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VEGETATION OF THE SOUTHERN APPALACHIANS: AN INDEXED BIBLIOGRAPHY, 1805-1982

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SOUTHEAST REGION

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GREAT SMOKY MOUNTAINS NATIONAL PARK
TWIN CREEKS AREA
GATLINBURG, TENNESSEE 37738

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AN INDEXED BIBLIOGRAPHY, 1805-1982

Research/Resources Management Report SER-63

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ABSTRACT

A bibliography of 1,081 references (78 of which are in a 1981-1982 supplementary update to the main list) was developed to provide researchers and naturalists with access to the accumulating work on southern Appalachian vegetation. The geographic focus was Great Smoky Mountains National Park, but studies from a broader area were included: northern Georgia, northwestern Alabama, western North and South Carolina, eastern Tennessee and Kentucky, eastern West Virginia, western Virginia, and western Maryland. The subject matter focus was the description and understanding of southern Appalachian vegetation patterns. Most papers listed are on the plant community level; typically, these describe vegetation composition, structure, and successional dynamics, and report the environmental relations or gradient distributions of species and vegetation types. Ecosystem and population work have also been cited, particularly when containing explicit reference to community patterns. We have provided an index of 80 major topics to aid initial literature searches. An appendix details the way in which cross-referencing categories were entered into a computerized data base.

ACKNOWLEDGEMENTS

The Great Smoky Mountains Natural History Association provided financial support for the compilation of this bibliography. We thank Shirley Boykin and Joyce McCarter of that organization for their kind help in administering the project. We also thank Claryse Myers, Great Smoky Mountains National Park librarian, for her assistance in obtaining inter-library loans. The need for bibliographic guides to scientific research in Great Smoky Mountains National Park and its surrounding area was first articulated by a committee representing the park offices of Interpretation and Resources Management and the Uplands Field Research Laboratory. The project has been supervised by Peter White of Uplands Laboratory.

INTRODUCTION

The rich vegetation of the southern Appalachians has attracted the attention of botanists and plant ecologists for over 100 years. The bibliography presented here contains 1,081 references spanning 177 years. Our primary objective in compiling this bibliography was to provide researchers and naturalists with access to this accumulating body of work. The volume of materials cited led us to provide an index by major topics.

This bibliography is part of an ongoing series on the biota and environment of Great Smoky Mountains National Park (GRSM) and vicinity. Bibliographies on Pteridophytes (Evans et al. 1981), Phanerogam systematics (Wofford and White 1982), and Chiroptera (Rabinowitz 1982) have been published. Other bibliographies on the area's soils, geology, and salamanders are in preparation. The bibliography project was, in part, inspired by the recognition of GRSM as an International Biosphere Reserve (Johnson and Bratton 1978). Shorter subject bibliographies restricted to work done within the national park appear in McCrone et al. (1982).

In order to provide easy access to the literature, Charlotte Pyle and Peter White designed a cross-reference system. This allowed us to index the bibliographies and to use the same reference on separate bibliographies (e.g., a reference that describes soils, geology, and vegetation was assessed once and was accessible for the three separate final reports). The cross-reference form was formatted for keypunching and is part of a computerized data base being developed at Uplands Field

Research Laboratory. The cross-referencing codes for the vegetation bibliography are included in this report as Appendix I.

Geographic Scope

Vegetation studies from a broad area of the southern Appalachian landscape are relevant to the understanding of vegetation patterns in GRSM. Although we provide an index to studies done within the strict confines of the national park itself, we have assembled literature from a larger geographic area. Research treating the conterminous mountainous portions of the following states has thus been included here: northeastern Alabama, northern Georgia, western West Virginia, western Virginia, and western Maryland (this coincides approximately with the "southern Appalachian highlands" as described by Blauch (1975). The bibliography focuses on the Blue Ridge physiographic province (Fenneman 1938), but parts of two adjacent provinces were also included--the Appalachian Plateau Province and the Ridge and Valley Province.

Definition of Subject Matter

The subject matter of this report is the description and understanding of southern Appalachian vegetation patterns. A wide variety of research is encompassed under this heading. Most papers focus on the community level; typically, these describe vegetation composition, structure, and successional dynamics. Community level work often describes environmental relations and/or gradient distributions of species and vegetation types. Ecosystem and population level works are also cited, particularly when they contain explicit references to community patterns.

The following areas were not exhaustively reviewed: autecology (or silvics) of southern Appalachian species, forestry-oriented studies of production and regeneration, and paleoecology. Nonetheless, important articles from each of these areas were included. Floras and checklists are frequently cited, particularly if they included descriptions of community types and species distributions. Special effort was made, of course, to include literature that had specific reference to the Great Smoky Mountains. The practical needs of resource managers in GRSM led us to include various impact studies (e.g., air pollution and exotic species impacts). The bibliography includes predominantly technical literature (journal articles, theses, dissertations, and government reports), although some popular articles and descriptive narratives were included, particularly in the older literature.

As might be inferred from the broad geographic scope and subject matter definition, the ultimate inclusion or exclusion of a given reference was, at least in part, a subjective decision. We tried to be consistent in these decisions and to make the bibliography complete and systematic. Omissions of one sort or another have probably occurred; we hope we have kept these to a minimum. Because the preparation of this report began two years ago, we felt it necessary to add a series of references that have only recently come to our attention; they are numbered from 2000 and are cited in the index.

We have made good use of several bibliographies for our region and subject matter: Stockbridge (1911, no. 860 in the bibliography), USDA Forest Service (1947, no. 915), Egler (1961, no. 282), Munn (1961, no.

643), Haug and Van Dyne (1968, no. 403), Hardin and McDonald (1975, no. 385), Sargent (1977, no. 775), and Peet (1979, no. 684). Peet's bibliography is particularly germaine, as it treats the vegetation of North Carolina (it includes Piedmont and Coastal Plain studies not referenced here). Sargent's bibliography covers work done at the Highlands Biological Station; it is updated in the station's Annual Announcement. For a compilation of literature on balds, see Saunders (1981) and references cited therein. The reader is further directed to the Guide to American Botanical Literature published in the Bulletin of the Torrey Botanical Club.

Two additional sources of information include abstracts from the Bulletin of the Association of Southeastern Biologists and the Proceedings of the Annual Scientific Research Meetings of the National Park Service, Southeast Regional Office (held each June in GRSM; copies are available on request through the Uplands Field Research Laboratory). These abstracts are not referenced here.

METHODS

The bibliographic search was predominantly done at GRSM and the University of Tennessee at Knoxville. We began with the card file and reprint collection of Peter White (at Uplands Field Research Laboratory). The GRSM Library was searched. At the University of Tennessee, literature from the card file and reprints of H. R. DeSelm were added. Theses and journals were reviewed at the University

Library. Other libraries used included those of Oak Ridge National Laboratory, Oak Ridge, Tennessee, and the Tennessee Valley Authority, Norris, Tennessee. We searched all issues of the following journals: Castanea, Bulletin of the Torrey Botanical Club, Torreya, Journal of the Elisha Mitchell Science Society, American Midland Naturalist, Ecology, Ecological Monographs, Journal of Forestry, and Journal of the Tennessee Academy of Science. We used a computer search available at the University of Tennessee that provided 250 references for the period 1973-1979. Only 18 of these had not been discovered in our manual searches.

In all cases, references were scanned for relevance and for cross-referencing. The bibliographies of included papers were themselves searched. Archival materials (e.g., raw data, correspondence, photos, and maps) are available in the GRSM archives. These were inventoried in the search but are not listed here. Interested researchers should contact Peter White at Uplands Field Research Laboratory.

Cross-referencing was accomplished using a data sheet formatted for direct keypunching at the University of Tennessee. Many of the cross-referencing categories on this data sheet are included here as the main headings of the index. The full scheme is included as Appendix I. The main kinds of information included are form of reference (journal article, thesis, etc.), topic (checklist, community ecology, autecology, etc.), specific reference to GRSM, geographic area treated, vegetation

types treated, relevance to succession and disturbance, relevance to management concerns, and inclusion of data on climate, geology, soils, human impacts, and history.

The index and summary tables were compiled from the cross-referencing forms, using the Statistical Analysis System at the University of Tennessee Computer Center. We have numbered the references in order to make the index less cumbersome. Literature is listed (and hence numbered) alphabetically, except for late additions which appear at the end of the bibliography and are numbered beginning with "2000."

RESULTS AND DISCUSSION

The literature cited in the bibliography spans 19 decades (Table 1). There is a steady increase from the early 1900's (when plant ecology first took shape as a discipline in this country) to the present. Floristic and descriptive material predominated until 1950-1960, when papers on community theory, succession, and ecosystem level processes began to increase. Practically all of the references on such topics as species diversity, productivity and energetics, and nutrient cycling date from 1960. Plant community descriptions have, of course, continued to be published. This is, at least in part, due to the complex nature of Appalachian vegetation. There are, for example, regional differences in the vegetation pattern within the areas considered here. Although such factors as elevation, site moisture, slope aspect, topographic shape, bedrock, and disturbance history adequately explain vegetation pattern on a given site, a highly

predictive model of southern Appalachian vegetation has never been produced. The broad vegetation pattern of the area is, however, well known and has been thoroughly described in the literature; more detailed understanding of specific problems is still possible. Many of the accepted facts of southern Appalachian vegetation (for example, its antiquity) have been disproved by more recent research (see Paleoecology in the index).

A number of recent papers reflect the growing need for management level information. Such issues as European wild boar, deer browsing, rare plant studies, grassy bald succession, pollution monitoring, and balsam woolly aphids have all stimulated research in the past 10 years. Chestnut blight was an earlier concern, but studies of post-blight vegetation change have continued to the present.

Journal articles predominated the literature assembled here but 167 M.S. and Ph.D. theses were also included (Table 2). Castanea (published by the Southern Appalachian Botanical Club) is a highly important outlet for work in this area. Many of the theses are unpublished and represent an important source for understanding the vegetation pattern of this region.

One hundred and seventy-four references (about one-sixth of the total) contain more than a passing reference to GRSM (Table 3). Fully 760 references are completely restricted to the study area in their scope. The most important general theme of the citations is community ecology, followed by floristic descriptions and checklists (Table 4). Within community ecology, descriptions of natural vegetation predominate

(Table 5). References to general vegetation types reflect the abundance of those types in the southern Appalachians, except that research on heath and grassy balds are over-represented since about 10 percent of the vegetation type references cite these communities, even though they occupy much less than 1 percent of the landscape within the park (Table 6). Research on species dynamics, natural disturbance regimes, human impacts, and management and ecosystem processes is at the forefront of this work, and these areas will become an important source of new insights into the southern Appalachian landscape.

Table 1. Number of citations by date. (In this and the following tables, some references could not be placed in any single category; hence, totals for the tables show minor discrepancies.)

Years	Number of Citations	Years	Number of Citations
1800-1809	1	1900-1909	36
1810-1819	1	1910-1919	26
1820-1829	0	1920-1929	48
1830-1839	0	1930-1939	101
1840-1849	1	1940-1949	113
1850-1859	1	1950-1959	141
1860-1869	1	1960-1969	195
1870-1879	1	1970-1979	335
1880-1889	6	1980+	90
1890-1899	19		

Table 2. Number of citations by form of material.

Form	Number of Citations
Journal articles	675
Master's theses	111
Pamphlets	95
Books	80
PhD. dissertations	56
Management Reports	21
Maps	6
Unpublished manuscripts	6
Popular articles	5

Table 3. Geographic area of reference. A reference was placed in the narrowest possible category, starting with "Great Smoky Mountains National Park" and ending with "General" (references containing significant descriptions of Southern Appalachian vegetation embedded in a larger context).

Area	Number of Citations
Great Smoky Mountains (exclusively)	174
Tennessee Mountains	159
North Carolina Mountains	192
Tennessee and North Carolina	21
Southern Appalachian Highlands	207
Southern United States	192
Eastern North America	75
General	54

Table 4. General reference type (each reference could be placed in more than one appropriate category).

General Theme	Number of Citations
Community ecology	544
Floristic checklist	222
Autecology	181
Popular guide	151
Miscellaneous	128
Ecosystem studies	113
Management reports	96
Biogeography	83
Systematics	38
Distribution notes	21
Classification keys	13
Taxonomic manuals	11

Table 5. Number of references by general topic (each reference could be placed in more than one appropriate category).

Topic of Reference	Number of Citations
Natural vegetation	344
Overall landscape patterns	290
Site characteristics, as they effect vegetation	284
Succession	279
Forestry	186
Seasonality	88
Species richness in plots and community types	85
Productivity and energetics	82
Nutrient cycling	59

Table 6. Frequency distribution by vegetation types (each reference could be placed in several appropriate categories).

General Vegetation Class	Number of Citations
Oak	835
Pine	348
Cove hardwoods	307
Spruce-fir	223
Hemlock	191
Northern hardwoods	154
Grassy balds	99
Heath balds	65

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THE INDEX

In preparing the index we have kept brevity and ease of use as the guiding principles. Hence, we have been conservative in listing references under a given topic. For example, articles with only a passing reference to grassy balds are not cross-referenced under the grassy bald heading; rather, only studies specifically addressing that community type are cited. This index may then serve as a beginning to further literature searches. It provides a concise list of references on each topic; the bibliographies of those references can then be searched for additional material.

The index, as noted above, was derived from the cross-referencing forms; however, those forms contain more information than could be published here. Anyone wishing to access the vegetation literature by means of the computerized version of the index should send details of their search requirements to Peter White at Uplands Field Research Laboratory.

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APPENDIX I

CROSS-REFERENCE CODING INSTRUCTIONS, VEGETATION BIBLIOGRAPHY

(Developed by C. Pyle, P. White, and H. DeYoung, Uplands Field Research Laboratory)

The system involves the coding of references on a form with space for one reference per sheet. This allows the references to be manually sorted (e.g., put in alphabetical order by the author's last name) prior to the entry into a computerized retrieval system. To simplify the transfer of data to the computer, the forms have been constructed with boxes in a computer-card format.

Individual references within the vegetation bibliography were alphabetized and then numbered consecutively. This number is used to identify each reference. In addition to the identification number, the location of the reference, the form of the material, the type/topic of reference, and a general cross-referencing format appears on each form. At the top of each form are 80 boxes which correspond to the 80 columns one may use in FORTRAN computer coding. They are filled in as follows:

BOX

1-2 Code number of GROUP being referenced.

3-6 Identification number of reference.
Begin with 0001 for the first reference of each GROUP and number the references consecutively after they have been alphabetized.

7 Enter a 1 in this box if the reference was not seen.

8 LOCATION OF REFERENCE.
Code with priority for GRSM Library.
Code as follows:

- A GRSM Library shelf
- B GRSM vertical files
- C GRSM archives
- D GRSM Uplands Field Research Lab. or Researcher/Collector file
- E GRSM Investigator's Annual Reports file
- F University of Tennessee, Knoxville Library System
- G Tennessee Valley Authority Library (Norris, TN)
- H Interlibrary loan
- I Author's personal copy

BOX

9 FORM OF MATERIAL
Code as follows:

A Book
B Journal article (includes notes, etc., published in a journal)
C Popular article

D Master's thesis - unpublished
E Doctoral dissertation - unpublished

F Uplands Management Report/Report for the Superintendent
G Uplands unpublished reports
H Other published sources: pamphlets, etc.
I Unpublished manuscripts, personal journals, notes, etc.
J Correspondence on file at GRSM
K Annual report
L Map
M Photograph
N Tape recording

10-11 TYPE/TOPIC OF REFERENCE

There is space for entering two. Not necessarily alphabetically left justified - for the computer scan, request individual code from either box 10 or 11. Code as follows:

A Popular guide
B Standard type taxonomic manual

C Checklist
D Distribution notes - including references to collections made in GRSM
E Key
F Systamtics - evolutionary relationships: includes monographs and detailed papers on morphology and anatomy.
G Autecology - life history, physiology, and breeding

H Community ecology - includes information on species diversity, reproduction, community dynamics, disturbance, succession, individual species community composition, and patterns across the landscape
I Ecosystem studies - includes energetics, nutrient cycling, and productivity

J Management Reports/concerns

K Floristic or fanustic relationship between geographic areas or geologic time periods - including papers on the fossil record

L Other

BOX

12 Put a 1 in this box if the Great Smoky Mountains National Park is specifically mentioned.

13 GEOGRAPHICAL AREA COVERED BY MATERIAL
Give priority to the specific location if it is 1-5.
Codes as follows:

1 Great Smoky Mountains National Park only
2 Great Smoky Mountains
3 Tennessee
4 North Carolina
5 Tennessee/North Carolina
6 Southern Appalachian Mountains - (1) Includes as a whole the following areas: Unakas, Great Smoky Mountains, Blue Ridge, Blue Ridge escarpment, Black Mountains, Grandfather Mt., Natahala Mountains and the Unicois, or (2) the general area bounded by the conterminous mountainous portions of the following states: northeastern Alabama, northern Georgia, northwestern South Carolina, western North Carolina, eastern Kentucky, western West Virginia, eastern Tennessee, western Virginia, and southeastern Maryland.
7 Southeastern United States or "southern" - Includes area east of Mississippi River and south of Pennsylvania, Ohio, Indiana, and Illinois. Also includes "Southern Appalachians" papers with this geography rather than that outlined under 6 (Southern Appalachian Mountains).
8 Eastern North America - Includes papers with Eastern North America in the title; papers on "Appalachians" or "Southern Appalachians" not included in the geography outlined under 6 or 7 above; general area east of the Mississippi River.
9 Other
0 General

14 PATTERN
1 = Material has reference to the pattern of distribution of vegetation on the landscape.

15 SITE CHARACTERISTICS
1 = Material relates vegetation (pattern, growth, species frequency...) to site characteristics.

16 SUCCESSION
1 = Material relates to changes in vegetative composition of a site over time.

17 FORESTRY
1 = Material relates to people's manipulation (especially of the growth, reproduction, and maintenance) of a stand.

BOX

18 GROWTH, REPRODUCTION, AND MAINTENANCE
1 = Material relates with the framework of "natural events," i.e.-- not presently being manipulated.

19 HUMAN-RELATED DISTURBANCE

1 = General
2 = Exotics (animal, plant, disease)
3 = Campsites, trails
4 = Roads, buildings
5 = Logging
6 = Farming/Livestock
7 = Digging/Gathering
8 = Indian
9 = Fire
0 = Other

20 NATURAL DISTURBANCE

1 = General
2 = Native animals
3 = Wind
4 = Fire
5 = Slides
6 = Flooding
7 = Native insects/diseases
8 = Allelopathy
9 = Other

21 SPECIES DIVERSITY
1 = Material goes into detail on what factors influence the number of plant species in a set of communities or plots.

22 NUTRIENT AND BIOGEOCHEMICAL CYCLING
1 = In a plant or plant ecosystem. Includes material related to vegetation on the rate of water flow through an ecosystem.

23 ENERGETICS/PRODUCTIVITY
1 = Material on energetics (flow of energy in plants and ecosystems; that is, where biomass goes--e.g., flowers, leaves, or trees; herbs; also, efficiency of conversion of energy from one form to another) and/or material on productivity (rate of making biomass or gathering together energy and nutrients).

24 SEASONALITY
1 = Material makes comparisons or statements about vegetation as relates to change of seasons.

25- VEGETATION TYPE
34 If a particular reference relates the GROUP being referenced in an important way to a major vegetation type, enter a 1 in the appropriate box.

BOX

25-34 VEGETATION TYPE (cont.)

25 Spruce-fir

26 Northern hardwoods - includes Beech, Maple, Buckeye, and Beech gaps

27 Cove hardwoods - includes "mesic hardwoods'

28 Hemlock

29 Oak - includes Oak - Chestnut, Oak, mixed Oak, etc.

30 Pine

31 Heath bald

32 Grassy bald

33 Aquatic bog or swamp forests

34 Other
Code as follows:

1 = Additional vegetation types mentioned
2 Understory information only
3 Additional vegetation types with understory information mentioned
4 Herbaceous and fern information only
5 Additional vegetation types, understory information, and herbaceous and fern information

35-54 ANIMALS
If a particular reference relates the GROUP being referenced to animals in terms of nontrivial ecological or systematic relationships of an individual species or group of animals, enter a 1 in the appropriate box.

35 Mammals (general) - Do not use if a more specific box can be found. Do use, however, if the cross-referencing is in general terms or to indicate that the specific reference material is within an overall reference dealing with mammals.

36 Hoofed animals (general)

37 White-tailed deer

38 European wild boar

39 Carnivores (general) - includes bears (general), bobcats, fishers, foxes, mink, mountain lion, otters, raccoons, skunks, weasels, etc.

40 Black bear

BOX

35-54 ANIMALS (cont.)

41 Rodents - Includes beavers, chipmunks, groundhogs (woodchucks), mice, muskrats, rats, squirrels, voles, etc.

42 Birds

43 Salmonid fish

44 Other fish

45 Reptiles and Amphibians (general) - Do not use if a more specific cross-reference can be found. Do use, however, if the cross-referencing is in general terms or to indicate that the specific reference material is within an over-all reference dealing with Reptiles and/or Amphibians.

46 Salamanders

47 Frogs

48 Snakes

49 Turtles

50 Lizards

51 Aquatic invertebrates (general)

52 Terrestrial invertebrates (general)

53 Arachnids - include spiders and mites

54 Insects

55-64 PLANTS
If a particular reference relates the GROUP being referenced to plants in terms of nontrivial systematic or ecological information on an individual species or group of plants, enter a 1 in the appropriate box.

55 Lower plants (general) - Do not use if a more specific category exists. Do use, however, if the cross-reference is in general terms or to indicate that the specific reference material is within an over-all reference dealing with Lower Plants.

56 Algae

57 Bryophytes (mosses, liverworts, hornworts)

58 Lichens

59 Fungi (mushrooms, other fungi; include slime molds)

BOX

55-64 PLANTS (cont.)

60 Vascular plants (general) - Use when the cross-referencing is in general terms or to indicate that the specific reference material is within an over-all reference dealing with vascular plants as components of a vegetation grouping.

61 Ferns and fern allies - includes grape ferns, club mosses, etc.

62 Gymnosperms - includes pine trees or any specific mention of cone-bearing plants

63 Angiosperms - includes wildflowers, grass-type plants, berry bushes, fruit trees

64 Trees and woody plants

65-76 PHYSICAL AND CONCEPTUAL
If a particular reference relates the GROUP being referenced to any of the categories below, enter a 1 in the appropriate box(es).

65 Management
Enter a 1 if the reference deals with management of land, visitors, vegetation, forests, water, boars, fire, etc.

66 Climate - Regional patterns, not site climates

67 Geology

68 Soils

69 Streams, waterfalls, ponds, watersheds, gorges

70 Water quality

71 Air quality

72 Fire - include fire fuels management, lightning strikes, fire suppression, etc.

73 Human impact - including ongoing impacts

74 Historic impacts - Refers to past human impacts no longer occurring in the park or on the site discussed; e.g., logging, local hunting, Native American use of land, farming.

75 Rarity - Flora
Enter a 1 in this box if the reference includes some specifically documented rare plant or the presence of a rare species in the southern Appalachians

76 Rarity - Fauna
(Same as above with Flora)

BOX

77-80 GEOGRAPHIC
If the particular reference relates the GROUP being referenced to one of the areas below, enter a 1 in the appropriate box.

77 Cades Cove

78 Greenbrier area

79 Mount LeConte

80 State Line Ridge

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environment and cultural value of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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