

1977

A Taxonomic Study of the Lichen Flora at the Peaks of Otter Natural Area Along the Blue Ridge Parkway, Bedford County, Virginia

Michael L. Slaughter

Eastern Illinois University

This research is a product of the graduate program in [Botany](#) at Eastern Illinois University. [Find out more](#) about the program.

Recommended Citation

Slaughter, Michael L., "A Taxonomic Study of the Lichen Flora at the Peaks of Otter Natural Area Along the Blue Ridge Parkway, Bedford County, Virginia" (1977). *Masters Theses*. 3279.
<https://thekeep.eiu.edu/theses/3279>

This is brought to you for free and open access by the Student Theses & Publications at The Keep. It has been accepted for inclusion in Masters Theses by an authorized administrator of The Keep. For more information, please contact tabruns@eiu.edu.

PAPER CERTIFICATE #2

TO: Graduate Degree Candidates who have written formal theses.

SUBJECT: Permission to reproduce theses.

The University Library is receiving a number of requests from other institutions asking permission to reproduce dissertations for inclusion in their library holdings. Although no copyright laws are involved, we feel that professional courtesy demands that permission be obtained from the author before we allow theses to be copied.

Please sign one of the following statements:

Booth Library of Eastern Illinois University has my permission to lend my thesis to a reputable college or university for the purpose of copying it for inclusion in that institution's library or research holdings.

28 April 1977
Date

Author

I respectfully request Booth Library of Eastern Illinois University not allow my thesis be reproduced because _____

Date

Author

pdm

A TAXONOMIC STUDY OF THE LICHEN FLORA AT THE

PEAKS OF OTTER NATURAL AREA ALONG THE BLUE

RIDGE PARKWAY, BEDFORD COUNTY, VIRGINIA

(TITLE)

BY

MICHAEL L. SLAUGHTER

B.S. in Environmental Biology, Eastern Illinois University, 1975

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

MASTER OF SCIENCE IN BOTANY

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1977
YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

27 April 1977

DATE

ADVISER

April 27, 1977

DATE

DEPARTMENT HEAD

353426

Acknowledgements

I wish to sincerely thank Dr. Wesley C. Whiteside, whose expertise and graciously given constructive criticism have guided this thesis from its beginning through its completion.

I wish also to thank Ms. Barbara Stolz, who persevered my handwriting during the typing of the rough draft and for her speedy typing of the final manuscript.

Special thanks to my wife, Nora, whose moral support was invaluable, and to Dr. John Speer, Dr. William Weiler and Mr. Richard Crites for their encouragement and cheerful mentoring.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	page ii
INTRODUCTION	1.
HISTORY	1.
CLIMATE	2.
GEOLOGY	3.
PREVIOUS BOTANICAL STUDIES	4.
MATERIALS AND METHODS	6.
DESCRIPTION OF COLLECTING AREAS	10.
RESULTS	14.
ANNOTATED SPECIES COMPOSITION LIST	14.
TABLE I COSMOPOLITAN SPECIES	26.
TABLE II SPLIT-RAIL FENCE (AREA 9) SPECIES COMPOSITION LIST	27.
TABLE III EXPOSED TREES (AREA 10) SPECIES COMPOSITION LIST	28.
DISCUSSION	31.
SUMMARY	34.
LITERATURE CITED	35.
PLATES	38.
MAPS	38.
SUMMARY OF THE ECOLOGICAL HABITATS	41.
PHOTOGRAPHS OF THE AREA	42.

Introduction

The purpose of this study was to examine the lichen flora of the Peaks of Otter section of the Blue Ridge Parkway. The Peaks of Otter is maintained by the National Park Service and offers visitors recreational facilities designed to accent the natural beauty of the Blue Ridge Mountains. The park is located within the Blue Ridge Mountains of south-central Virginia between mileposts 84 and 87 of the Blue Ridge Parkway. The park is approximately 35 miles north of Roanoke, Virginia, and 14 miles west from Bedford, Virginia. It is bounded on the north and west by the Jefferson National Forest of Botetourt County and on the south and east by Bedford County. The area is comprised of some 4000 acres, the majority of which is woodland. A small mountain valley situated between the three mountains that comprise the park (Flat Top Mountain, elevation 4004'; Sharp Top Mountain, elevation 3875'; and Harkening Hill, elevation 3372') has been cleared to accomodate park structures such as a visitors' center, a camp store, as well as a small lake adjacent to the lodge. The elevation at lake level is 2494'.

History

Archeological evidence discovered in 1964 during the construction of Lodge Lake revealed that Indians had used the area as a seasonal hunting grounds for at least seven thousand years before the arrival of pioneering settlers. The arrival of settlers during the mid-1700's changed the area considerably. Within a hundred years of the time settlement began a community of twenty or more families had developed in the triangular valley and on the slopes of the three mountains that

today comprise the park. The first major change wrought by the settlers was the clearing of most of the more gentle and less rocky slopes, which remained cleared until the National Park Service acquired the area in 1936. Photographs taken in 1934 show that about half of Harkening Hill was then either pasture or cultivated land. The lower slopes of Sharp Top just across from the present location of the picnic grounds was a small orchard, above which several terraces were built to make the land easier to cultivate. A second major orchard occupied the ridge in front of the Peaks Lodge and Restaurant. Other changes in the landscape included a wagon turnpike that went from Jennings's Creek on the western slope of Blue Ridge through the mountain valley to Bedford on the eastern slope of the Blue Ridge (Kirkwood, 1968).

The original land purchase was made during the administration of Franklin D. Roosevelt with the intention of constructing a scenic ridge-top highway that would connect the Shenandoah and Great Smoky Mountains National Parks. The project fitted appropriately into the program of public works President Roosevelt was fostering to help the tide of economic depression. The 469 miles of the Blue Ridge Parkway are the result of that effort (Jolley, 1969).

Climate

Climatic data taken from the Bedford County reporting station and published by the National Oceanic and Atmospheric Administration (U.S. Department of Commerce) is summarized as follows:

Mean Maximum Temp. January (F ^o)	49 ^o
Mean Minimum Temp. January (F ^o)	29 ^o
Mean Maximum Temp. July (F ^o)	89 ^o
Mean Minimum Temp. July (F ^o)	65 ^o
Mean Annual Precipitation (Inches)	44"

It is generally recognized that local weather patterns, particularly in mountainous regions, cause some difficulty in obtaining accurate weather data (Crockett, 1971). This is supported by the raw weather data from the Peaks of Otter Park Ranger Station for the years 1961 through 1967, which show that local weather conditions at the Park vary considerably from those in Bedford. At the Peaks Ranger Station the average yearly rainfall for the 1961-67 period was 47 inches, and the yearly average snowfall was also 47 inches, for an annual precipitation equivalent to 54.6 inches. This is an increase of approximately 10 inches over that recorded at the Bedford reporting station. The wettest months of the year are normally July, August and September, and the driest months are usually January, February and April. The average annual temperature as recorded at the ranger station is 50° F, with temperatures being highest in June, July and August and being lowest in December, January and February. Within the park, during an average year, temperatures will vary between -5° and 89° F (Johnson, 1975). The growing season for the region in general averages 183 days, from mid-April through mid-October (Dalmas, 1972).

Geology

The geology of the Peaks of Otter region is typified by imbricate thrust sheets and faulted anticlines and synclines. Precambrian rocks dominate the area, with granite, hypersthene granodiorite, diorite and unakite collectively forming the Pedlar Formation (Spencer, 1968).

Podzols constitute the basic soil type. However, in localized areas of mixed forest the soils have become melanized, or humus-darkened (Braun, 1950).

Previous Botanical Investigations

During the first half of this century E. Lucy Braun undertook a comprehensive study of the eastern deciduous forest. Braun's studies (1950) were based primarily upon the predominance of Castanea dentata (American Chestnut) in the mountains of the Blue Ridge. According to Braun the Peaks of Otter is located within the southern-most section of the Northern Blue Ridge Mountains in an Oak-Chestnut Forest Region. This region was bounded by a Mixed-Mesophytic Forest to the west, a Hemlock-White Pine-Northern Hardwood Forest to the north, and an Oak-Pine Forest to the east and south. Because of the ravages of the chestnut blight fungus (Endothia parasitica), which reached the Peaks of Otter in the mid-1920's, little evidence of this former chestnut dominance exists today (Johnson, 1975).

The vascular flora of the Blue Ridge Parkway, including that of the Peaks of Otter is well known. A checklist of the vascular flora of the central Blue Ridge Mountains with special reference to the Parkway documents a total of 585 taxa (Freer, 1950, 1958, 1968).

A recent study by Dalmas (1972), listed 18 species of mosses, 7 species of liverworts, 10 species of ferns and fern allies and 109 species of flowering plants from the Cornelius Creek area adjacent to the park.

Specifically within the Peaks of Otter region five community types have been recognized. At elevations above 3900' a Betula lutea - Quercus rubra community dominates, but at elevations between 3900' and 2300' a Quercus prinus - Carya community is prevalent if the slope is not distinctly xeric, while on slopes that are south or west-facing and distinctly xeric a Quercus prinus - Pinus community is dominant. At all elevations and on slopes facing in any direction, unique mesic communities

have been documented (Johnson, 1975). These cove-mesic communities, typified by extremely mesic conditions, are dominated by Acer saccharum, Liriodendron tulipifera and Betula lutea and occasionally Tsuga canadensis (Whittaker, 1956).

There is a paucity of literature regarding the lichen flora within the geographical region of Virginia. Small (1893) in a report to the Torrey Botanical Club reported 81 species of lichens as occurring in southwestern Virginia. Allard (1940) undertook a study of Cetraria islandica in an attempt to document ecological parameters, especially climate, with the development of that species. Patterson (1940) in a study of bryophyte succession recognized only 4 lichen species as occurring on boulders and ignored the rest, as identification of the numerous species proved too cumbersome. Platt (1951) reported 24 taxa of lichens as occurring on Mid-Appalachian shale barrens, some of which are located within 25 miles of the Park. Allard (1944) and Luttrell (1955) studied the Cladoniaceae of Virginia, reporting 36 and 52 species respectively.

Lichens of the Peaks of Otter region have received scant attention. Isolated collections have been made by workers but are by no means comprehensive and have not been recorded in the literature (Hale, 1976c).

MATERIALS AND METHODS

Specimens were collected during the month of June, 1976. A collecting permit was obtained from John W. Stockert, Interpretive Specialist, Blue Ridge Parkway, Roanoke, Virginia. The permit stipulated that all collecting was to be done out of the sight of park visitors.

A small hunting knife was used to remove specimens from corticolous (tree) substrates. The identification of tree species was accomplished by using Trees of Shenandoah National Park by Mazzeo (1967). Specimens collected from rocks were also removed with a knife where possible. However, certain adanate specimens were collected by chipping the rock with a geologist hammer. In an effort to avoid defacing the substrates commonly viewed by park visitors, all specimens were collected away from roads and out of sight of the trails. Upon collection specimens were placed in paper bags and dried to prevent the development of molds.

Identification of foliose and fruticose specimens was primarily accomplished using The Lichens by Hale (1969). Frequently consulted also were The Lichens of Ohio (Part 1 and 2) by Taylor (1967, 1968), The Lichens of Long Island, New York by Brodo (1968), Lichens of the Black Hills by Wetmore (1967), and The Lichens of Southern Illinois by Skorepa (1973), as each contains keys or accurate descriptions which aided in the identification of questionable specimens. Certain monographic treatments such as The Lichen Genus Cladonia by Thomson (1967), the Lichen Genus Parmelina by Hale (1976a), The Lichen Genus Physcia by Thomson (1963) and the Lichen Genus Pseudoparmelia by Hale (1976b) were used in the determination of species within these genera. For the identification of crustose specimens The Lichen Book by Nearing (1946) was used exten-

sively, as it contains useable descriptions as well as valuable drawings, although much of the nomenclature is outdated. Also employed in the identification of crustose lichens were Fink (1935), Wetmore (1967), Brodo (1968) and Skorepa (1973). Species of Leparia were identified according to Duncan's Introduction to British Lichens (1970). Final verification of valid names was determined using A Fourth Checklist of Lichens of the Continental United States by Hale and Culberson (1970).

A Bausch and Lomb dissecting microscope with a magnification range of 0.7X to 30.0X was used to examine important thallus characteristics such as the presence or absence of soredia and isidia. For the identification of crustose species a Zeiss compound microscope having an oil immersion lens and fitted with an ocular micrometer was employed for the study and measurement of ascospores, as well as for other microscopic characteristics of the ascocarp. Photographs of the study area were taken with a Pentax KX single-lens reflex camera with Kodak Pan X film ASA 32.

The chemical tests that are an intrinsic part of most modern keys were utilized. The standard reagents are paraphenylenediamine (P test), potassium hydroxide (K test), and sodium hypochlorite (C test). A variety of color reactions may result when a drop of the reagent is placed on the appropriate lichen thallus. Since these chemicals are caustic, care was taken not to inhale them or allow them to come into contact with anything except the material to be tested.

A concentrated solution of potassium hydroxide (1M KOH) was prepared and kept in a small dropper bottle. When a "K" test was required a pipette was used to place a small amount of the KOH solution on either the cortex or on the medulla, depending upon which was indicated. For

the medulla test the upper cortex was removed with a teasing needle in order to expose the medulla. A positive test (K+) is generally yellow, yellow turning to red, or purple, with the color changes indicating the presence of diagnostic chemicals within the thallus.

Sodium hypochlorite (5.25 % commercial liquid bleach) was used for the "C" test. Generally the reagent is used on the medulla and a positive test (C+) is usually green or shades of red.

Since paraphenylenediamine is unstable and lasts but a few hours it was made fresh every day. A small amount of the dried paraphenylenediamine (P) was mixed with 10 mls of 95 % ethyl alcohol (ETOH). Although the exact concentration of the "P" is not significant, enough was mixed with the ETOH to give the solution a rose-pink color. A positive "P" test (P+) is orange, orange turning to red, red or yellow. With some lichens the "P" reaction is in the medulla while in others it is in the cortex.

In an attempt to quantify the frequency of occurrence of a lichen species within the park, a system based upon the number of times a given species was collected is employed. The criteria for determining frequency is summarized as follows:

Very sparsely collected	=	1 or 2 collections
Sparsely collected	=	3 or 4 collections
Frequently collected	=	5, 6 or 7 collections
Very frequently collected	=	8 or more collections

It should be noted that these parameters do not entirely reflect an accurate account of frequency for any given species, but rather the frequency of collection. Ecological factors that influence the occurrence of a given species might cause that species to be very dominant

in one section of the park, while completely lacking in others. An IBM 360-50 computer was used to make frequency computations. PL/1 was used as the programming language.

The entire collection of lichens from the Peaks of Otter Natural Area described herein is deposited in the Ernest L. Stover Herbarium at Eastern Illinois University in Charleston, Illinois.

DESCRIPTIONS OF COLLECTING AREAS

For convenience the park was divided into ten collecting areas (Plate II). The purpose of such a division was to insure that intensive collecting occurred in every ecological habitat present within the park. Several distinct habitats are usually contained in each area. Excursions away from existing trails into the brush were frequently made to locate habitats relatively undisturbed by park visitors. The numbers used to designate the collection sites correspond with the numbers that appear following the substrates for each species within the Annotated Species Composition List (Page 14). A chart (Plate III) summarizing the ecological habitats of each of the collecting sites is provided on page 41.

Area 1: Picnic - Campgrounds and adjacent areas

Most of Area 1 is characterized by gentle slopes and mesic woods. Drainage from Lodge Lake feeds a small stream that passes through the area. The areas above the picnic and campgrounds provided the best collecting, as park visitors seldom venture there.

Area 2: The Johnson Farm

Area 2 is primarily an open field which is mowed periodically to restrict the growth of woody vegetation. Isolated trees within this open area provided excellent substrates for corticolous lichens, while several large exposed boulders at the west end of the area provided excellent substrates for saxicolous species. Species of Cladonia were frequently collected from the ground, as the herbaceous vegetation was not sufficiently dense to prevent their occurrence.

Area 3: Falling Water Cascades and adjacent areas

Area 3 is large enough to provide several ecological habitats. Part of the area consists of south-facing xeric slopes which provided diverse lichen populations. Specimens of corticolous species were particularly abundant on these slopes. Large outcrops of rock also provided extensive lichen populations. At the north end of the area a mesic woods interrupted by a large stream provided for the collection of species characteristic of moist areas, such as Dermatocarpon fluviatile, Ephebe lanata and species of Peltigera.

Area 4: Flat Top Mountain and adjacent areas

This area was primarily xeric woods. Some scattered rock-outcroppings were encountered at the north end of the area. Since this area was very similar to the south-facing xeric slopes of Area 8 (Sharp Top Mountain) only limited collecting was done.

Area 5: Park sewage-treatment plant and adjacent areas

Area 5 was the smallest of all the collection sites. In order to provide sewage treatment for the Peaks of Otter Lodge and Restaurant, the Park Service constructed a small treatment lagoon that collectively covers approximately two acres. The banks of the lagoon are kept free of trees and provided an excellent site for the collection of species of Cladonia and Peltigera.

Area 6: Purgatory Mountain Overlook.

Area 6 is the only site in which collections were made that were actually out of the park. The site is located approximately four miles south of the park on the Blue Ridge Parkway. In order to construct such

an overlook, large road cuts were made into the mountain. These roadcuts, now covered with herbaceous vegetation, provided an excellent site for the growth of species of Cladonia

Area 7: Elkrun Trail and adjacent areas

The Elkrun Trail area occupies the lower slopes of Harkening Hill. The section directly behind the Park Visitors' Center is an open seepage area where few ground lichens occur, but corticolous species such as Anaptychia and Physcia abound. The higher portions of the area consist of south-facing xeric slopes.

Area 8: Sharp Top Mountain and adjacent areas

Area 8 was the largest and most diverse collection site. A trail which leads to the peak traverses south-facing xeric slopes, while a road constructed to facilitate scenic bus trips to the top traverses primarily mesic north slopes. The actual "Peak" consists of massive exposed boulders that provide a substrate for large populations of Usnea, Umbilicaria and many crustose species.

Area 9: Split-rail Fence

A split-rail fence that traverses the open areas of the park valley was chosen as a collection site because of the unique nature of the fence. It was constructed in the early 1960's from chestnut (Castanea) rails stockpiled by the United States Park Service. A cursory examination showed robust specimens of several species of lichens to be present on the fence. It was decided that a detailed examination would indicate precisely how many species had become established on the fence during its fifteen-year existence.

Area 10: Exposed trees in the park valley

Area 10 is unique in that some of the substrates sampled extended into certain of the other 9 Areas. Collections were made from twelve trees, each of a different species, that grew in open situations within the main park valley or adjacent areas. Since lichen growth is limited by low-light levels within mesic woodlands, it was postulated that these exposed trees might yield lichen species not encountered elsewhere within the park. The tree species selected and their location is as follows:

- A. Quercus rubra -- Situated between the Johnson Farm and the rangers' quarters.
- B. Pinus strobus -- Situated along the roadside 40' south of Tree A.
- C. Pyrus communis -- Situated in the farm yard at the Johnson Farm.
- D. Liriodendron tulipifera -- Situated beside the west parking lot at the Camp Store.
- E. Quercus velutina -- Situated directly across from the Camp Store.
- F. Nyssa sylvatica -- Situated approximately 30' north of Tree E.
- G. Sassafras albidum -- Situated at the extreme eastern end of the parking lot within the Bedford Picnic Grounds.
- H. Robinia pseudoaccacia -- Situated just across the road from Tree G.
- I. Fraxinus americana -- Situated at the north entrance to the Peaks of Otter Lodge and Restaurant.
- J. Quercus alba -- Situated 70 yards north of Tree I directly beside the Blue Ridge Parkway.
- K. Pinus virginiana -- Situated at the north end of the Visitors' Center parking lot.
- L. Cornus florida -- Situated at the north corner of the Visitors' Center.

RESULTS

Annotated Species Composition List

The following lichens were collected from the Peaks of Otter area. Each entry contains a reference concerning the frequency of collection of the species, as well as a complete list of substrates and the areas from which each species was collected.

1. Alectoria nidulifera Norrl. Very sparsely collected; On rock (08).
2. Anaptichia palmulata (Michx.) Vain. Very frequently collected; On Liriodendron tulipifera (03), Quercus prinus (03, 07, 08), Quercus rubra (01, 03, 10) and rock (03).
3. Arthonia caesia (Flot.) Korb. Frequently collected; On Carya sp. (01, 02, 03, 07, 08), Quercus prinus (06) and Robinia pseudoaccacia (10).
4. Arthropyrenia alba (Schrad.) Zahlbr. Very sparsely collected; On Pyrus communis (10).
5. Bacidia atrogrisea (Del.) Korb. Very sparsely collected; On Carya sp. (10).
6. Baeomyces roseus Pers. Sparsely collected; On ground (03, 04, 08).
7. Buellia disciformis (Fr.) Mudd. Very frequently collected; On Carya sp. (01, 08), Fagus sp. (01), Liriodendron tulipifera (01, 03, 07) and Quercus rubra (01, 06, 08).
8. Buellia punctata (Hoffm.) Mass. Very sparsely collected; On dead wood (09).
9. Caloplaca flavovirescens (Wulf.) Dalla Torre & Sarnth. Sparsely collected; On rock (02, 03, 06, 08).
10. Caloplaca lobulata (Florke) Hellb. Very sparsely collected; On rock (02).

11. Candelaria concolor (Dicks.) B. Stein. Very frequently collected; On dead wood (09), Fraxinus americana (10), Liriodendron tulipifera (01, 02, 10), Pyrus communis (10), Quercus alba (10), Quercus prinus (01) and Quercus rubra (01, 08).
- Candelaria concolor f. effusa (Dicks.) B. Stein. Very frequently collected; On Carya sp. (01), dead wood (02, 09), Prunus serotina (01), Quercus alba (01), Quercus rubra (03, 08) and Robinia pseudoaccacia (10).
12. Candelaria fibrosa (Fr.) Mull. Arg. Very frequently collected; On Carya sp. (01), Cornus florida (10), Fraxinus americana (07, 10), Liriodendron tulipifera (01, 02, 10) and Robinia pseudoaccacia (10).
13. Catillaria sp. (Ach.) Th. Fr. Very sparsely collected; On rock (06).
14. Cetraria ciliaris Ach. Frequently collected; On Betula lutea (01), dead wood (09), Kalmia latifolia (03, 08) and Pinus virginiana (10).
15. Cetraria fendleri (Nyl.) Tuck. Very sparsely collected; On dead wood (09).
16. Cetraria hepatizon (Ach.) Vain. Very sparsely collected; On rock (08).
17. Cetraria oakesiana Tuck. Frequently collected; On Betula lutea (01), dead wood (03), Kalmia latifolia (03, 04) and Quercus prinus (03).
18. Cetrelia chicitae (W. Culb.) W. Culb. & C. Culb. Very sparsely collected; On Quercus prinus (08) and rock (08).
19. Cetrelia olivetorum (Nyl.) W. Culb. & C. Culb. Very sparsely collected; On Quercus prinus (08) and rock (03).
20. Cladina subtenuis f. subulata (Abb.) Hale & W. Culb. Frequently collected; On ground (02, 03, 04, 05, 06, 08).
21. Cladonia apodocarpa Robb. Sparsely collected; On dead wood (01), ground (07) and rock (03).
22. Cladonia bacillaris f. abbreviata (Ach.) Nyl. Very sparsely collected; On dead wood (01, 03).
- Cladonia bacillaris f. bacillaris (Ach.) Nyl. Sparsely collected; On dead wood (09) and rock (02, 08).
- Cladonia bacillaris f. subtomentosula (Ach.) Nyl. Very sparsely collected; On ground (05).
23. Cladonia capitata f. capitata (Michx.) Spreng. Very sparsely collected; On ground (05).

24. Cladonia caroliniana f. tenuiramea Schwein. ex Tuck. Very sparsely collected; On ground (08).
25. Cladonia chlorophaea (Florke ex Somm.) Spreng. Very sparsely collected; On ground (05).
26. Cladonia coniocraea f. ceratodes (Florke) Spreng. Sparsely collected; On dead wood (03), ground (03, 07) and rock (03).
Cladonia coniocraea f. subpellucida (Florke) Spreng. Very sparsely collected; On dead wood (04).
27. Cladonia conista (Ach.) Robb. Very sparsely collected; On ground (02, 07).
28. Cladonia cristatella f. orchrocarpia Tuck. Very sparsely collected; On ground (05).
Cladonia cristatella f. vestita Tuck. Frequently collected; On dead wood (09) and ground (02, 03, 05, 07, 08).
29. Cladonia furcata f. furcata (Huds.) Schrad. Sparsely collected; On ground (03, 06, 08).
Cladonia furcata f. ramosella (Huds.) Schrad. Very sparsely collected; On ground (08).
30. Cladonia parasitica f. parasitica (Hoffm.) Hoffm. Sparsely collected; On dead wood (03, 04, 07).
31. Cladonia piedmontensis f. intermedia Merr. Very sparsely collected; On ground (05).
32. Cladonia pleurota f. extensa (Florke) Schaer. Very sparsely collected; On ground (06).
Cladonia pleurota f. pleurota (Florke) Schaer. Very sparsely collected; On ground (05).
33. Cladonia polycarpoides f. epiphylla Nyl. Very sparsely collected; On ground (02).
Cladonia polycarpoides f. squamulosa Nyl. Very sparsely collected; On ground (02).
34. Cladonia pyxidata (L.) Hoffm. Very sparsely collected; On ground (02, 03).
35. Cladonia squamosa f. frondosa (Scop.) Hoffm. Very sparsely collected; On ground (03) and rock (03).
Cladonia squamosa f. muricella (Scop.) Hoffm. Very sparsely collected; On ground (08).

- Cladonia squamosa f. squamosa (Scop.) Hoffm. Very sparsely collected;
On ground (08).
- Cladonia squamosa f. turfacea (Scop.) Hoffm. Very sparsely collected;
On dead wood (08).
36. Cladonia strepsilis f. coralloidea (Ach.) Vain. Very sparsely
collected; On ground (08).
37. Cladonia subcariosa f. subcariosa Nyl. Very sparsely collected;
On ground (06).
38. Cladonia uncialis f. uncialis (L.) Wigg. Very sparsely collected;
On ground (02).
39. Cladonia verticillata f. aggregata (Hoffm.) Schaer. Very sparsely
collected; On ground (02).
- Cladonia verticillata f. apodicta (Hoffm.) Schaer. Very sparsely
collected; On ground (05).
- Cladonia verticillata f. verticillata (Hoffm.) Schaer. Very sparsely
collected; On ground (02).
40. Coccocarpia cronia (Tuck.) Vain. Very sparsely collected; On rock
(08).
41. Collema subfurvum (Mull. Arg.) Degel. Very frequently collected;
On Fraxinus americana (07, 10), Liriodendron tulipifera (02,
07), Quercus prinus (01, 03), Quercus rubra (01, 03) and rock
(08).
42. Cyphelium tigillare (Ach.) Ach. Very sparsely collected; On dead
wood (09).
43. Dermatocarpon fluviatile (G. Web.) Th. Fr. Very sparsely collected;
On rock (03).
44. Diploschistes scruposus (Schreb.) Norm. Very sparsely collected;
On rock (08).
45. Endocarpon pusillum Hedw. Very sparsely collected; On rock (06).
46. Ephebe lanata (L.) Vain. Very sparsely collected; On rock (03).
47. Graphis scripta (L.) Ach. Frequently collected; On Carya sp. (01,
08), Fagus sp. (01) and Liriodendron tulipifera (03, 07).
48. Heterocarpon ochroleucum (Tuck.) Mull. Arg. Very sparsely collected;
On rock (02).

49. Heterodermia appalachensis (Kurok.) W. Culb. Very sparsely collected; On Quercus prinus (07).
50. Heterodermia echinata (Tayl.) W. Culb. Very sparsely collected; On Liriodendron tulipifera (01) and Quercus prinus (08).
51. Heterodermia granulifera (Ach.) W. Culb. Sparsely collected; On dead wood (09), Nyssa sylvatica (10) and Quercus prinus (08).
52. Heterodermia hypoleuca (Muhl.) Trev. Very frequently collected; On Carya sp. (08), Fraxinus americana (07, 10), Pyrus communis (10), Quercus prinus (04), Quercus rubra (01, 07, 08, 10) and Salix nigra (07).
53. Heterodermia leucomela (L.) Poelt. Sparsely collected; On Liriodendron tulipifera (03) and Quercus prinus (07, 08).
54. Heterodermia obscurata (Nyl.) Trev. Very frequently collected; On Cornus florida (10), Fraxinus americana (07, 10), Liriodendron tulipifera (01, 02, 10), Nyssa sylvatica (07), Pyrus communis (10), Quercus alba (01, 10), Quercus prinus (03) and Quercus rubra (03, 08).
55. Heterodermia pseudospeciosa (Kurok.) W. Culb. Sparsely collected; On Quercus prinus (03, 08) and Quercus rubra (01).
56. Heterodermia squamulosa (Degel.) W. Culb. Very sparsely collected; On Quercus rubra (01).
57. Hypogymnia enteromorpha (Ach.) Nyl. Very sparsely collected; On Kalmia latifolia (08).
58. Hypogymnia physodes (L.) W. Wats. Sparsely collected; On Kalmia latifolia (03, 08), Quercus rubra (08) and Rhododendron catawbiensis (08).
59. Ionaspis epulotica (Ach.) Th. Fr. Very sparsely collected; On rock (03).
60. Lasallia papulosa (Ach.) Llano. Sparsely collected; On Kalmia latifolia (08) and rock (02, 03, 08).
61. Lecanora caesiocinerea Nyl. Very sparsely collected; On rock (01, 04).
62. Lecanora caesiorubella Ach. Sparsely collected; On Liriodendron tulipifera (03), Quercus rubra (01, 08) and Quercus velutina (10).
63. Lecanora chlarotera Nyl. Frequently collected; On Carya sp. (01, 07), Liriodendron tulipifera (01, 02, 06, 10) and Quercus alba (10).

64. Lecanora cinerea (L.) Somm. Very sparsely collected; On rock (02, 06).
65. Lecanora conizaea (Ach.) Nyl. Very frequently collected; On Betula lutea (07), Carya sp. (01, 03, 07, 08), dead wood (01, 09), Fagus sp. (01), Liriodendron tulipifera (01, 07), Nyssa sylvatica (10), Prunus serotina (02), Quercus alba (10), Quercus rubra (06) and Sassafras albidium (10).
66. Lecanora dispersa(Pers.) Somm. Very sparsely collected; On rock (03, 06).
67. Lecidea albocaerulescens (Wulf.) Ach. Sparsely collected; On rock (01, 02, 03, 04).
68. Lecidea botryosa (Fr.) Th. Fr. Very sparsely collected; On dead wood (03).
69. Lecidea carnulenta (Tuck.) Fink. Very sparsely collected; On dead wood (08).
70. Lecidea crustulata (Ach.) Spreng. Very sparsely collected; On rock (02).
71. Lecidea cyrtidia Tuck. Very sparsely collected; On rock (08).
72. Lecidea macrocarpa (DC.) Steud. Very sparsely collected; On rock (03, 08).
73. Lecidea scalaris (Ach.) Ach. Very sparsely collected; On dead wood (08).
74. Lecidea speirea (Ach.) Very sparsely collected; On rock (03).
75. Lecidea varians Ach. Very frequently collected; On Carya sp. (01, 03, 07, 08), dead wood (09), Fagus sp. (01), Liriodendron tulipifera (02, 07), Prunus serotina (07), Quercus prinus (06), Quercus rubra (06), Robinia pseudoaccacia (10) and Salix nigra (07).
76. Lepraria aeruginosa (Wigg.) Sm. Very sparsely collected; On Quercus rubra (10).
77. Lepraria candelaris (L.) Fr. Very sparsely collected; On dead wood (08).
78. Lepraria chlorina (Ach.) Ach. ex Sm. Very sparsely collected; On rock (08).
79. Lepraria incana (L.) Ach. Very sparsely collected; On dead wood (07) and Quercus alba (01).

80. Lepraria membranacea (Dicks.) Vain. Sparsely collected; On Carya sp. (03, 07), dead wood (07) and Quercus prinus (08).
81. Leptogium cyanescens (Ach.) Korb. Sparsely collected; On Liriodendron tulipifera (07), Quercus rubra (01, 10) and rock (08).
82. Leptogium hirsutum Sierk. Very sparsely collected; On Quercus rubra (08).
83. Lobaria pulmonaria (L.) Hoffm. Sparsely collected; On Quercus prinus (03, 07, 08) and Quercus rubra (10).
84. Lobaria quercizans Michx. Frequently collected; On Carya sp. (03), Quercus prinus (03, 07), Quercus rubra (08, 10) and rock (02, 03).
85. Melanaria macounii Lamb. Very sparsely collected; On Betula lutea (07) and Carya sp. (08).
86. Ochrolechia tartarea (L.) Mass. Very frequently collected; On Betula lutea (03), Kalmia latifolia (03), Quercus prinus (07), Quercus rubra (03, 08) and rock (03, 06, 08).
87. Pannaria leucosticta (Tuck.) Tuck. ex Nyl. Very sparsely collected; On Quercus prinus (03).
88. Parmelia appalachensis W. Culb. Very frequently collected; On Acer rubrum (03), Fraxinus americana (10), Quercus prinus (03, 08) and Quercus rubra (01, 07, 08, 10).
89. Parmelia conspersa (Ach.) Ach. Sparsely collected; On rock (02, 03, 08).
90. Parmelia crinata Ach. Frequently collected; On Fraxinus americana (07, 10), Nyssa sylvatica (10), Pyrus communis (10), Quercus prinus (03, 08) and rock (03).
91. Parmelia cumberlandia (Gyeln.) Hale. Very sparsely collected; On rock (01, 02).
92. Parmelia flaventior Stirt. Frequently collected; On Carya sp. (08), Diospyros virginiana (01), Fraxinus americana (07, 10) and Liriodendron tulipifera (07).
93. Parmelia halei Ahti. Very sparsely collected; On rock (08).
94. Parmelia hypopsila Mull. Arg. Very sparsely collected; On rock (01).
95. Parmelia hypotropa Nyl. Frequently collected; On dead wood (01, 09), Diospyros virginiana (01), Liriodendron tulipifera (07) and Sassafras albidium (10).

96. Parmelia perforata (Jacq.) Ach. Very sparsely collected; On Betula lutea (01) and Quercus rubra (08).
97. Parmelia perlata (Huds.) Ach. Sparsely collected; On dead wood (09), Quercus alba (01) and Quercus velutina (10).
98. Parmelia piedmontensis Hale. Very sparsely collected; On rock (03).
99. Parmelia plittii Gyeln. Sparsely collected; On rock (01, 02, 03, 08).
100. Parmelia prolongata Kurok. Very sparsely collected; On rock (08).
101. Parmelia reticulata Tayl. Very Frequently collected; On Betula lutea (01), dead wood (03, 06), Fraxinus americana (10), Kalmia latifolia (03), Liriodendron tulipifera (01), Pyrus communis (10), Quercus marilandica (06), Quercus rubra (02, 08) and Salix nigra (07).
102. Parmelia rudecta Ach. Very frequently collected; On Carya sp. (01), dead wood (01, 03, 09), Kalmia latifolia (04), Liriodendron tulipifera (01, 02, 07), Pyrus communis (10), Quercus alba (01, 10), Quercus rubra (03, 08), Quercus velutina (10), Robinia pseudoaccacia (10), rock (07, 08) and Salix nigra (07).
103. Parmelia saxatilis (L.) Ach. Frequently collected; On dead wood (01, 03), Diospyros virginiana (01), Prunus serotina (02), Quercus rubra (08), Salix nigra (07) and Sassafras albidium (10).
104. Parmelia stuppea Tayl. Frequently collected; On Betula lutea (01), dead wood (03), Diospyros virginiana (01), Liriodendron tulipifera (07) and Quercus prinus (08).
105. Parmelia subrudecta Nyl. Frequently collected; On Betula lutea (01), Cornus florida (10), dead wood (09), Fraxinus americana (10) and Kalmia latifolia (08).
106. Parmelia subtinctoria Zahlbr. Very sparsely collected; On Fraxinus americana (10) and Nyssa sylvatica (10).
107. Parmelia sulcata Tayl. Sparsely collected; On dead wood (09), Pinus virginiana (10) and Quercus velutina (10).
108. Parmelia xanthina (Mull. Arg.) Vain. Very sparsely collected; On rock (08).
109. Parmelina aurulenta (Tuck.) Hale. Frequently collected; On Liriodendron tulipifera (10), Nyssa sylvatica (07), Quercus alba (01), Quercus prinus (07), Quercus rubra (08) and rock (03, 08).
110. Parmelina dissecta (Nyl.) Hale. Sparsely collected; On Quercus prinus (03), rock (03) and Salix nigra (07).

111. Parmelina galbina (Ach.) Hale. Very sparsely collected; On dead wood (09) and Diospyros virginiana (01).
112. Parmelina horrescens (Tayl.) Hale. Very sparsely collected; On Betula lutea (01) and rock (06).
113. Parmeliopsis aleurites (Ach.) Nyl. Very sparsely collected; On Pinus strobus (03, 08).
114. Parmeliopsis hyperopta (Ach.) Arn. Very sparsely collected; On Carys sp. (01)
115. Parmeliopsis placorodia (Ach.) Nyl. Very sparsely collected; On Pinus virginiana (10).
116. Peltigera canina (L.) Willd. Sparsely collected; On ground (02, 03, 06, 08).
117. Peltigera horizontalis (Huds.) Baumg. Very sparsely collected; On ground (05, 08).
118. Peltigera polydactyla (Neck.) Hoffm. Very sparsely collected; On ground (05).
119. Peltigera pratextata (Florke ex Somm.) Vain. Very sparsely collected; On ground (03).
120. Peltigera spuria (Ach.) DC. Very sparsely collected; On ground (05).
121. Pertusaria amara (Ach.) Nyl. Very sparsely collected; On Fagus sp. (01).
122. Pertusaria marginata Nyl. Very sparsely collected; On Salix nigra (07).
123. Pertusaria multipuncta (Turn.) Nyl. Frequently collected; On Fagus sp. (01, 03), Liriodendron tulipifera (03), Quercus prinus (08) and Quercus rubra (06).
124. Pertusaria pertusa (L.) Tuck. Sparsely collected; On Fagus sp. (03) and rock (03, 08).
125. Pertusaria tuberculifera Nyl. Sparsely collected; On Quercus prinus (01, 07) and Quercus rubra (10).
126. Pertusaria velata (Turn.) Nyl. Frequently collected; On Carya sp. (03, 08), dead wood (03), Liriodendron tulipifera (03), Quercus prinus (08) and Quercus rubra (08).
127. Pertusaria xanthodes Mull. Arg. Sparsely collected; On Carya sp. (01, 03, 08) and Liriodendron tulipifera (07).

128. Phaeographis dendritica (Ach.) Mull. Arg. Sparsely collected;
On Betula leuta (07), Carya sp. (07), Liriodendron tulipifera
(01) and Pyrus communis (10).
129. Physcia ciliata (Hoffm.) Du Rietz. Very sparsely collected;
On Liriodendron tulipifera (10).
130. Physcia endococcinea (Korb.) Th. Fr. Very sparsely collected;
On rock (08).
131. Physcia halei Thoms. Very sparsely collected; On rock (03).
132. Physcia lacinulata Mull. Arg. Very sparsely collected; On Quercus
prinus (03) and Quercus rubra (07).
133. Physcia millegrana Degel. Very frequently collected; On Carya sp.
(01, 07), Cornus florida (10), dead wood (09), Diospyros
virginiana (08), Fraxinus americana (10), Liriodendron tulip-
ifera (02), Pyrus communis (10), Quercus alba (01, 10) and
Sassafras albidium (10).
134. Physcia orbicularis f. orbicularis (Neck.) Poetsch. Frequently
collected; On Liriodendron tulipifera (01, 10), Quercus alba
(01), Quercus rubra (08), Robinia pseudoaccacia (10) and
rock (02, 08).
- Physcia orbicularis f. rubropulchra (Neck.) Poetsch. Very frequently
collected; On Betula lutea (07), Carya sp. (01), Cornus
florida (10), dead wood (09), Fraxinus americana (07),
Liriodendron tulipifera (01, 02, 07, 10) and Pyrus communis (10).
135. Physcia setosa (Ach.) Nyl. Very sparsely collected; On Quercus
prinus (07).
136. Physcia stellaris (L.) Nyl. Very frequently collected; On Betula
lutea (01), Carya sp. (01), dead wood (03, 09), Liriodendron
tulipifera (01, 02, 07, 10), Prunus serotina (02, 08) and
Robinia pseudoaccacia (10).
137. Physcia subtilis Degel. Sparsely collected; On rock (01, 02, 07,
08).
138. Physcia tribacoides Nyl. Sparsely collected; On Carya sp. (07),
Quercus rubra (01) and rock (08).
139. Platismatia glauca (L.) W. Culb. & C. Culb. Very sparsely collected;
On Pinus virginiana (10).
140. Platismatia tuckermanii (Oakes) W. Culb. & C. Culb. Very sparsely
collected; On dead wood (09) and Kalmia latifolia (08).
141. Porina mastoidea (Ach.) Mull. Arg. Very sparsely collected; On
Betula leuta (07).

142. Pseudoevernia consocians (Vain.) Hale & W. Culb. Very sparsely collected; On Kalmia latifolia (08) and Pinus virginiana (10).
143. Pseudoparmelia caperata (L.) Hale. Very frequently collected; On Betula lutea (01), Carya sp. (01), Cornus florida (10), dead wood (09), Diospyros virginiana (02), Fraxinus americana (10), Liriodendron tulipifera (01, 02, 10), Pinus strobus (10), Pinus virginiana (10), Pyrus communis (10), Quercus alba (10), Quercus rubra (01, 08), Quercus velutina (10) and Sassafras albidium (10).
144. Pseudoparmelia caroliniana (Nyl.) Hale. Frequently collected; On Liriodendron tulipifera (01), Nyssa sylvatica (07), Quercus rubra (08) and rock (02, 08).
145. Pyrenula nitida (Weig.) Ach. Very sparsely collected; On Quercus rubra (01).
146. Pyxine soredata (Ach.) Mont. Very frequently collected; On dead wood (03), Fraxinus americana (07), Liriodendron tulipifera (01, 10), Quercus prinus (08), Quercus rubra (10), Quercus velutina (10) and Sassafras albidium (10).
147. Ramalina fastigiata (Pers.) Ach. Very frequently collected; On Carya sp. (08), Cornus florida (01), dead wood (09), Fraxinus americana (07), Liriodendron tulipifera (02, 03, 07, 08) and Pyrus communis (02).
148. Rhizocarpon concentricum (Dav.) Beltr. Very sparsely collected; On rock (06, 08).
149. Rhizocarpon grande (Florke ex Flot.) Arn. Very sparsely collected; On rock (03).
150. Rhizocarpon obscuratum (Ach.) Mass. Very sparsely collected; On rock (03).
151. Rhizocarpon sp. Ram. Very sparsely collected; On rock (03).
152. Rinodina sp. (Ach.) S. Gray. Very sparsely collected; On Salix nigra (07).
153. Sarcogyne clavus (Ram.) Kremp. Sparsely collected; On rock (02, 03, 06, 08).
154. Sarcogyne simplex (Dav.) Nyl. Very sparsely collected; On rock (06).
155. Sticta fuliginosa (Dicks.) Ach. Very sparsely collected; On ground (03) and Quercus prinus (08).

156. Sticta weigelii (Isert ex Ach.) Vain. Frequently collected; On Fraxinus americana (10), Quercus prinus (03, 08) and Quercus rubra (01, 10).
157. Trapelia coarctata (Turn. ex Sm.) Choisy. Very sparsely collected; On rock (02, 08).
158. Trypethelium virens Tuck. Sparsely collected; On Fagus sp. (03, 07, 08).
159. Umbilicaria mammulata (Ach.) Tuck. Sparsely collected; On Betula lutea (01) and rock (02, 03).
160. Umbilicaria muhlenbergia (Ach.) Tuck. Very sparsely collected; On rock (02).
161. Umbilicaria vellea (L.) Ach. Very sparsely collected; On rock (03).
162. Usnea dasypoga (Ach.) Rohl. Very sparsely collected; On rock (08).
163. Usnea herrei Hale. Sparsely collected; On rock (02, 03, 08).
164. Usnea hirta (L.) Wigg. Very sparsely collected; On Quercus prinus (08).
165. Usnea mutabilis Stirt. Sparsely collected; On dead wood (09) and Liriodendron tulipifera (03, 07).
166. Usnea rubiginea (Michx.) Mass. Very sparsely collected; On Quercus prinus (03).
167. Usnea strigosa (Ach.) A. Eat. Frequently collected; On Acer rubrum (03), Diospyros virginiana (01), Liriodendron tulipifera (07, 08) and Quercus rubra (08).
168. Usnea subfloridana Stirt. Frequently collected; On dead wood (09), Liriodendron tulipifera (02, 03, 07) and Quercus prinus (01, 07, 08).
169. Xanthoria fallax (Hepp) Arn. Very sparsely collected; On Robinia pseudoaccacia (01).

TABLE I Cosmopolitan Species

Buellia disciformis

Candelaria concolor

Candelaria concolor f. effusa

Cladina subtenuis

Collema subfurvum

Heterodermia obscurata

Lecanora conizaea

Lecidea varians

Parmelia reticulata

Parmelia rudecta

Parmelia saxatilis

Physcia millegrana

Physcia orbicularis f. orbicularis

Physcia orbicularis f. rubropulchra

Physcia stellaris

Pseudoparmelia caperata

Pyxine sorediata

Ramalina fastigiata

TABLE II Split-rail fence (AREA 9) - species composition list

Buellia punctata
Candelaria concolor
Candelaria concolor f. effusa
Cetraria ciliaris
Cetraria fendleri
Cladonia bacillaris f. bacillaris
Cladonia cristatella f. vestita
Cyphelium tigillare
Heterodermia granulifera
Lecanora conizaea
Lecidea varians
Parmelia hypotropa
Parmelia perlata
Parmelia rudecta
Parmelia subrudecta
Parmelia sulcata
Parmelina galbina
Physcia millegrana
Physcia orbicularis f. rubropulchra
Physcia stellaris
Platismatia tuckermanii
Pseudoparmelia caperata
Ramalina fastigiata
Usnea mutabilis
Usnea subfloridana

TABLE III Exposed trees (AREA 10) - species composition list

Tree A	<u>Quercus rubra</u>
	<u>Anaptychia palmulata</u>
	<u>Heterodermia hypoleuca</u>
	<u>Lepraria aeruginosa</u>
	<u>Leptogium cyanescens</u>
	<u>Lobaria pulmonaria</u>
	<u>Lobaria quercizans</u>
	<u>Parmelia appalachensis</u>
	<u>Pertusaria tuberculifera</u>
	<u>Pyxine sorediata</u>
	<u>Sticta weigeli</u>
Tree B	<u>Pinus strobus</u>
	<u>Pseudoparmelia caperata</u>
Tree C	<u>Pyrus communis</u>
	<u>Arthropyrenia alba</u>
	<u>Candelaria concolor</u>
	<u>Heterodermia hypoleuca</u>
	<u>Heterodermia obscurata</u>
	<u>Parmelia crinata</u>
	<u>Parmelia reticulata</u>
	<u>Parmelia rudecta</u>
	<u>Phaeographis dendritica</u>
	<u>Physcia millegrana</u>
	<u>Physcia orbicularis f. rubropulchra</u>
	<u>Pseudoparmelia caperata</u>
Tree D	<u>Liriodendron tulipifera</u>
	<u>Candelaria concolor</u>
	<u>Candelaria fibrosa</u>
	<u>Heterodermia obscurata</u>
	<u>Lecanora chlarotera</u>
	<u>Parmelina aurulenta</u>
	<u>Physcia ciliata</u>
	<u>Physcia orbicularis f. orbicularis</u>
	<u>Physcia orbicularis f. rubropulchra</u>
	<u>Physcia stellaris</u>
	<u>Pseudoparmelia caperata</u>
	<u>Pyxine sorediata</u>
Tree E	<u>Quercus velutina</u>
	<u>Lecanora caesiorubella</u>
	<u>Parmelia perlata</u>
	<u>Parmelia rudecta</u>
	<u>Parmelia sulcata</u>
	<u>Pseudoparmelia caperata</u>
	<u>Pyxine sorediata</u>

TABLE III (cont.)

- Tree F Nyssa sylvatica
Heterodermia granulifera
Lecanora conizaea
Parmelia crinata
Parmelia subtinctoria
- Tree G Sassafras albidum
Lecanora conizaea
Parmelia hypotropa
Parmelia saxatilis
Physcia millegrana
Pseudoparmelia caperata
Pyxine sorediata
- Tree H Robinia pseudoaccacia
Arthonia caesia
Candelaria concolor f. effusa
Candelaria fibrosa
Lecidea varians
Parmelia rudecta
Physcia orbicularis f. orbicularis
Physcia stellaris
- Tree I Fraxinus americana
Candelaria concolor
Candelaria fibrosa
Collema subfurvum
Heterodermia hypoleuca
Heterodermia obscurata
Parmelia appalachensis
Parmelia crinata
Parmelia flaventior
Parmelia reticulata
Parmelia subrudecta
Parmelia subtinctoria
Physcia millegrana
Pseudoparmelia caperata
Sticta weigeli
- Tree J Quercus alba
Candelaria concolor
Heterodermia obscurata
Lecanora chlarofera
Lecanora conizaea
Parmelia rudecta
Physcia millegrana
Pseudoparmelia caperata

TABLE III (cont.)

Tree K	<u>Pinus virginiana</u>
	<u>Cetraria ciliaris</u>
	<u>Parmelia culcata</u>
	<u>Parmeliopsis placorodia</u>
	<u>Platismatia glauca</u>
	<u>Pseudoevernia consocians</u>
	<u>Pseudoparmelia caperata</u>
Tree L	<u>Cornus florida</u>
	<u>Candelaria fibrosa</u>
	<u>Heterodermia obscurata</u>
	<u>Parmelia subrudecta</u>
	<u>Physcia millegrana</u>
	<u>Physcia orbicularis f. rubropulchra</u>
	<u>Pseudoparmelia caperata</u>

DISCUSSION

Of the 169 species collected at the Peaks of Otter, nine are not recognized by Hale and Culberson in their 1970 checklist. Parmelia hypopsila, P. reticulata and Umbilicaria muhlenbergia seem to have been excluded from the checklist by an oversight. Species of Parmelina and Pseudoparmelia were formerly regarded as species of Parmelia on the checklist (Hale, 1976 ab).

Ecological conditions at the Peaks of Otter support a diverse lichen population. Some species occur regularly throughout the park, while the occurrence of others seem to be more restricted. Table I lists the species that were considered cosmopolitan within the park. Certain habitats within the park often supported species whose occurrence was limited to those ecological conditions.

In areas where streams or springs occurred species such as Dermatocarpon fluviatile, Ephebe lanata, Leptogium cyanescens, Peltigera canina, P. horizontalis, P. polydactyla, P. praetextata, Ramalina fastigiata and Sticta weigelia could usually be collected. Most of these species are not necessarily restricted to this type of habitat, but are generally encountered in such places.

Forty-three separate species were collected exclusively on rock substrates. Rocks encountered in mesic woods were frequently covered with such species as Lecanora caesiorinera, L. dispersa, Lecidea albocaerulescens, Parmelia conspersa, P. hypopsila and Rhizocarpon concentricum. Rocks situated in mesic forests supported different lichen populations than rocks found in exposed areas. At the summit of Sharp Top Mountain weathering has exposed a large mound of diorite boulders

that support large populations of Caloplaca flavovirescens, Lecidea macrocarpa, Physcia subtilis, Sarcogyne clavus and several species of Umbilicaria. The Umbilicari thalli were frequently so abundant they concealed the rock surface. Specimens of Caloplaca were found to occur most abundantly on the mortar between the stones of a shelter constructed at the Peak to protect hikers during storms. Also occurring on these exposed boulders but in small populations are such species as Alectoria nidulifera, Caloplaca lobulata, Cetraria hepatizon, Coccocarpia coronia, Diploschistes scruposus, Lepraria chlorina, Parmelia prolongata, P. xanthina, Physcia endococcinea and Usnea dasypoga.

Roadsides, old fields, and areas adjacent to park facilities such as the sewage-treatment lagoon, were the only locations within the park that supported large populations of Cladoniform lichens. The area surrounding the sewage treatment lagoon was especially productive for the collection of such species as Cladonia bacillaris f. subtomentorula, C. capitata, C. chlorophaea, C. cristatella f. orchrocarpa, C. piedmontensis and C. verticillata f. apodicta. Also collected on the mud bank that surrounds the lagoon were several specimens of Peltigera spuria. The Purgatory Mountain overlook (Area 6) was another excellent site for the collection of Cladoniform lichens. Two species, Cladonia pleurota f. extensa and C. subcariosa, were not collected outside of Area 6.

Twenty-five species were collected from the split-rail fence (Area 9) that traverses the park valley (Table II). Buellia punctata, Cetraria fendleri and Cyphelium tigillare were collected exclusively on the fence. Species collected only once or twice outside of Area 9 include Heterodermia granulifera, Parmelia perlata, P. subrudecta, Parmelina galbina, Platismatia tuckermanii and Usnea mutabilis. The most frequently

collected and conspicuous species occurring on the fence were Parmelia rudecta, P. sulcata and Pseudoparmelia caperata.

A total of 39 species were collected from the exposed valley trees of Area 10 Table III). Arthropyrinia alba, Lepraria aeruginosa, Parmelia subtinctoria, Parmeliopsis placorodia, Physcia ciliata and Platismatia glauca were collected exclusively from these exposed trees.

Although a total of 169 species are reported in this study from the Peaks of Otter it is probably that the total number of lichen taxa in the area is higher. As a comparison, researchers at the Great Smoky Mountains National Park, which encompasses nearly half a million acres and a greater diversity of habitats have reported approximately 400 species. Additional collecting at the Peaks of Otter Natural Area along the Blue Ridge Parkway would unquestionably boost the number of lichen species reported from that area.

Summary

The Peaks of Otter is located along the Blue Ridge Parkway in south-central Virginia. The park is maintained by the National Park Service. The majority of the 4000 acres that constitute the area are primarily forest. The park was divided into ten major collecting areas to insure that extensive collecting occurred in every ecological habitat present within the park.

One hundred and sixty-nine species were identified from the specimens collected. Some species occur regularly throughout the park, while the occurrence of others seem to be more restricted. Some of the more unique habitats that provided for the collection of unusual species were exposed boulders, stream banks, south facing xeric slopes and certain trees located in open situations within the park valley.

LITERATURE CITED

- Allard, H. A. 1940. "Iseland moss", Cetraria islandica, in Virginia. Va. Jour. Sci. 1(1): 17-25.
- _____ and E. C. Leonard. 1944. The Cladoniae of Bull Run Mountain, Virginia. Castanea 9: 81-100.
- Braun, Lucy. 1950. Deciduous Forest of North America. Hafner Publishing Co., New York, New York.
- Brodo, I. M. 1968. The Lichens of Long Island, New York: A vegetational and floristic analysis. Bulletin #410, New York State Museum and Science Service, Albany, New York.
- Crockett, C. W. 1971. The climate of Virginia. In Climates of the States (Vol. 1 - Eastern States), A Practical Reference Containing Basic Climatological Data of the United States. 1974. Water Information Center, Inc. Port Washington, New York. (pp. 398-420).
- Dalmas, T. H. 1972. The flora of the headwaters of Cornelius Creek, Botetourt County, Virginia. Unpublished manuscript available at the offices of the Blue Ridge Parkway, Roanoke, Va.
- Duncan, U. K. and P. Hames. 1970. Introduction to British Lichens. Buncle & Co. Ltd. Arbroath, Scotland.
- Fink, B. and J. Hedrick. 1935. The Lichen Flora of the United States. University of Mich. Ann Arbor, Mich.
- Freer, Ruskin. 1950. A preliminary checklist of plants in the central Virginia Blue Ridge. Castanea 15: 1-37.
- _____. 1958. Flora of the Central Blue Ridge: Additions to the checklist. Castanea 23: 96-109.
- _____. 1968. Plants of the Central Blue Ridge--Supplement II. Castanea 33: 163-1933.
- Goldfield, E. D. 1967. County and City Data Book, A Statistical Abstract Supplement. U.S. Dept. of Commerce, Washington, D. C.
- Hale, M. E. 1969. The Lichens. Wm. C. Brown Co. Publishers, Dubuque, Iowa.
- _____ and W. L. Culberson. 1970. A fourth checklist of the lichens of the continental United States and Canada. The Bryologist Vol. 73(3): 499-543.

- _____. 1976a. A monograph of the lichen genus Parmelina.
Smithsonian Contributions To Botany #33. Smithsonian Institution
Press, Washington, D. C.
- _____. 1976b. A monograph of the lichen genus Pseudoparmelia.
Smithsonian Contributions To Botany #31. Smithsonian Institution
Press, Washington, D. C.
- _____. 1976c. Personal communication with author.
- Johnson, G. G. 1975. Vegetation of the Peaks of Otter Region of the
Virginia Blue Ridge. Unpublished manuscript, available at the
offices of the Blue Ridge Parkway, Roanoke, Va.
- Jolley, H. E. 1969. The Blue Ridge Parkway. The University of
Tennessee Press, Knoxville, Tennessee.
- Kirkwood, J. J. 1968. A preliminary sketch of the history of the
Virginia Peaks of Otter Blue Ridge Parkway. Unpublished manu-
script, available at the offices of the Blue Ridge Parkway,
Roanoke, Va.
- Luttrell, E. S. 1955. The Cladoniaceae of Virginia. *Lloydia* 17(4):
275-306.
- Mazzeo, P. M. 1967. Trees of Shenandoah National Park in the Blue
Ridge Mountains of Virginia. The Shenandoah Natural History
Association, Inc. Luray, Virginia.
- Nearing, G. G. 1947. The Lichen Book. Eric Lungberg Pub. Ashton,
Maryland.
- Patterson, Paul. 1940. Bryophytes succession on boulders in the
Mountain Lake area, Giles County, Virginia. *Va. Jour. Sci.*
1(1): 5-17.
- Platt, R. B. 1951. An ecological study of the Mid-Appalachian shale
barrens and of the plants endemic to them. *Ecological Monographs*
21(4): 269-300.
- Skorepa, A. C. 1973. Taxonomic and ecological studies on the lichens
of southern Illinois. University Microfilms, Ann Arbor, Michigan.
- Small, J. K. and A. M. Vail. 1893. Report of the botanical explora-
tion of south-western Virginia during the season of 1892. *Memoirs
Torrey Bot. Club.* 4(2): 92-201.
- Spencer, Edgar. 1968. Geology of the Natural Bridge, Sugarloaf Moun-
tain, Buchanan, and Arnold Valley Quadrangles, Virginia. Common-
wealth of Virginia Publication, Division of Natural Resources,
Charlottesville, Virginia.

- Taylor, C. J. 1967. The Lichens of Ohio, Part I (Foliose Lichens).
Ohio Biological Survey, Biological Notes #3. Ohio State University.
- _____. 1968. The Lichens of Ohio Part II (Fruticose and
Cladoniform Lichens). Ohio Biological Survey, Biological Notes
#4. Ohio State University.
- Thomson, J. W. 1963. The Lichen Genus *Physcia* in North America.
Beihefte Zur Nova Hedwigia, Heft 7. Verlag Von J. Cramer,
Weinheim, Germany.
- _____. 1967. The Lichen Genus Cladonia in North America. Univ-
ersity of Toronto Press, Toronto, Canada.
- Wetmore, C. M. 1967. Lichens of the Black Hills of South Dakota
and Wyoming. Vol. 3 (4) Publications of the Museum, Michigan
State University, East Lansing, Michigan.
- Whittaker, R. H. 1956. Vegetation of the Great Smoky Mountains.
Ecological Monographs 26: 1-80.

PLATE I County map of Virginia showing the location of
the Peaks of Otter.



SCALE
0 10 20 30 40 50 MILES

Incorporated places of 100,000 and over (●)
Incorporated places of 25,000-100,000 (○)

INCORPORATED CITIES

- | | | |
|--------------------|-------------------|------------------|
| 1 ALEXANDRIA | 12 FRANKLIN | 23 FERRISBURG |
| 2 BRISTOL | 13 FREDERICKSBURG | 24 PETERSBURG |
| 3 BUENA VISTA | 14 GALAX | 25 RADFORD |
| 4 CHARLOTTESVILLE | 15 HAMPTON | 26 RICHMOND |
| 5 CHESAPEAKE | 16 HARRISONBURG | 27 ROANOKE |
| 6 CLIFTON FORGE | 17 HOPEWELL | 28 SOUTH BOSTON |
| 7 COLONIAL HEIGHTS | 18 LYNCHBURG | 29 STAMFORD |
| 8 CROFTSVILLE | 19 MARTINSVILLE | 30 SULLY |
| 9 DANVILLE | 20 NEWPORT NEWS | 31 WASHINGTON |
| 10 FARMAS | 21 NORFOLK | 32 WASHINGTON |
| 11 FALLS CHURCH | 22 NORFOLK | 33 W. L. AMHERST |
| | | 34 WYOMING |

Plate II Outline Map of the Peaks of Otter in Virginia

- | | | |
|---|------------------------|--|
| 1. Collection site 1,
and adjacent areas | Picnic - Campgrounds | a. Blue Ridge Parkway to Roanoke Virginia
(35 miles) |
| 2. Collection site 2,
adjacent areas | Johnson Farm and | b. Harkening Hill, elevation 3372' |
| 3. Collection site 3,
Loop Trail and adjacent areas. | Falling Water Cascades | c. Park Visitors Center |
| 4. Collection site 4,
south slope only | Flat Top Mountain | d. Camp store |
| 5. Collection site 5,
and adjacent areas | Park sewage treatment | e. Sharp Top Mountain, elevation 3875' |
| 6. Collection site 6,
Purgatory Mt. Overlook | | f. Lodge Lake, elevation 2494' |
| 7. Collection site 7,
and adjacent areas | Elk Run Loop Trail | g. Peaks Lodge and Restaurant |
| 8. Collection site 8,
and adjacent areas | Sharp Top Mountain | h. State Route 43 to Bedford Virginia
(14 miles) |
| 9. Collection site 9,
Valley split-rail fence | | i. Flat Top Mountain, elevation 4004' |
| 10. Collection site 10,
valley | Selected trees within | j. Blue Ridge Parkway to Shenandoa National
Park (82 miles) |

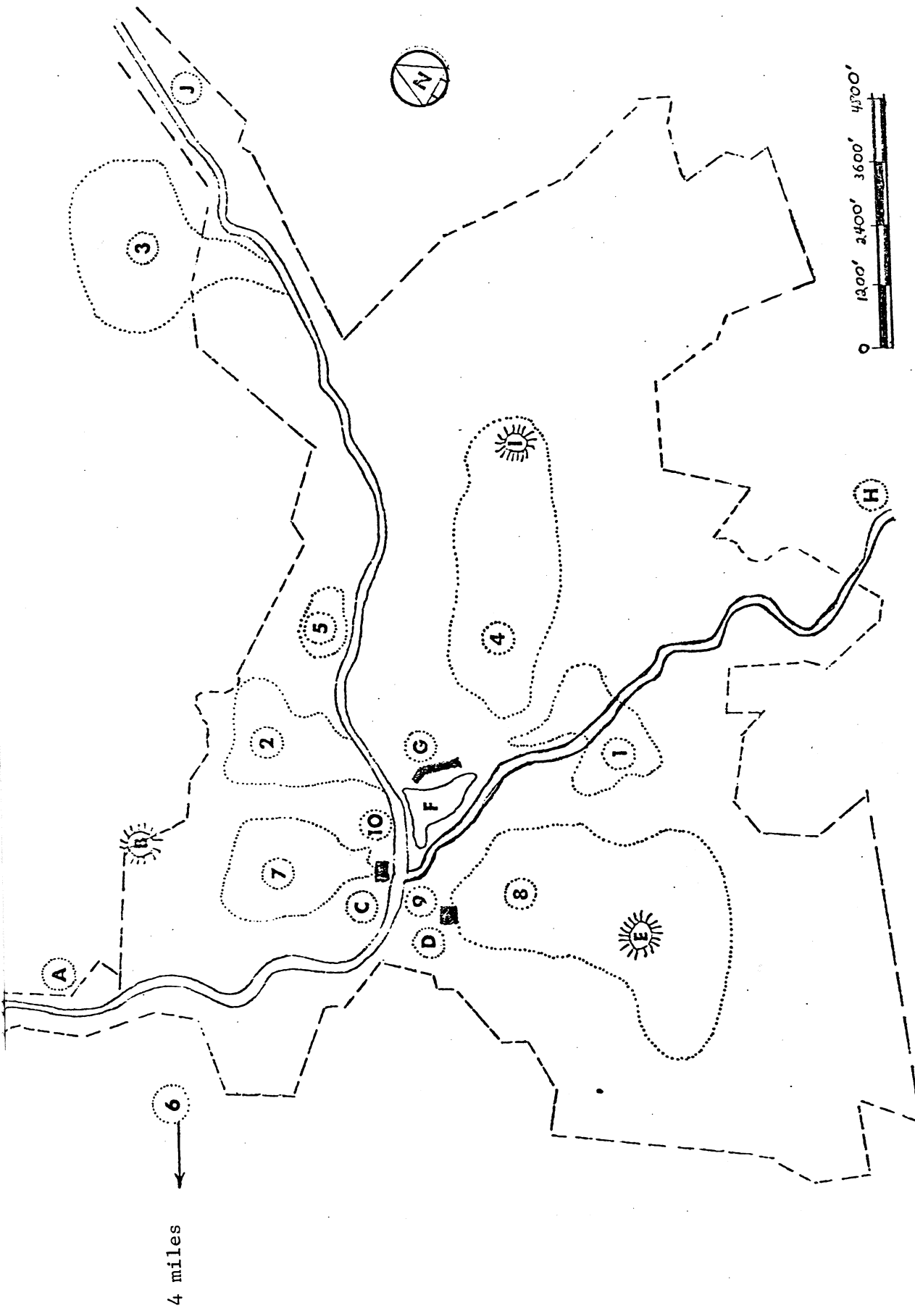


PLATE II

PLATE III The ecological habitats of each of the collection sites.

	<u>AREAS</u>									
	1	2	3	4	5	6	7	8	9	10
Mesic slopes present	X		X				X	X		
Xeric slopes present			X	X			X	X		
North & east slopes	X	X						X		
South & west slopes			X	X			X	X		
Primarily forest	X		X	X			X	X		
Not forested (open)		X			X	X			X	X
Rock outcrops present			X	X		X				
Exposed boulders present			X	X				X		
Streams present	X		X		X		X			
Park valley					X				X	X
Elevation above 3000'		X	X	X		X		X		
Elevation below 3000'	X	X			X		X		X	X

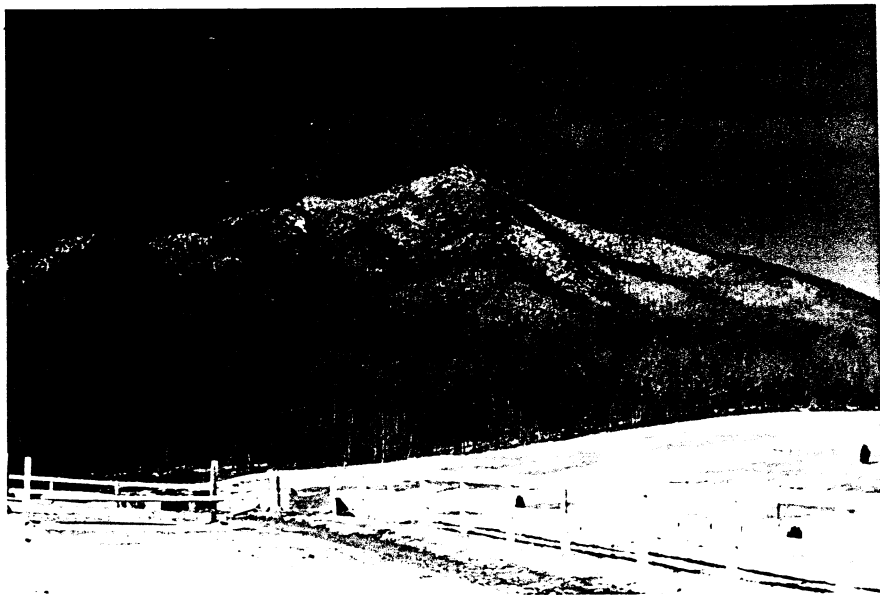


PLATE IV

Sharp Top Mountain (Area 8), elevation 3875', forms the eastern boundary of the park. The eastern slope of the mountain pictured in the background is comprised primarily of mesic forest.



PLATE V

During the mid-1960's the United States Park Service constructed the Peaks of Otter Lodge and Restaurant. The lodge pictured in the foreground is situated in the park valley, elevation 2494', between Flat Top Mountain (Area 4) as seen in the background and a small man-made lake.

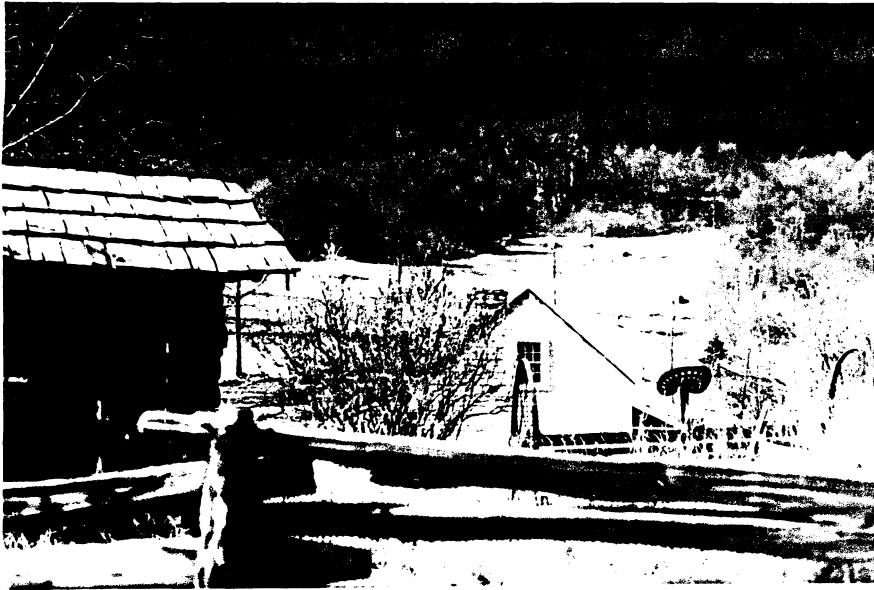


PLATE VI

The Johnson Farm (Area 3) is maintained by the Park Service as a "mountain farm" where pioneer crafts are demonstrated seasonally. The cleared area pictured in the background was used by pioneers to grow hay for winter feed. The area is periodically mowed to prevent the invasion of woody plants and is an excellent site for the collection of species of Cladonia.



PLATE VII

Large exposed boulders and rock outcrops as encountered in Areas 3, 4, 6 and 8 supported diverse lichen populations. Species of Parmelia, Physcia, Umbilicaria, Usnea and many species of crustose lichens were frequently collected in these habitats.



PLATE VIII

The split-rail fence (Area 9) that traverses the park valley was constructed by the National Park Service in the early 1960's from Chestnut (Castanea) rails. A thorough study showed that 24 species of lichens had become established on the fence during the sixteen years since its construction.



PLATE IX

Parmelia subcata was one of the co-dominant species encountered on the split-rail fence (Area 9). The thallus pictured above has a diameter of approximately 7.5 dm. The other dominant species were Parmelia rudecta and Pseudoparmelia caperata.



PLATE X

Since sunlight is one of several factors that influence the occurrence of lichens, twelve selected species of trees, each located in the open park valley, were carefully sampled. One tree of each species was studied. Pictured above is Tree 10, a White Oak (Quercus alba), located north of the Peaks of Otter Lodge on a gentle south slope in direct sunlight.

Arthropyrenia alba, Lepraria aeruginosa, Parmelia subtinctora, Parmeliopsis placorodia, Physcia ciliata and Platismatia glauca were exclusively collected on these exposed trees.