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VASCULAR FLORA OF THE SIM'S POND AREA

A Thesis

by

Joseph Michael Livengood

Submitted to the Graduate College of Appalachian State University partial fulfillment of the requirement for the degree of

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# ABSTRACT

Vascular Flora of the Sim's Pond Area (August 1972)

Joseph Michael Livengood, B.S., Appalachian State University Directed by: Dr. I. W. Carpenter, Jr.

The Sim's Pond Area in the Blue Ridge Mountains of North Carolina provides a typical and easily accessible area for the study of vascular flora of Watauga County. Although elevation, soil types, climate, and history of the area were investigated, the main emphasis was the collection and identification of the vascular flora of the area. From the survey, a catalog of vascular taxa by families and an alphabetical list was prepared.

#### ACKNOWLEDGEMENTS

The author wishes to express gratitude to Dr. I. W. Carpenter, Jr., who directed this thesis. His enthusiasm and assistance in identification aided the author throughout his work. Special thanks are also extended to Dr. William R. Hubbard, Dr. Homer H. Hurley, and Dr. J. Frank Randall for their encouragement and advice. Invaluable information regarding the thesis area was provided by Mr. Ted Pease of the National Park Service and Mr. Ernest Banner. Special information on Watauga County was obtained from Mr. L. E. Tuckwiller and Mr. Edgar Greene. To each of these persons, the author

extends special thanks.

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### INTRODUCTION

According to Bold (1967), more than 350,000 species of plants have been described and approximately 211,000 species are vascular. The variety of vascular flora in Watauga County makes it an ideal locality for a detailed study. Radford, Ahles, and Bell (1968) list 710 species for Watauga County in Manual of the Vascular Flora of the Carolinas.

The altitude of Watauga County varies from 1500 feet to more than 5500 feet. The main broadleaf trees found between 1500 and 3000 feet are Quercus and Carya. The gymnosperms include Pinus, Tsuga, Picea, and Abies. Between elevations of 3000 and 4500 feet are Tsuga, Betula, Acer, and Fagus, which according to Braun (1967) constitute a mixed mesophytic forest. Along the summits of the mountains, above 5000 feet, *Picea* and *Abies* comprise the majority of the forest.

Yellow poplar, walnut, and cherry are in great demand by the furniture industry, while the lumber industry demands white pine and hemlock. Tobacco and cabbage are important field crops for the county.

Although there are manuals covering the vascular flora of Watauga County, there is a need for detailed study in significant

The citations of this paper follow the style of the journal of Plant Physiology.

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areas of the county. The herbarium of Appalachian State University contains many specimens of the county; however, extensive study and expansion of the herbarium is needed.

It is necessary for any survey to be contained in a herbarium, since it is a complete record of the botanist's work. The significance of such a survey is important for future use in helping to determine the inter-relationship between plants. The objectives of this survey are to identify as many species

of vascular plants as possible in a specific area of Watauga County, to increase the herbarium of Appalachian State University, and to enrich the knowledge of the diversity of vascular flora of the county.

In 1970, the National Park Service assigned control of the Sim's Pond area, along the Blue Ridge Parkway, to Appalachian State University for ecological study. Before any research on the ecological aspects of the area can be undertaken, a catalog of the existing flora is necessary. The cryptogamic flora has been investigated, and it was the purpose of this study to catalog the vascular flora.

#### REVIEW OF LITERATURE

Thomas Walter (1788), a mid-18th century botanist from South Carolina, was among the first to explore and collect in the Carolinas. His <u>Flora Caroliniana</u> was the first actual description of the flora in the area.

William Bartram (1791), a late 18th century botanist from Philadelphia, traveled through North and South Carolina listing many of the observed genera. However, he did not list in any order or describe the distribution of the flora.

During the 19th century, Andre' and Francois Andre' Michaux described the agriculture and flora of the southeastern United States, giving descriptions of the natural produce and agriculture from the Alleghany Mountains and portions of the Carolinas (Michaux, 1805).

Curtis (1867) made a list of the flora of North Carolina in which 1920 species of vascular plants were cataloged. The list was organized by families, but no key was included. Although distributions were given, there were no descriptions of the plants.

Harshberger (1903) described the mountainous area of North Carolina including the topography and geology. The distribution of plants was discussed in relation to type of soil, climate, and growing season; however, no list of the flora was made.

Coker and Totten (1916) listed 166 species in a key to the trees of North Carolina. A description and distribution of each species was given. Harbison (1931) cataloged the ligneous flora of the Highlands of North Carolina in which a phylogenetic check-list of 157 species was given.

Small (1933) listed all the species of seed plants which he had found in the southeastern United States. Included in his manual was a key to the orders and a key to the species under each family. Included under each species was a description and distribution, and for some species, habitat was given. Later in the decade, Small (1938) in <u>Ferns of the Southeastern States</u> included an illustrated key to the orders, families, and genera along with a description and distribution of each species.

Blomquist (1948) made an extensive study of the grasses of North Carolina in which 360 species were listed. Included in his text were keys to the subfamilies, tribes, and genera. A description and distribution of each species was given.

Green and Blomquist (1953) listed a few of the flowers of North Carolina in <u>Flowers of the South Native and Exotic</u>. For each species, a description and general distribution was given. Radford, Ahles, and Bell (1968) made the most extensive study

Radford, Ahles, and Bell (1968) made the most extensive study of the vascular flora of the Carolinas. A key to the families, genera, and species of all the collected flora was included along with a description of each species and the county in which each species was found.

Tucker (1972) made a survey of the vascular flora of Bluff Mountain, Ashe County, North Carolina which borders Watauga County and is similar in floristics. A catalog of vascular taxa was included.

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#### MATERIALS AND METHODS

#### Description of the Area

Julian Price Memorial Park was donated to the National Park Service in July, 1951, through the cooperation of Mr. Price's son and daughter, Ralph C. Price and Mrs. Joseph McKinley Bryan. The area donated was approximately 4200 acres (Jefferson Standard Life Insurance Company).

The Sim's Pond area lies between mileposts 295 and 296 on the Blue Ridge Parkway. It is 10.7 miles from Boone and is part of Julian Price Memorial Park. U. S. 221 borders the area on the northeast, the Blue Ridge Parkway on the North, and the Old John's River Road on the southeast.

The W. S. Whiting Lumber Company was first to enter the area for anything more than botanical study. In 1914 the company established a sawmill, and by World War I was cutting every piece of merchantible timber available. By the mid-1920's, the virgin forest had been "clean cut" and the lumber company was ready to move from the area. However, when the lumber train made its last trip down the side tram, a spark started a forest fire which completely burned about 1000 acres (C. Downs 1972, personal communication).

According to Mr. Dale Wood, the W. S. Whiting Lumber Company owned about 2000 acres which was sold to Mr. Price in the mid-1930's. Hampton Sims owned about 360 acres within this same area which Mr. Price also bought during this time (D. Wood 1972, personal communication). Mr. Price asked Mr. Ernest Banner, a rubble stone mason, and his brother-in-law to build a fish pond on his newly acquired property. According to Banner, construction of the pond began in the fall of 1943 and was completed in the spring of 1944. The pond, named after Mr. Hampton Sims, now occupies about 1.7 acres (E. Banner 1972, personal communication). After Mr. Price's death on October 25, 1946, nothing was done in the area until it was given to the National Park Service in 1951.



Figure 1. Collection Area

## Climate

The temperate humid climate of Watauga County varies greatly due to relatively high altitudes. Based on a 23-year record (1929-1951), the average annual temperature for Boone is 51.7°F. The coldest month is January with 35.4°F average and the warmest is July with 69.4°F average. The average annual minimum temperature is O°F. The average precipitation, based on a 23-year record (1929-1951), is 57.4 inches. The greatest precipitation occurs in August with 6.18 inches average and the least in November with 2.94 inches (United States Department of Agriculture, 1958). The average number of days without killing frost is 152 (May 6 to October 6). Killing frosts have occurred as late as June 15 and as early as September 18 (United States Department of

Agriculture, 1958).

The prevailing southwest wind is strongest on high mountains and ridges. Fog occurs frequently on the higher mountains, and 30 to 40 days of dense fog can be expected annually throughout the county (United States Department of Agriculture, 1958).

## Soils

The soils of Watauga County resemble those of mountain districts in the neighboring counties of North Carolina, northwestern Tennessee, and southwestern Virginia. They consist mainly of loam or stony loam surface soil, and somewhat permeable subsoil (United States Department of Agriculture, 1958).

The soils have formed in a temperate climate where rainfall is moderately high and well distributed. During much of the year, water leaches the soil and removes soluble plant nutrients varying the soil acidity from 5.1 to 4.5 (United States Department of Agriculture, 1958).

Most of the soils were formed under a forest vegetation consisting mainly of hardwoods. They do not have as much organic matter as those found under a grass vegetation. These soils are primarily light in color, except for a dark-colored surface layer, usually less than an inch thick, found in undisturbed forest areas where organic matter has accumulated. The chart on the following pages shows the types of soil found in the Sim's Pond area (United States Department of Agriculture, 1958).

aphy Surface soil	s and Dark yellowish- brown, friable stony loam.	mountain Light-brown, or slopes, strong-brown to sides. moderate brown, friable light to heavy clay loam.	mountain Light-brown, or slopes, strong-brown to sides. moderate brown friable stony clay loam.	peaks Moderate to weak- s, brown friable sides loam.	s and Moderate yellowish- brown, friable heavy loam, light clay loam, or clay loam.	s and Dark yellowish-brown, s. very friable loam.
Physiogra	Hillsides mountains	Rounded m ridges, s and hills	Rounded m ridges, s and hills	Mountain or ridges mountains and hills	Hillsides mountains	Hillsides mountains
Parent material	Residual material mainly from weathered granite, gneiss, and schist.	Residual material chiefly from weathered hornblende schist, hornblende gneiss, and diorite.	Residual material chiefly from weathered hornblende schist, hornblende gneiss, and diorite.	Residual material mainly from weathered granite, schist, and gneiss.	Residual material mainly from weathered granite, schist, and gneiss.	Residual material mainly from weathered granite, schist, and
Slope %	30-60	15-30	15-30	7-15	15-30	7-15
Symbol	Af	ð	B	РН	Ра	Рс
Soil type	Ashe stony loam steep phase	Clifton clay loam eroded hilly phase	Clifton stony clay loam, eroded hilly phase	Halewood loam, rolling phase	Perkinsville loam eroded hilly phase	Perkinsville loam rolling phase

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Soil type	Symbol	Slope	Parent material	Physiography	Surface soil
Stony colluvium	Sb	2-30	Local alluvial and colluvial accumulations.	Foot slopes of mountains and hills; alluvial and colluvial fans.	Dark yellowish- brown to weak brown, friable or very friable loam.
Tate loam rolling phase	đ	7-15	Old alluvial or colluvial accu- mulations of soil and rock material from adjacent or nearby slopes.	Foot slopes of mountains and hills; alluvial or colluvial fans.	Dark yellowish- brown, friable or very friable loam
Tate stony loam hilly phase	Р .	15-30	Old alluvial or colluvial accu- mulations of soil and rock material from adjacent or nearby slopes.	Foot slopes of mountains and hills; alluvial or colluvial fans.	Dark yellowish- brown, friable or very friable loam
Tate stony loam rolling phase	Ч	7-15	Old alluvial or colluvial accu- mulations of soil and rock material from adjacent or nearby slopes.	Foot slopes of mountains and hills; alluvial or colluvial fans.	Dark yellowish- brown, friable or very friable loam

Soil type	Symbo 1	Slope	Parent material	Physiography	Surface soil
Tusquitee loam rolling phase	Ч Н	15-30	Moderately old alluvial or colluvial accumulations of soil and rock material from adjacent or nearby slopes.	Foot slopes of mountains and hills; alluvial and colluvial fans.	Dark yellowish- brown to weak- brown, friable or very friable loam.
Weehadkee loam	MK	0-2	Young alluvium.	First bottoms.	When wet medium olive-gray or brownish-gray slightly plastic loam; some moderate brown mottlings.
Slope		Percent			



# Legend

Af	Ashe stony loam, steep phase
Ck	Clifton clay loam, eroded hilly phase
Cm	Cliton stony clay loam, eroded hilly phase
Hd	Hale wood loam, rolling phase
Pa	Perkinsville loam, eroded hilly phase
Pc	Perkinsville loam, rolling phase
Sb	Stony colluvium
ТЬ	Tate loam, rolling phase
Td	Tate stony loam, hilly phase
Те	Tate stony loam, rolling phase
Th	Tusquitee loam, rolling phase
Wk	Wehadkee loam



Figure 2. Soil Types of Collection Area



Method of Collection

Several methods of collecting vascular flora were reviewed, and it was found that random collection throughout the area was the most practical. Collecting trips through the area were made regularly from February 1971 through August 1972. After each collecting trip the specimens were identified, labeled, and pressed. Pressing was sometimes necessary before identification to prevent wilting. The pressed and mounted plants were deposited in the Appalachian State University herbarium, and duplicates were filed with the National Park Service on the Blue Ridge Parkway. Method of Identification

Specimens were identified before pressing if possible. The field data included date, altitude, and habitat. Identification was based on Radford, Ahles, and Bell's <u>Manual of the Vascular Flora of</u> <u>the Carolinas, Gray's Manual of Botany</u> by Fernald, and Small's <u>Manual of the Southeastern Flora</u>. If any uncertainty arose about identification of a specimen, it was compared to a known species from the herbarium of Appalachian State University. A journal of the flora was kept by the author.

## LITERATURE CITED

## SUMMARY

The primary purpose of this survey was to identify as many species as possible in a specific area of Watauga County. Results of this survey revealed 36 families and 70 genera in the area.

Soil types did not seem to influence species distribution. The major effect of climate was the shortened growing season. The elevation of the area varied only 100 feet, making it insignificant in influencing plant distribution.

The appendix includes a list of vascular taxa by families and an alphabetical list.

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APPENDIX



## TAXA BY FAMILIES

#### LYCOPODIACEAE

Lycopodium flabelliforme (Fernald) Blanchard Lycopodium obscurum L. Lycopodium lucidulum Michaux

OSMUNDACEAE Osmunda cinnamomea L.

PTERIDACEAE Dennstaedtia punctilobula (Michaux) Moore

ASPIDIACEAE Dryopteris intermedia (Willd.) Gray Polystichum acrostichoides (Michaux) Schott

ASPLENIACEAE Asplenium platyneuron (L.) Oakes

POLYPODIACEAE Polypodium virginianum L.

### POACEAE

Anthoxanthum odoratum L. Dactylis glomerata L. Poa chapmaniana Scribner Poa sylvestris Gray Panicum languinosum Ell. Holcus lanatus L. Phleum pratense L. Panicum dichotomum L.

### CYPERACEAE

Carex brunnescens (Pers-on) Poiret Carex lurida Wahlenberg Scirpus expansus Fernald Eleocharis tenuis (Willd.) Schultes Caxex vulpinoidea Michaux

#### ARACEAE

Arisaema triphyllum (L.) Schott

#### JUNCACEAE

Luzula multiflora (Retzius) Lej. Juncus effusus L.

#### LILIACEAE

Clintonia umbellulata (Michaux) Morong Erythronium americanum Ker. Maianthemym canadense Desf. Medeola virginiana L. Polygonatum biflorum (Walter) Ell. Smilacina racemosa (L.) Desf. Trillium erectum L. Trillium undulatum (Willd.) Uvularia pudica (Walter) Fernald

AMARYLLIDACEAE Hypoxis hirsuta (L.) Coville

IRIDACEAE Sisyrinchium mycronatum var. atlanticum (Bicknell) Ahles

POLYGONACEAE Rumex acetosella L. Polygonum persicaria L.

CARYOPHYLLACEAE Cerastium nutans Raf. Dianthus armeria L.

## RANUNCULACEAE

Actea pachypoda Ell. Ranunculus abortivis L. Ranunculus allegheniensis Britton Thalictrum thalictroides (L.) Boivin Thalictrum dioicum L.

MAGNOLIACEAE Liriodendron tulipifera L.

LAURACEAE Sassafras albidum (Nuttall) Nees

BRASSICACEAE Barbarea verna (Miller) Ascherson Barbarea vulgaris R. Brown Cardamine concatenata (Michaux) Ahles

SAXIFRAGACEAE

Saxifraga micranthidifolia (Haw.) Steudel

ROSACEAE

Amelanchier arborea (Michaux f.) Fernald Fragaria virginiana Duchesne Potentilla canadensis L. Prunnus cerasus L. Rubus allegheniensis Porter Rubus hispidus L.

GERANIACEAE Geranium maculatum L.

EUPHORBIACEAE Euphorbia corollata L.

ACERACEAE Acer rubrum L.

BALSAMINACEAE Impatiens capensis Meerb.

HYPERICACEAE Hypericum perforatum L.

## VIOLACEAE

Viola affinis LeConte Viola blanda Willd. Viola hastata Michaux Viola macloskeyi (Banks ex. DC.) C.L. Hitchcock Viola papilionaceae Pursh Viola rotundifolia Michaux

APIACEAE

Daucus carota L.

ERICACEAE Leucothoe recurva (Buckley) Gray Monotropa uniflora L.

DIAPENSIACEAE Galax aphylla L.

PRIMULACEAE Lysimachia quadrifolia L.

#### LAMIACEAE

Salvia lyrata L. Prunella vulgaris L. Stachys latidens Small

## ALPHABETICAL LIST OF TAXA

Acer rubrum L.

Achillea millefolium L.

Actea pachypoda Ell.

Amelanchier ardorea (Michaux F.) Fernald

Anthoxanthum odoratum L.

Arisaema triphyllum (L.) Schott

Asplenium platyneuron (L.) Oakes

Barbarea verna (Miller) Ascherson Barbarea vulgaris R. Brown

Cardamine concatenata (Michaux) Ahles

Carex brunnescens (Persoon) Poiret Carex lurida Wahlenberg Carex vulpinoidea Michaux

Cerastium nutans Raf.

Chrysanthemum leucanthemum L.

Clintonia umbellulata (Michaux) Morong

Coreopsis major var. stellata (Nuttall) Robinson

Dactylis glomerata L.

Daucus carota L.

Dennstaedtia punctilobula (Michaux) Moore Dianthus armeria L.

Dryopteris intermedia (Willd.) Gray Eleocharis tenuis (Willd.) Schultes

Erythronium americanum Ker.

Euphorbia corollata L.

Fragaria virginiana Duchesne

Galax aphylla L.

Galinsoga ciliata (Raf.) Blake

Geranium maculatum L.

Hieracium pratense Tausch.

Holcus lanatus L.

Houstonia caerulea L. Houstonia purpurea L.

Hypericum perforatum L.

Hypoxis hirsuta (L.) Coville

Impatiens capensis Meerb.

Juncus effusus L.

Leucothoe recurva (Buckley) Gray

Liriodendron tulipifera L.

Luzula multiflora (Retzius) Leji

Lycopodium flabelliforme (Fernald) Blanchard Lycopodium Incidulum Michaux Lycopodium obscurum Michaux

Lysmachia quadrifolia L.

Maianthemum canadense Desf.

Medeola virginiana L.

Monotropa uniflora L.

Osmunda cinnamomea L.

Panicum dichotomum L. Panicum languinosum Ell.

Phleum pratense L.

Plantago lanceolata L.

Poa chapmaniana Scribner Poa sylvestris Gray

Polygonatum biflorum (Walter) Ell.

Polygonum persicaria L.

Polypodium virginianum L.

Polystichium acrostichoides (Michaux) Schott

Potentilla canadensis L.

Prunella vulgaris L.

Prunnus cerasus L.

Ranunculus abortivis L. Ranunculus allegheniensis Britton Rubus allegheniensis Porter Rubus hispisdus L.

Rudbeckia hirta L.

Salvia lyrata L.

Sassafras albidum (Nuttall) Nees

Saxifraga micranthidifolia (Haw.) Steudel

Scirpus expansus Fernald

Senecio aureus L.

Sisyrinchium mucronatum var atlanticum (Bricknell) Ahles

Smilacina racemosa (L.) Desf.

Stachys latidens Small

Thalictrum dioicum L. Thalictrum thalictroides (L.) Boivin

Trillium erectum (L.) Trillium undulatum Willd.

Rumex acetosella L.

Uvularia pudica (Walter) Fernald

Veronica chamaedrys L.

Veronica officinalis L.

Veronica serpyllifolia L.

Viola affinis LeConte

Viola blanda Willd.

Viola hastata Michaux

Viola macloskeyi (Banks ex. DC.) C. L. Hitchcock

Viola papilionaceae Pursh

Viola rotundifolia Michaux

VITA

Born September 25, 1948, to Mr. and Mrs. J. E. Livengood in Forsyth County, North Carolina, the author was one of two children. His secondary education was obtained at North Forsyth High School in Forsyth County. He attended Brevard Junior College and Appalachian State University, Boone, North Carolina where he received a B. S. in Biology. July 11, 1970, he was married to Sarah Jane Bleckley and resided in Winston Salem, North Carolina until graduate work was started at Appalachian State University. Graduate work was completed for a master's degree in August, 1972. The author's present address is 4320 Robin Hood Road, Winston Salem, N. C. The typist for this paper was Mrs. Janice Ashley.