitosum Blume. 4/24/72

Polygonuum lapathifolium L. 7/23/72

*Polygonuum persicaria L. 10/15/72

**Rumex acetosa L. 4/29/72

Resedaceae

**Reseda alba L. 8/15/72

Rosaceae

*Amelanchier canadensis (L.) Medicus 6/3/72

*Crataegus phaenopyrum (L.) Medicus 4/20/72

*Geum virginianum L. 7/16/72

*Potentilla canadensis L. 4/23/72

*Potentilla simplex Michx. 5/23/72

**Potentilla virginiana L. 12/12/72

**Prunus malus L. 4/8/72

*Prunus virginiana L. 4/29/72

*Rubus frondosus Bigel. 6/3/72

**Rubus pubescens Raf. 5/30/72

Rubiaceae

Galium tinctorum L. 6/22/72

*Houstonia caerulea L. 4/29/72

*Houstonia purpurea L. 6/4/72

*Michella repens L. 6/3/72

*Sherardia arvense L. 7/20/72

Salicaceae

*Populus deltoides Marsh. 9/28/72

Ulmaceae

*Celtis occidentalis L. 9/23/72

*Ulmus alata Michx. 9/28/72

*Ulmus americana L. 9/28/72

Umbelifereae

*Cryptotaenia canadensis L. 6/20/72

Senicula canadensis L. 8/15/72

Utricacea

*Boehmaria cylindrica (L.) Sw. 7/20/72

*Laportea canadensis (L.) Wedd. 6/8/72

Violaceae

Viola fimbriatula Sm. 9/18/72

*Viola primulifolia L. 4/29/72

*Viola septemloba House 5/7/72

*Viola sororia (Willd.) 4/29/72

Vitaceae

Vitis rotundifolia Michx. 6/26/72

Vitis vulpina L. 6/3/72

The total number of specimens collected were 227, of which 70% are the new County records and 7.5% are the new State records.

Table II shows the distribution of the species by major groups of vascular plants.

TABLE II

MAJOR COMPONENTS OF THE FLORA OF
FORT DARLING, CHESTERFIELD COUNTY, VIRGINIA

Major Groups	Families	Genera	Species
Pteridopytes	1	6	7
Gymnosperms	2	2	5
Dicotyledons	7	17	20
Monocotyledons	58	129	195
Total	68	154	227

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ACKNOWLEDGMENTS

The author owes many thanks to all who made the preparation of this report pleasant and enjoyable. I wish to thank especially Dr. Bernard Woodson for his kind guidance as my major professor. Others I wish to thank who helped in many ways are: Mr. Duane Pearson of National Battlefield Parks (Richmond, Virginia) for helping to get a permit to collect the specimen; Dr. Gwynn Ramsey of Lynchburg College for providing the information about the Academy of Science working on Virginia Flora; Dr. Miles F. Johnson of Virginia Commonwealth University for providing the writer with an up-to-date list of Chesterfield County plant identifications; Mr. Glenn Richardson, Soil Scientist for Chesterfield County for providing information about Chesterfield soils; Mr. Harry L. Smith, Supervisor, Seed Lab of Virginia Department of Agriculture and Commerce and the friends working in the Seed Lab who helped me to prepare this report. Last but not least I wish to include my loving husband, Mr. Raja R. Rashid and my children; with their help and encouragement I was able to write this report.

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INTRODUCTION

The objective of this research was to set forth the results of a study of the Vascular Flora of Fort Darling at Drewry's Bluff, a National Battlefield Park situated in Chesterfield County, Virginia. Fort Darling is a representative section of Virginia considering its historical and geographic significance relative to Civil War due to its location on the Fall Belt where the Coastal Plain and Piedmont sections meet in Virginia.

On researching previous floral history, it was found that very little work had been done on flora identification within this region. What information of the flora of Fort Darling and its vicinity that has been sighted pertained to the early 1930's. A catalogue published by A. B. Massey was found to be a good basis of information on distribution of the plants of Virginia, but information on the subject area will be the first one of its kind.

The author of this study considered it of interest in expanding collection and identification of the naturally existing vascular flora of Fort Darling in Drewry's Bluff (Chesterfield County, Virginia) and preparing a catalogue of the identified plants.

PROCESS AND PROCEDURE OF STUDY

The study was initiated in the Spring of 1972 and lasted for one year. The area was objectively toured. The greenery and plant foilage were in great profusion. Since plucking or picking of any flower or plant is prohibited in well-preserved historical parks and battlefields, it was essential to obtain permission for collection of specimens of the vascular flora of Fort Darling.

The Department of Interior of United States Government was approached, and after the intent of the study was explained to the authorities, the superintendent of the National Battlefield Parks (Richmond, Virginia, Office) issued a permit to carry out the research work on the condition that the author will provide a copy of the thesis for the Park Library.

Plant collection trips were arranged twice a week. This frequency was increased as the spring flora blossom climaxed. All segments (low lands, river bed, wet and dry bluff) surrounding Fort Darling were included for the plant collection. An extreme effort was made to collect all available vascular flora in the subject area. The process of collection was kept in progress throughout the entire spring season. On expiration of the spring season, the collection of the spring flora was terminated.

P L A N T S C O L L E C T I N G P E R M I T

United States Department of the Interior
National Park Service

COLLECTING PERMIT

CLASS A

In Accordance with the Conditions and Restrictions Appearing on the Back Permission
is Granted

Name of Collector	Area	Date Issued
Majida Rashid	Fort Darling - Richmond NBP	5-1-72
To Collect the Following Specimens		
Plants		
Locality of Collecting Limited to		Expiration Date
Fort Darling		April 30, 1973
Special Conditions or Restrictions		
A copy of the thesis will be placed in the Park Library.		
Approved (Signature)	Title	
Stuart H. Maule <i>Stuart H. Maule</i>	Superintendent	

• Two classes of collecting may be conducted under this permit:

Class A - That required for public exhibits and for research undertaken by persons who can establish their connection with public museums or other scientific or educational institutions. Specimens collected may be insects (Hexapoda), spiders (Araneida), plants, rocks, or minerals, as designated in the permit.

Class B - That undertaken by Federal employees only for scientific or educational purposes. Specimens collected may be plants, rocks, minerals or animal life as designated in the permit.

The collecting of endangered or vanishing species of animals, if permitted at all, will be allowed only where the required approval has been obtained from the Director of the National Park Service

THIS PERMIT MUST BE CARRIED AT ALL TIMES WHILE COLLECTING. SEE REVERSE FOR CONDITIONS AND RESTRICTIONS.

Issued by United States Department of the
Interior --- National Park Service

Professor A. B. Massey first suggested forming a committee in a letter dated February 16, 1926. Finally Botanical Division of the Biological Section of the Academy of Science appointed a committee in May 1926 to undertake seriously the preparation and ultimate publication of a "Flora of Virginia". This committee consisted of A. B. Massey, W. D. Hoyt, P. A. Warren, and I. F. Lewis. The committee members changed from time to time with the addition of R. P. Carrol, Ruskin S. Freer, and Robert F. Smart. Finally Paul R. Merriman, in 1930, published "Flora of Richmond and Vicinity".

In 1933 M. L. Fernald began an investigation, that lasted for a decade, of the flora of southern Coastal Plains of James River, and this publication remains the best known in the state.

A. B. Massey published a second catalogue of "Virginia Flora" in 1961. In 1970 "Spring Flora of Virginia" was compiled by Dr. A. M. Harvill, Jr. Longwood College, Farmville, Virginia. Virginia Flora Committee of Virginia Academy of Science worked toward preparing a catalogue on Virginia Flora covering the entire state. The collections were done all over the state by volunteers. Following are the present members of the Virginia Flora Committee of the Academy of Science.

Charlotte, Franklin, Halifax, Henry, Lunenburg, Nelson, Patrick, and Pittsylvania Counties of Virginia.

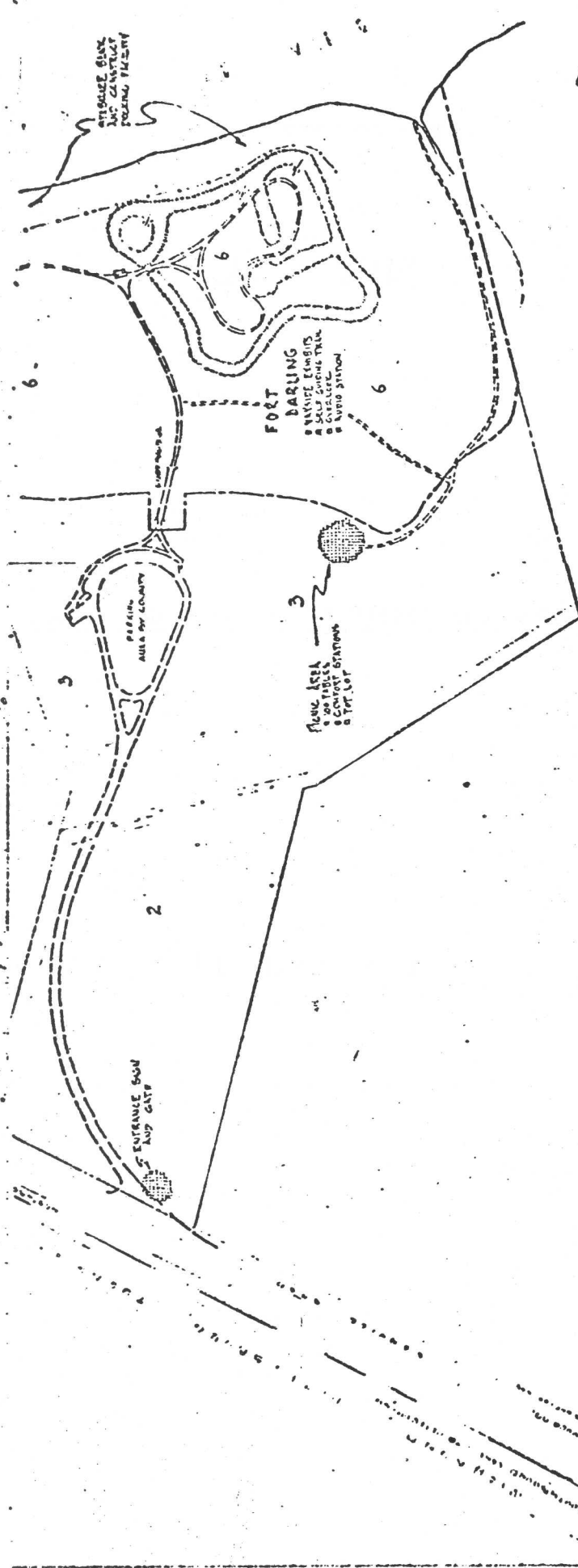
Stevens, Charles E. Charlottesville, Virginia, working on Albermarle County, West, Southwest and Northwest Virginia.

In March 1973, "The Flora of Pittsylvania," compiled by William Hathaway of Danville and Dr. Gwynn Ramsey of Lynchburg College, was published in Castanea: The Journal of Southern Appalachian Botanical Club.

Dr. Miles F. Johnson is presently working on Chesterfield and adjoining counties. Mr. Duane Pearson of the National Battlefield Park Services informed the writer that no one has done plant identification work previously on the Fort Darling Flora.

The author's identification of this specific Battlefield area, which constitutes approximately seventeen acres, may be of some help to Dr. Miles Johnson in completing his work on Chesterfield County and add a bit to the history of the National Battlefield Parks.

The steep banks on both sides of the James River are called Bluffs, and the particular area of this study is called Drewry's Bluff, after ^{Captain} General Drewry. The references show that the name Fort Darling was given by the Federals. The battle of Drewry's Bluff was fought in 1862 in the time of Republican President Abraham Lincoln, and was won by the Confederates. Federal gun boats were ^{turned back,} destroyed, so Richmond was saved.



is demonstrated by deep submerged river valleys that cut across the bottom of the Chesapeake Bay and some of the larger estuaries. Physiographically the Coastal Plain has been divided into the Atlantic and Gulf regions.

Fall Line

The "fall line" is described as the boundary between the Piedmont Plateau and the Coastal Plain. From west to east beginning at the base of the so-called Fall Belt that extends from Great Falls to Fredericksburg to Richmond and southwestward, a number of progressively lower wave-cut terrace levels are distinguishable and have been given names derived from areas of classical exposure. The rock structure of Piedmont is resistant and strong, whereas the consolidated plain is constituted of weaker cretaceous and unconsolidated rocks. Due to this contact of the plains, the river descends from Piedmont Plateau onto the Coastal Plain.

Geologically the surface of the basin is that of roughened plain on low level land which is somewhat intersected by lesser streams and is divided by the relatively broad and deep gorge of the James River. The James River and Appomattox River which cross the area have cut trenches 100 to 200 feet deep. The course of the James River exhibits the most marked

FIGURE 2

GEOLOGICAL CROSSECTION OF THE RICHMOND BASIN

Taken from: "Geology of The Richmond Basin"

-- by N. S. Shaler and J. B. Woodworth.

FIGURE 3

MAP OF THE PHYSIOGRAPHIC PROVINCES OF VIRGINIA

Taken from: "Virginia Flora" - published by
A. B. Massey (1961).

3. TOPOGRAPHY

The topography of Fort Darling in Chesterfield County is a rolling type. The study area is situated on the line where the Piedmont Plateau and Coastal Plain blend; therefore it will have the qualities of both biotic regions--i.e. Piedmont Plateau and Coastal Plain.

The study area is situated on the bluff on the western end of the James River. This area seems to have no connection to any stream coming from outside, but water drains into a self-made trench and finally into the river. Water comes and goes into the trench as a result of the tide of the James River.

The Coastal Plain towards its western margin in Chesterfield County shows a rolling topography, but towards its eastern edge shows somewhat flat topography; however, the study area lies on the bluff on the western bank of the James River.

The bluff shows the presence of coal beds. Newark strata lie upon the coal bed; shales are also found in this area. The sandstones of this group are often heavily bedded. They are brown loam, but due to the recent surface changes, some places are white if they are not colored by iron oxides. The thickness

FIGURE 4

RICHMOND CITY MAP

By: American Oil Company -- "Area of study
designated by a dark square in the double circle."

4. SOILS

There are approximately eighty different kinds of soil in Chesterfield County (Mathews - 1970). They have developed from parent materials weathered from old sediments of Triassic sandstones and shales, Igneous and Metamorphic Piedmont granites, granite gneiss, schist, and various river terrace and Coastal Plain sedimentary deposits. Each is different in its physical, chemical and biological characteristics. These characteristics affect the suitability of different soils for agricultural, suburban or engineering uses.

Most of the soils in Chesterfield County have developed under forest vegetation and have light colored sandy surfaces which are low in organic matter. Soils developed in similar materials, but under grassland vegetation, have dark surfaces and contain larger amounts of organic matter.

Out of eighty kinds of soil in Chesterfield County, there are two types in the study area--171C1 and 17C2. The soil symbol may be broken down into three basic parts with each part telling something about the landscape of the area represented. The symbol 17C2 is broken down as follows:

to very slow in the subsoil and substrates; workability is fair and moisture-supplying capacity moderate to low.

Agricultural suitability: - Poor for pasture; unsuited for crops and vegetables and nursery sites.

Forest suitability: - Good to very good for timber production...site index of thirty to ninety for loblolly pine; adapted forest species: loblolly pine, Virginia pine, short-leaf pine, red oaks, white oaks, and yellow poplar; loblolly pine suited to use in establishing new plantations. Poor for homesites, basements, foundations, cemeteries, sanitary landfills, roadways, septic tanks, drainfields, lawns, and shrubs; topsoil is poor for use in landscaping.

Problem summary: - Erosion difficult to control in road ditches because of stratified sediments; some "slipping clays" may be found on steep slopes; not stable in deep cuts or excavations.

17C2 Caroline fine sandy loam, 6-12% slopes, eroded:-
Occupies rolling side slopes. Having a thinner profile and moderate surface erosion; less suited to most uses because of slope and erosion; surface run off moderately rapid and erosion potential moderately severe.

PRELIMINARY SOIL SURVEY
BY GLEN RICHARDSON (7-18-72)
SCALE = 1" = 400'

29

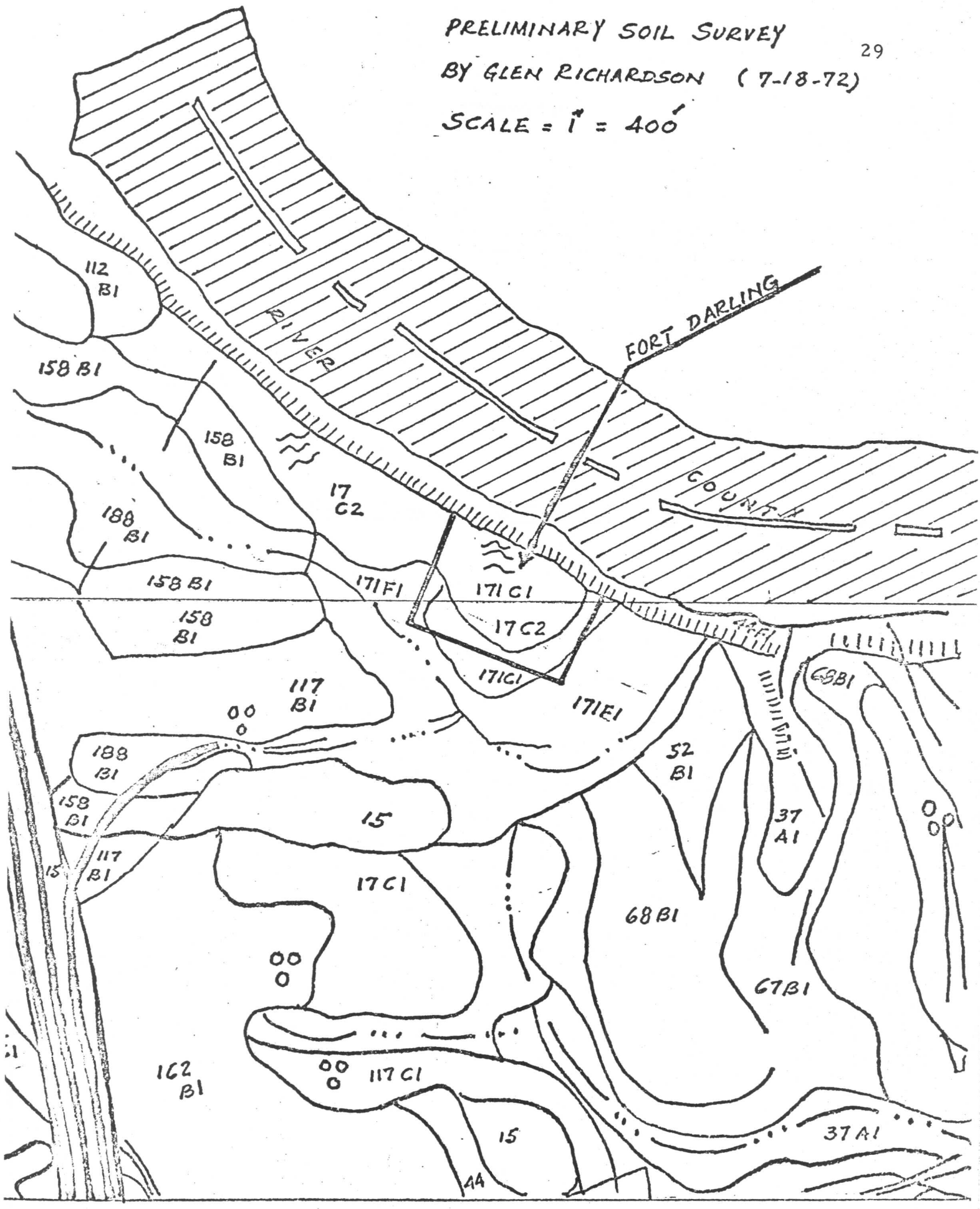


FIGURE 6

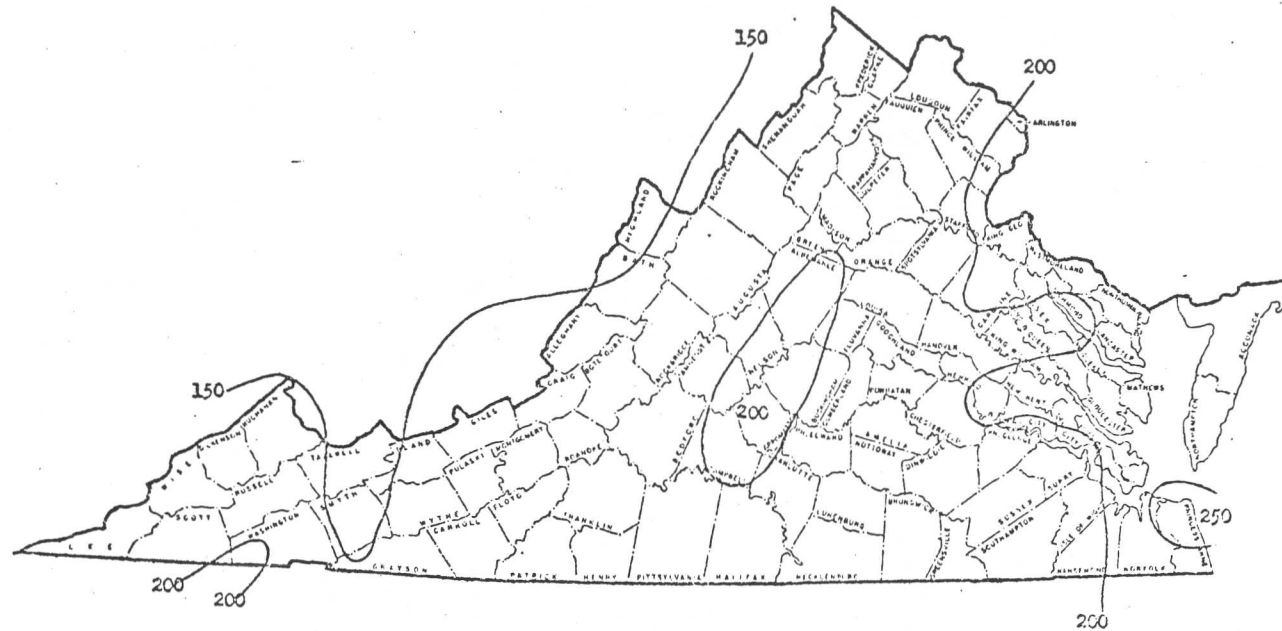
MAP OF ANNUAL PRECIPITATION IN VIRGINIA

Taken from: "The Biotic Regions in Virginia",
by Richard L. Hoffman (1969 Bulletin).

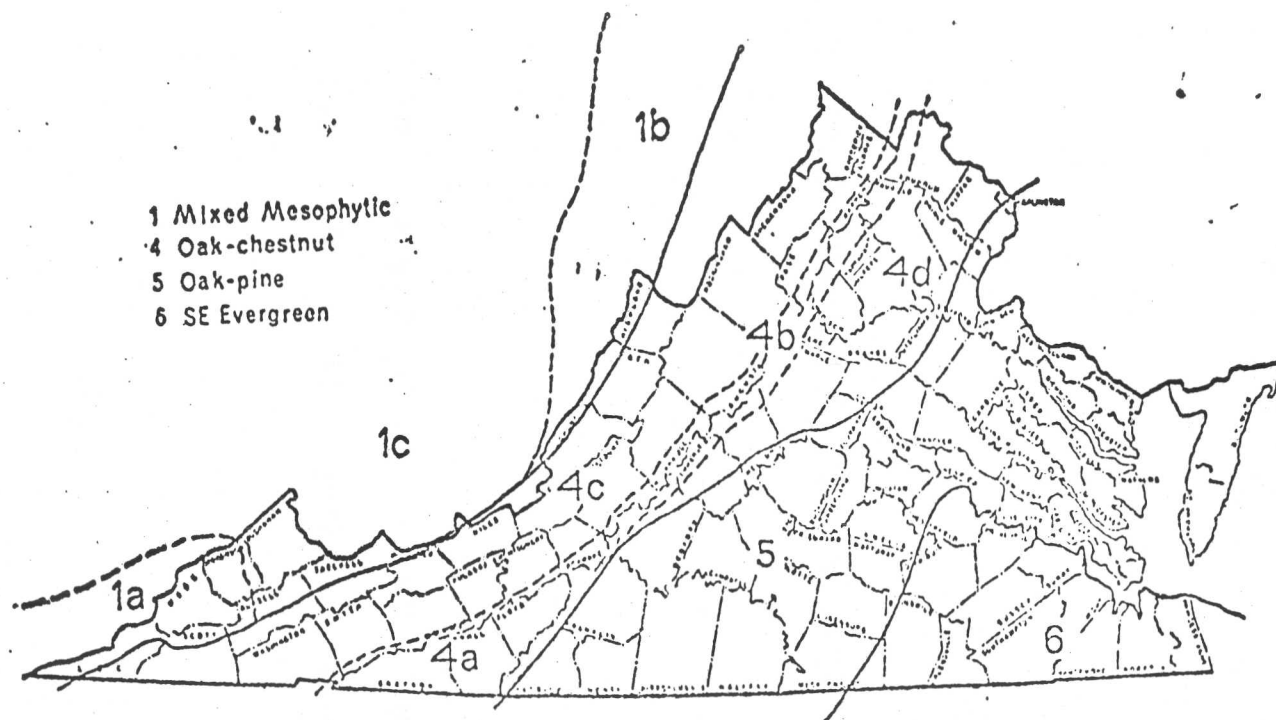
6. GROWING SEASONS

To a considerable extent, the thermal characteristics of a given region are reflected by the number of frost-free days per annum, or by the length of the growing seasons. The growing season in Virginia's counties last from 150 to 200 days.

The area of study is at the end in the 200 days growing season; this means that the weather stays rather mild in winter, which keeps the frost away (Richard L. Hoffman - 1969).



Distribution of the length of growing season in Virginia. Only three isophenes are mapped in order to indicate the major pattern and avoid an overcrowded map. As emphasized in the text, the shorter growing season interval is undoubtedly more extensive in the mountains than suggested by the "less than 150 days" isophene, and the area so characterized doubtless in fact extends southward into North Carolina instead of ending, as shown here, in Grayson County.



The distribution of forest regions in Virginia, after Braun, 1950, and with the same index numbers. 1a, Cumberland Mountains; 1b, Alleghany Mountains; 1c, Cumberland & Alleghany Plateaus. 4a, Southern Appalachian Section; 4b, Northern Blue Ridge Section; 4c, Ridge & Valley Section; 4d, Piedmont Section, of the Oak-Chestnut Forest Region. 5, Oak-Pine Region, Atlantic Slope Section. 6, Southeastern Evergreen Forest Region. The general distribution of many of these sections invites comparison with physiographic regions, Figure 1.

The upland can be classified into dry bluffs and the lowland creek area into wet bluffs, as the whole area is situated on the bluffs on the western bank of the James River.

Wet Bluffs and Ledges

Due to the presence of moisture, this area is rich in plants, moderately deep soils, comparatively cool air due to the dense canopy of the dense undergrowth of the trees and shrubs. The floor is covered with the profuse growth of honeysuckle, while the ledges are covered with Rubus spp. The deep trench usually fills it up with water and appear like a creek when it rains and with the tide in the James River. One can find bluets, Polygonatum biflorum, Mitchilla repens, Houstonia spp., viola spp., Euonymus americanus, Euphorbia spp., Smilacena recemosa, Smilex spp., and this area is rich in Polygonaceae and several spp. of ferns.

On the wet bluffs, with a somewhat flat floor, one can find Ranunculus spp., some composites such as Eupatorium spp., Bidens spp., Erigeron spp., and Asters.

The canopy trees are Celtis spp., Liriodendron tulipifera, Quercus nigra, Cornus florida, young maples and elms.

spp., Vaccinium spp., Clethra alnifolia and of course vines such as Lonicera japonica have grown occasionally along with grasses and sedges.

On the moist site of the mixed woods one can find Carya spp., Liquidamber styraciflua, Pinus serotina, Pinus taeda, Quercus spp., Vitis rotundifolia, and Smilex spp. are usually

Trails

The plants grow in abundance on both sides of the trails. These belong to the families of Brassicaceae, Chenopodiaceae, Euphorbiaceae and Convolvulaceae and are usually seen in mid-summer. Most of the representatives of the family compositae as black eyed susan, dandelions and thistles are more productive in summer.

Aquifoliaceae

*Illex opaca Ait. 5/23/72

Aristolochiaceae

*Asarum canadense L. 6/3/74

Balsaminaceae

*Impatiens capensis Meerb. 6/20/72

*Impatiens pallida Nutt. 8/15/72

Boraginaceae

Lithospermum arvense L. 4/18/72

Campanulaceae

*Specularia perfoliata L. 6/20/72

Caprifoliaceae

*Lonicera japonica Thunberg. 4/6/72

Sambucus canadensis L. 6/11/72

Caryophyllaceae

*Silene caroliniana (Michx.) Fern 9/29/72

*Stellaria media (L.) Cyrill. 4/3/73

*Stellaria pubera Michx. 4/23/72

- *Cichorium intybus L. 7/14/72
- *Cirsium vulgare (Savi) 5/29/72
- **Conyza floribunda HBK 8/1/72
- **Elephantopus canadensis (L.) Willd 8/15/72
- Elephantopus tomentosus L. 8/15/72
- *Erigeron annuus (L.) Persh. 9/26/72
- *Erigeron canadensis (L.) Willd 8/4/72
- *Eupatorium aromaticum L. 8/7/72
- *Eupatorium hyssopifolium L. 9/17/72
- *Eupatorium purpureum 8/15/72
- Eupatorium rotundifolium L. 7/9/72
- *Galinsoga ciliata (Raf.) Blake 5/25/72
- *Gnaphalium obtusifolium L. 9/21/72
- *Hypochoeris radicata L. 5/9/72
- Lactuca canadensis (L.) Willd 7/16/72
- Mikania scandens (L.) Willd 8/15/72
- *Rudbeckia hirta L. 7/9/72
- Senecio obovatus Muhl. 5/6/72
- *Senecio smallii Britt. 5/6/72
- *Solidago boottii Hook. 10/22/72
- Solidago juncea Ait. 8/20/72
- Solidago odora Ait. 8/22/72

Crucifereae

- **Brassica campetres L. 4/23/72
 *Lepidium virginicum L. 5/20/72
 *Thlaspi arvense L. 6/7/72

Cupressaceae

- Juniperus virginiana L. 4/29/72

Cyperaceae

- *Cyperus lancastris Porter. 7/16/72

Ericaceae

- *Chimaphila maculata (L.) Persh 6/26/72
 *Gaylussacia dumosa (Andr.) T.B. 4/29/72
Kalmia latifolia L. 4/29/72
 *Rhododendron nudiflorum (L.) Torr. 4/23/72
 *Vaccinium corymbosum L. 5/6/72
 *Vaccinium staminum L. 5/21/72
 *Vaccinium vacillan Torr.

Euphorbiaceae

- *Euphorbia corollata L. 8/22/72
Euphorbia maculata 7/26/72
 *Euphorbia polygonifolia L. 7/16/72

*Quercus merilandica Muench 6/4/72

*Quercus nigra L. 6/4/72

*Quercus phellos L. 7/20/72

*Quercus rubra Michx. 9/23/72

*Quercus velutina Lam. 6/4/72

Geraniaceae

*Geranium carolinianum L. 5/23/72

Gramineae

*Bromus tectorum L. 8/1/72.

*Digitaria sanguialis (Scop.) L. 8/6/72

*Elusine indica (L.) Gaertn 7/23/72

*Eragrostis curvula (Schrader) Nees. 7/30/72

*Panicum depauperatum Muhl. 7/23/72

Panicum lanuginosum Ehl. 6/4/72

*Setaria fabarii Hrrum. 8/2/72

Setaria viridis (L.) Beauvois 8/6/72

Guttifereae

*Ascyrum hypericoides L. 8/15/72

Hamamelidaceae

Liquidamber styraciflua L. 4/29/72

Magnoliaceae

- *Magnolia virginiana L. 6/4/72
*Liriodendron tulipifera L. 7/26/72

Malvaceae

- *Abutilon jheophrasti Medic. 8/22/72
Sida spinosa L. 8/1/72

Melastomaceae

- Rhexia virginica L. 7/20/72

Nyssaceae

- *Nyssa sylvestica Marsh.

Onagraceae

- Ludwigia alternifolia L. 8/12/72
*Onothera lacinata Hill. 6/26/72

Orchidaceae

- *Cypripedium acaule Ait. 4/29/72
*Malaxis unifoliata Michx. 6/26/72

Oxalidaceae

- Oxalis dillenii Jacq. 5/23/72
*Oxalis stricta L. 5/9/72

*Rumex conglomeratus Murr. 5/23/72

*Rumex crispus L. 5/23/72

Rumex hastatulus Baldeo. 5/23/72

Rumex obtusifolius L. 6/3/72

Polypodiaceae

*Asplenium platyneuron (L.) Oakes 6/20/72

*Athyrium thelypteroides (Michx.) Desv. 2/21/72

*Dennstaedtia punctilobula (Michx.) Moore 4/29/72

Onoclea sensibilis L. 6/20/72

Polystichum acrostichoides (Michx.) Schott. 5/22/72

*Thelypteris hexagonoptera (Michx.) Weatherby. 6/11/72

Thelypteris noveboracensis (L.) Nieuwl. 6/20/72

Portulacaceae

Claytonia virginica L. 4/23/72

*Portulaca oleracea L. 7/23/72

Primulaceae

*Anagallis arvensis L. 6/2/72

Ranunculaceae

*Ranunculus balbosus L. 4/23/72

*Ranunculus ficaria L. 5/7/72

Saxifragaceae

Heucheria americana L. 4/23/72

Tiarella cordifolia L. 6/4/72

Scrophulaceae

**Aureolaria flava (L.) Farewell 6/3/72

*Linaria canadensis L. 8/15/72

*Paulownia tomentosa (Thumb.) Steud. 8/3/72

*Penstemon hirsutus (L.) Willd. 6/4/72

Verbascum thapsus L. 7/9/72

Simaroubaceae

**Alianthus alitissima (Mill.) Swingle 7/26/72

Solonaceae

*Solanum carolinense L. 7/23/72

*Solanum nigrum L. 6/20/72

Texaceae

*Taxus canadensis Marsh. 8/29/72

Tiliaceae

**Tilia europeae L. 10/3/72

SUMMARY

Little attention has been paid to Chesterfield County flora. This will be indicated by the summary in Table I.

TABLE I

COMPARATIVE DATA FOR COUNTY DISTRIBUTION OF
FAMILIES AND SPECIES*

Area	Number of Families Recorded	Number of Species Recorded
State of Virginia	155	3610
Combined Seven Counties	135	1713
Chesterfield County	47	194
Amelia County	104	769
Charles City County	45	100
Dinwiddie County	59	203
Henrico County	99	793
Powhatan County	3	4
Prince George County	69	322

*Data from: "Virginia Flora", compiled by A. B. Massey

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MAPS

Map No. 1 "Virginia 1974" Official State Highway Map. Department of Highways.

Map No. 2 Richmond City Map. Issued by: American Oil Company. 1972.