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Checklist and Distribution of Arkansas Pteridophytes

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Abstract

Over the past 14 years, an effort was made to summarize and improve our knowledge of the Arkansas pteridophyte flora beyond that developed by Taylor and Demaree (1979). They presented a flora of 68 species plus 2 varieties plus 4 hybrids, for a total of 74 taxa vouchered with 1335 county-level occurrence records. Changes in accepted nomenclature, field work, and herbaria searches have added as new to the flora 10 species plus 1 variety plus 7 hybrids, supported with 74 county-level occurrence records. Another 815 county-level occurrence records were added to the known flora. The Arkansas pteridophyte flora now consists of 78 species plus 3 varieties plus 11 hybrids, supported with 2224 county-level occurrence records. A checklist, 92 distribution maps, a history of Arkansas pteridophyte floristics, corrective nomenclatural notes, and a phylogeny based on a recent national treatment on pteridophytes are provided.

Introduction

The ferns and fern allies (also known as vascular cryptogams or pteridophytes) of Arkansas have warranted a continuum of study by researchers who investigated the biodiversity and natural heritage of Arkansas (Peck and Peck, 1988a). The first account of the ferns and fern allies in Arkansas was that of Nuttall (1821, 1835) who reported 23 species from the Arkansas Territory. Lesquereux (1860) recorded 35 species as part of a geological survey. Harvey (1881) compiled an annotated list of 40 ferns. Branner and Coville (1891) reported 45 ferns and fern allies. Buchholz (1924) revised previous lists to arrive at 46 species and 3 varieties. Then Palmer (1924, 1932) reported two species new to the state. A summary report by Buchholz and Palmer (1926) listed 51 pteridophytes. Scully (1937, 1939) reported additional taxa as a result of survey in and around Hot Springs National Park. Dwight Moore, whose contributions on Arkansas ferns spanned three decades, added a spikemoss (Moore, 1940b), published a state pteridophyte flora (Moore, 1940a) of 67 ferns and fern allies, and reported (Moore, 1941) on five fern communities that typified the Interior Highlands. Delzie Demaree, whose contributions on Arkansas ferns spanned five decades, reported on ferns that were rare or new to Arkansas (Demaree, 1943a) and published a list (Demaree, 1943b) of 70 pteridophytes as part of a state vascular flora.

Pteridophytes new to the state or quite rare in Arkansas continued to be reported by Chandler (1941), Moore (1947, 1950, 1951, 1957, 1958), Moore and Hartsoe (1955), Clark (1962), Wagner (1962), Bowers and Redfearn (1967), Farrar and Redfearn (1968), and Tucker (1971). As part of Ph.D. dissertation research at the University of Southern Illinois and aided by Dr. Dwight

Moore and Dr. Delsie Demaree. Taylor (1976) summarized the known fern flora of Arkansas through inspection and annotation of herbarium specimens, field collection to relocate historic or rare populations (Taylor, 1982; Wagner and Taylor, 1976), general collection to document undercollected plants or regions, and special study of variation of quillworts (Taylor et al., 1975) and spleenworts (Taylor et al., 1976). Taylor's dissertation provided a summary for 70 pteridophytes treated in the first modern work on the flora and distribution of the Arkansas vascular flora (Smith, 1978). Prior to its publication of Taylor's results (Taylor and Demaree, 1979), additions were discovered and reported by Buck (1977), Thomas (1978), and Taylor and Johnson (1979). Subsequently, another fern species new to Arkansas was reported by Werth and Taylor (1980). Moore (1982) prepared a manual for her students to aid them in learning the pteridophyte flora of Arkansas. Summarizing this activity, Taylor (1984) published through the Milwaukee Museum a complete manual to 72 Pteridophytes in 31 genera. The manual's line drawings by Paul W. Nelson caught the attention of many plant enthusiasts in Arkansas and focused additional attention on the pteridophyte flora of Arkansas.

The book-length manual by Taylor (1984), *Arkansas Ferns and Fern Allies*, graphically portrayed the diagnostic characters and extent of county-level distribution data of Arkansas pteridophytes. This manual facilitated efforts by many to contribute to the Arkansas fern flora, including academic botanists and those hired by the Department of Natural Heritage, the Arkansas Nature Conservancy, and the Ouachita National Forest. Two wood ferns and seven clubmosses were added to the state flora (Orzell and Peck, 1985; Peck and Peck, 1988c; Peck et al., 1985a; Peck et al., 1985b; Peck et al., 1987). Revisions in the systemat-

ics of three genera resulted in the addition of species and varieties that are new to Arkansas or provided a new correct name: *Cystopteris* (Haufler and Windham, 1991; Haufler et al., 1985; Haufler et al., 1990), *Polypodium* (Haufler and Windham, 1991), and *Woodsia* (Windham, 1993). Johnson (1986; 1988) reduced into synonymy the two pepperworts reported from Arkansas. Additionally, many reports on the status of rare plants continued to update our knowledge of Arkansas pteridophytes (Bates and Pittman, 1993; Bray and Marsh, 1993; Culwell, 1994; Farrar, 1985, 1990, 1992; Orzell and Bridges, 1987; Peck, 1985a, 1985b, 1986a, 1986b; Peck and Peck, 1987; Peck and Peck, 1988b; Sundell, 1986). Summary documents were developed to collate and compile these changes (Peck and Peck, 1986; Peck et al., 1987a, 1987b). Smith (1988) incorporated these changes to his checklist and dot maps of the state vascular flora and prepared keys (Smith, 1994) to that flora, including pteridophytes. Recently, a quillwort was reported as new to Arkansas (Brown and Thomas, 1992), and whiskfern was discovered in Arkansas (Bray et al., 1994; Peck et al., 1995).

With the publication in 1993 of Volume 2 of the multi-volumed *Flora of North America North of Mexico*, much of which treats pteridophytes, a common and modern basis is now available against which to assess the Arkansas pteridophyte flora. Many changes in nomenclature known to pteridologists were placed together for the first time in one place for pteridologists and non-pteridologists. Changes in generic nomenclature significantly affected six genera found in Arkansas: *Lycopodium*, *Athyrium*, *Lorinseria*, *Notholeana*, *Polypodium* and *Thelypteris*. Other changes affected varieties or forms in *Asplenium*, *Marsilea*, *Thelypteris* and *Woodsia*. The authors of this paper postponed writing a new summary of Arkansas pteridophytes until this work was available. As contributing authors, we felt it was imperative that any future state treatment concur or refer to the nomenclature of this work as it provides a national "monograph". We include these changes and want to facilitate their integration into the floristic literature of Arkansas. The compiled list by Kartesz (1994) was consulted, but found to unevenly reflect pteridological knowledge. Recent symposia on the implications of DNA sequences on family classifications of pteridophytes suggest that a final classification has yet to be written.

The most recent treatment of Arkansas ferns (Taylor, 1984) is no longer available. An appreciable amount of collecting since then has added many species and augmented the county-level occurrence records that voucher that flora. With the recent publication of a national pteridophyte treatment, it is possible to write a work with a degree of phylogenetic/nomenclatural stability. Until a book-length version can be written and published, an interim flora is needed to summarize what is currently

known and to stimulate a final flurry of field work. This report is provided to summarize the literature and to meet those ends.

Materials and Methods

Voucher specimens were searched in 1994-1995 at research and most teaching herbaria within the state and in adjacent states. Herbaria searched by Taylor (1984) were re-examined. Herbaria code (boldface) and location: **APCR**, Arkansas Tech University, Russellville, AR; **F**, Field Museum of Natural History, Chicago, IL; **HXC**, Hendrix College, Conway, AR; **HSU**, Henderson State University, Arkadelphia, AR; **LRU**, University of Arkansas at Little Rock, Little Rock, AR; **MEM**, University of Memphis, Memphis, TN; **MIL**, Milwaukee Public Museum, Milwaukee, WI; **MO**, Missouri Botanical Garden, St. Louis, MO; **NCU**, University of North Carolina, Chapel Hill, NC; **NY**, New York Botanical Garden, Bronx, NY; **PH**, Academy of Natural Sciences, Philadelphia, PA; **SIU**, Southern Illinois University, Carbondale, IL; **SMS**, Southwest Missouri State University, Springfield, MO; **SMU**, Southern Methodist University, Dallas, TX; **STAR**, Arkansas State University, Jonesboro Station, AR; **TENN**, University of Tennessee, Knoxville, TN; **UAM**, University of Arkansas at Monticello, Monticello, AR; **UARK**, University of Arkansas, Fayetteville, AR; **UCA**, University of Central Arkansas, Conway, AR; and **US**, Smithsonian Institution, Washington, DC. A summary data-base of at least one voucher was recorded for each county-level occurrence record.

Inspection of specimens and literature on fern floras from neighboring states was used to direct field efforts in peripheral counties. The following states and sources were consulted: Illinois (Mohlenbrock, 1986), Kentucky (Cranfill, 1980), Louisiana (Thieret, 1980; Thomas and Allen, 1993), Mississippi (Evans, 1978; Wofford and Evans, 1979), Missouri (Key, 1982), Tennessee (Evans, 1989), Texas (Correll, 1955; 1972; Correll and Johnson, 1970), and a regional treatment (Small, 1964).

Field work was conducted from 1994-1995 to supplement and complete an ongoing field study initiated by the senior authors in 1981. Travel and collection occurred in every county in Arkansas. During 1994-1995, the senior author traveled over 30,000 miles to inspect vouchers in 20 herbaria, to consult with pteridologists, and to visit field sites to make this flora as complete as possible.

A checklist was prepared to provide the correct name and synonymy. A county-level occurrence map to depict distribution was prepared to summarize minimal floristic information for each taxon.

Checklist and Distribution Maps

The Arkansas pteridophyte flora is presented as a checklist (Table 1) of 92 pteridophytes in 4 divisions, 18 families, and 38 genera, with 78 species, 3 varieties, and 11 hybrids. Distributional data are presented for each of the 92 taxa with a county-level distribution map (Maps 1-92), an increase of 18 over the 74 presented by Taylor and Demaree (1979). The 2224 county-level occurrence records presented here represents a 66% increase over the 1335 presented by Taylor and Demaree (1979).

The recent *Flora of North America North of Mexico, Vol. 2: Pteridophytes* (1993) provides an excellent, national-level treatment, but requires a few corrective comments with specific regard to Arkansas. The national work incorrectly attributes *Asplenium ruta-muraria* to Arkansas. The following pteridophytes occur in Arkansas but are not listed nor shown on their maps as present in Arkansas: *Psilotum nudum*, *Pseudolycopodiella caroliniana*, *Osmunda claytoniana*, and *Asplenium Xebenoides*. The relation of *Azolla mexicana* and *Azolla caroliniana* remains unclear in the national work. Arkansas has one species that extends its range northward to Minnesota; pteridologists recognize this plant as *Azolla mexicana*. This species differs in many aspects with plants of the Coastal Plain of the Southeastern United States that have been called *Azolla caroliniana*. This species does not occur in the Mid-south or upper Midwest. The range of latter species is over-stated in the national treatment.

Table 1. Annotated checklist of Arkansas ferns and fern allies, giving Division, Family, scientific binomial, common name, and synonymy. The phylogenetic sequence follows that of *Flora of North America North of Mexico*, vol. 2.

Division PSILOPHYTA

Family PSILOTACEAE

Psilotum nudum (L.) Beauv., Whisk Fern

Division LYCOPODIOPHYTA

Family LYCOPODIACEAE

Huperzia lucidula (Michx.) Trevisan, Shining Clubmoss, [*Lycopodium lucidulum* Michx.]

Diphasiastrum digitatum (Dillenius ex A. Braun) Holub, Southern

Running-pine, [*Lycopodium digitatum* Dillenius ex A. Braun]

Lycopodiella appressa (Chapman) Cranfill, Appressed Bog Clubmoss, [*Lycopodium appressum* (Chapman) Lloyd & Underw.]

Lycopodiella alopecuroides (Linnaeus) Cranfill, Foxtail Bog Clubmoss, [*Lycopodium alopecuroides* L.]

Lycopodiella prostrata (Harper) Cranfill, Prostrate Bog Clubmoss, [*Lycopodium prostratum* Harper]

Lycopodiella Xbrucei Cranfill, Bruce's Bog Clubmoss, [*L. appressa* X *L. prostrata*]

Lycopodiella Xcopelandii (Eiger) Cranfill, Copeland's Bog Clubmoss, [*L. alopecuroides* X *L. appressa*]

Lycopodiella alopecuroides X *Lycopodiella prostrata*

Pseudolycopodiella caroliniana (Lineaus) Holub, Carolina Bog Clubmoss, [*Lycopodium carolinianum* L.]

Family SELAGINELLACEAE

Selaginella apoda (L.) Spring, in Mart., Meadow Spikemoss

Selaginella eclipses Buck, Buck's Meadow Spikesmoss

Selaginella arenicola Underw. subsp. *riddellii* (Van Eselt.) R.M. Tryon, Riddell's Spikemoss

Selaginella rupestris (L.) Spring, Spring's Rock Spikemoss

Family ISOËTACEAE

Isoetes butleri Engelm., Butler's Quillwort

Isoetes engelmannii A. Braun, Engelmann's Quillwort

Isoetes melanopoda Gay & Dur., Black-footed Quillwort

Division EQUISETOPHYTA

Family EQUISETACEAE

Equisetum arvense L., Field Horsetail

Equisetum hyemale L. subsp. *affine* (Engelm.) Calder & Taylor, Common Scouring-rush

Equisetum laevigatum A. Braun, Smooth Scouring-rush

Equisetum Xferrissii Clute, Ferriss's Scouring-rush, [*E. hyemale* subsp. *affine* X *E. laevigatum*]

Division POLYPODIOPHYTA

Family OPHIOGLOSSACEAE

Botrychium biternatum (Sav.) Underw., Sparse-lobed Grapefern

Botrychium dissectum Spreng. f. *dissectum*, Dissected Grapefern

Botrychium dissectum Apreng. f. *obliquum* (Muhl.) Fern., Oblique Grapefern

Botrychium lunarioides (Michx.) Sw., Winter Grapefern

Botrychium virginianum (L.) Sw., Rattlesnake Fern

Ophioglossum crotalophoroides Walt., Bulbous Adder's-tongue Fern

Ophioglossum engelmannii Prantl, Limestone Adder's-tongue Fern

Ophioglossum nudicaule L. f., Least Adder's-tongue Fern

Ophioglossum petiolatum Hook., Stalked Adder's-tongue Fern

Ophioglossum vulgatum L. var. *pyncostichum* Fern., Southern Adder's-tongue Fern, [*Ophioglossum pyncostichum* (Fern.) Löve & Löve]

Family OSMUNDACEAE

Osmunda cinnamomea L., Cinnamon Fern

Osmunda claytoniana L., Interrupted Fern

Osmunda regalis L. var. *spectabilis* (Willd.) A. Gray, American Royal Fern

Family LYGODIACEAE

Lygodium japonicum (Thunb. ex Murray) Swartz, Japanese Climbing Fern

Family PTERIDACEAE

Adiantum capillus-veneris L., Southern Maidenhair Fern

Adiantum pedatum L., Northern Maidenhair Fern

Argyroschisma dealbata (Pursh) Windham, Powdery Cloakfern

[*Notholeana dealbata* (Pursh) Kunze]

Cheilanthes alabamensis (Buckley) Kunze, Alabama Lipfern

Cheilanthes eatonii Baker in Hook. & Baker, Eaton's Lipfern

Cheilanthes feeii Moore, Slender Lipfern

Cheilanthes lanosa (Michx.) D. C. Eat., Hairy Lipfern

Cheilanthes tomentosa Link, Woolly Lipfern

Pellaea atropurpurea (L.) Link, Purple-stemmed Cliff Brake

Pellaea glabella Mett ex Kuhn subsp. *glabella*, Smooth Cliff Brake

Pteris multifida Poir., Spider Brake

Family HYMENOPHYLLACEAE

Trichomanes boschianum Sturm ex Bosch, Appalachian Filmy Fern

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Trichomanes petersii A. Gray, Dwarf Bristle Fern

Family DENNSTAEDTIACEAE

Dennstaedtia punctilobula (Michx.) Moore, Hay-scented Cup Fern
Pteridium aquilinum (L.) Kuhn var. *latiusculum* (Desv.) Underw. ex Heller, Eastern Bracken Fern

Pteridium aquilinum (L.) Kuhn var. *pseudocaudatum* (Clute) Heller, Tailed Bracken Fern

Family THELYPTERIDACEAE

Macrothelypteris torresiana (Gaudichaud-Beaupre) Ching, Mariana Maiden Fern, [*Thelypteris torresiana* (Guad.-Beaup.) Alston]

Phegopteris hexagonoptera (Michx.) Fee, Southern Beech Fern

Thelypteris kunthii (Desv.) Morton, Southern Shield Fern. [*Thelypteris normalis* (Christ.) Moxley]

Thelypteris noveboracensis (L.) Nieuwl., New York Fern

Thelypteris palustris Schott var. *pubescens* (Laws.) Fern., Marsh Fern

Family BLECHNACEAE

Woodwardia areolata (L.) Moore, Net-veined Chain Fern, [*Lorinseria areolata* (L.) Presl]

Woodwardia virginica (L.) J.E. Smith, Virginia Chain Fern

Family ASPLENIACEAE

Asplenium bradleyi D. C. Eat., Bradley's Spleenwort

Asplenium pinnatifidum Nutt, Lobed Spleenwort

Asplenium platyneuron (L.) Britton, Sterns & Poggenburg, Ebony Spleenwort

Asplenium resiliens Kunze, Black-stemmed Spleenwort

Asplenium rhizophyllum L., Walking Spleenwort, [*Camptosorus rhizophyllum* (L.) Link]

Asplenium trichomanes L. subsp. *trichomanes*, Maidenhair Spleenwort

Asplenium Xebenoides R.R. Scott, Scott's Spleenwort, [*A. pinnatifidum* X *A. rhizophyllum*]

Asplenium Xgravesii Maxon, Graves' Spleenwort, [*A. bradleyi* X *A. pinnatifidum*]

Asplenium Xkentuckiense McCoy, Kentucky Spleenwort, [*A. pinnatifidum* X *A. platyneuron*]

Family DRYOPTERIDACEAE

Athyrium filix-femina (L.) Mert. var. *asplenioides* (Michx.) Farw., Southern Lady Fern. [*Athyrium filix-femina* (L.) Mert. subsp. *asplenioides* (Michx.) Hulten; *Athyrium asplenioides* (Michx.) Desv.]

Cystopteris bulbifera (L.) Bernh., Bulblet Fragile Fern

Cystopteris protrusa (Weatherby) Blasdell, Protruding Fragile Fern

Cystopteris tennesseensis Shaver, Shaver's Fragile Fern

Cystopteris tenuis (Michx.) Desv., Mackay's Fragile Fern

Cystopteris bulbifera X *Cystopteris tennesseensis*

Cystopteris protrusa X *Cystopteris tennesseensis*

Deparia acrostichoides (Schwartz) M. Kato, Silvery Glade Fern, [*Athyrium thelypteroides* (Michx.) Desv.]

Diplazium pycnocarpon (Sprengel) M. Broun, Narrow-leaved Glade Fern, [*Athyrium pycnocarpon* Sprengel]

Dryopteris carthusiana (Villars) H.P. Fuchs, Spinulos Woodfern

Dryopteris celsa (W. Palmer) Knowlton, Palmer & Pollard, Logfern

Dryopteris ludoviciana (Kunze) Small, Louisiana Logfern

Dryopteris marginalis (L.) A. Gray, Marginal Woodfern

Dryopteris Xaustralis (Wherry) Small, Southern Logfern, [*D. celsa* X *D. ludoviciana*]

Dryopteris Xleedsii Wherry, Leeds' Logfern, [*D. celsa* X *marginalis*]

Onoclea sensibilis L., Sensitive Fern

Polystichum acrostichoides (Michx.) Schott, Christmas Fern

Woodsia obtusa (Spreng.) Torr. subsp. *obtusa*, Blunt-lobed Cliff Fern

Woodsia obtusa (Spreng.) Torr. subsp. *occidentalis* Windham, Blunt-

lobed Cliff Fern

Woodsia scopulina D. C. Eat. subsp. *appalachiana* (T.M.C. Taylor) Windham, Appalachian Mountain Cliff Fern [*Woodsia appalachiana* T.M.C. Taylor]

Family POLYPODIACEAE

Pleopeltis polypodioides (L.) Andrews & Windham var. *marchauxiana* (Weatherby) Andrews & Windham in Windham, Resurrection Fern, [*Polypodium polypodioides* (L.) Watt var. *michauxianum* Weatherby]

Polypodium virginianum L., Rock Polypody

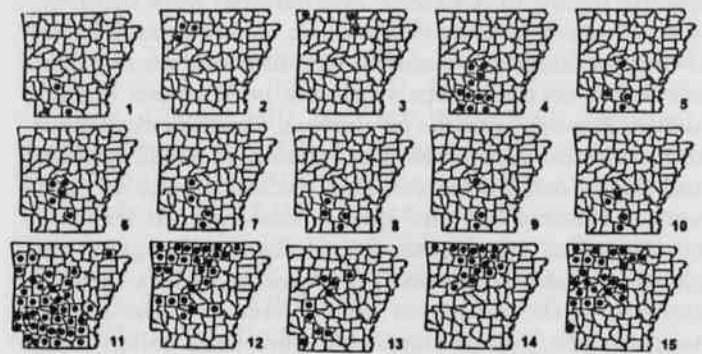
Family MARSILEACEAE

Marsilea vestita Hook. & Grev., Prairie Waterclover [*M. mucronata* A. Br.; *M. uncinata* A. Braun]

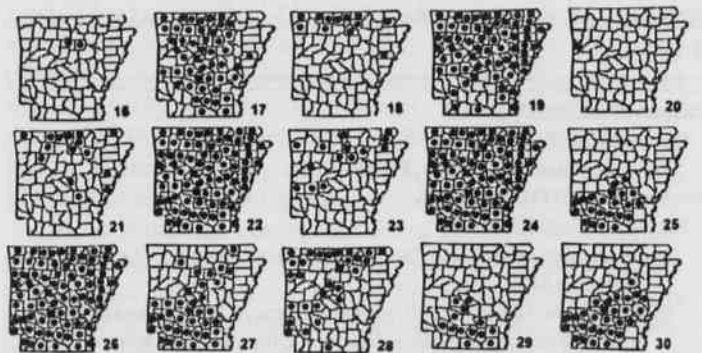
Pilularia americana A. Braun, American Pillwort

Family AZOLLACEAE

Azolla mexicana Schlecht. & Cham. ex Presl, Mosquito Fern

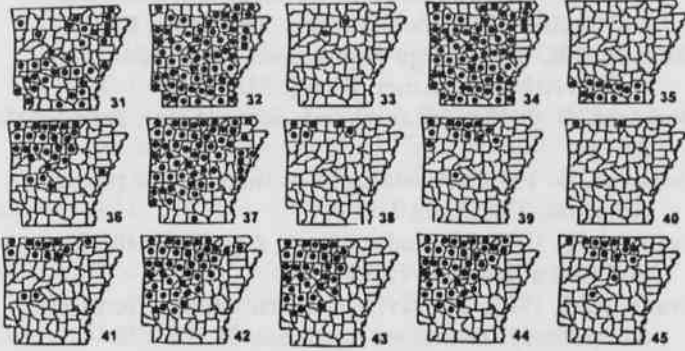


MAPS 1-15: 1. *Psilotum nudum*, 2. *Huperzia lucidula*, 3. *Diphasiastrum digitatum*, 4. *Lycopodiella appressa*, 5. *Lycopodiella alopecuroides*, 6. *Lycopodiella prostrata*, 7. *Lycopodiella Xbrucei*, 8. *Lycopodiella Xcopelandii*, 9. *L. alopecuroides* X *L. prostrata*, 10. *Pseudolycopodiella caroliniana*, 11. *Sealginella apoda*, 12. *Sealginella eclipses*, 13. *Sealginella arenicola* subsp. *riddellii*, 14. *Selaginella rupestris*, 15. *Isoetes butleri*.

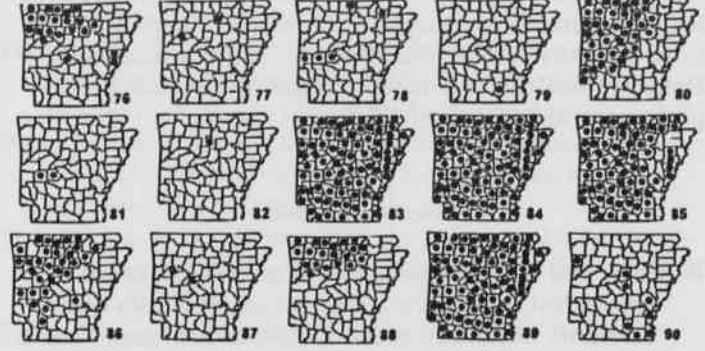


MAPS 16-30: 16. *Isoetes engelmannii*, 17. *Isoetes melanopoda*, 18. *Equisetum arvense*, 19. *Equisetum hyemale* subsp. *affine*, 20. *Equisetum laevigatum*, 21. *Equisetum Xferrissii*, 22. *Botrychium biternatum*, 23. *Botrychium dissectum* f. *dissectum*, 24. *Botrychium dissectum* f. *obliquum*, 25. *Botrychium lunarioides*, 26. *Botrychium virginianum*, 27. *Ophioglossum crotalophoroides*, 28. *Ophioglossum engelmannii*, 29. *Ophioglossum nudicaule*, 30. *Ophioglossum petiolatum*,

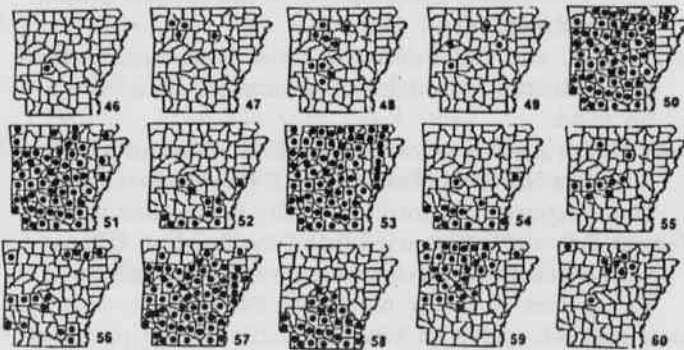
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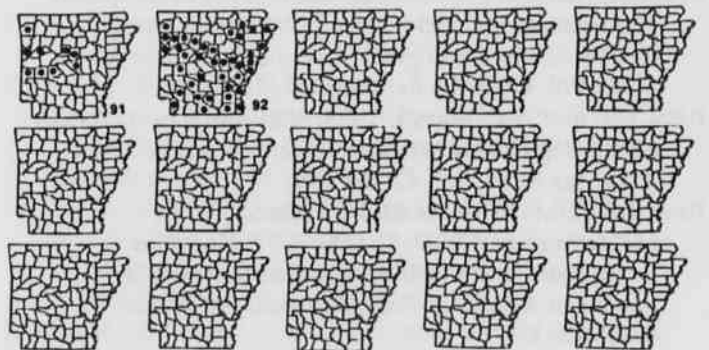
MAPS 31-45: 31. *Ophioglossum vulgatum* var. *pycnostichum*, 32. *Osmunda cinnamomea*, 33. *Osmunda claytoniana*, 34. *Osmunda regalis* var. *spectabilis*, 35. *Lygodium japonicum*, 36. *Adiantum capillus-veneris*, 37. *Adiantum pedatum* var. *pedatum*, 38. *Argyrochosma dealbata*, 39. *Cheilanthes alabamensis*, 40. *Cheilanthes eatonii*, 41. *Cheilanthes feeii*, 42. *Cheilanthes lanosa*, 43. *Cheilanthes tomentosa*, 44. *Pellaea atropurpurea*, 45. *Pellaea glabella* subsp. *glabella*.



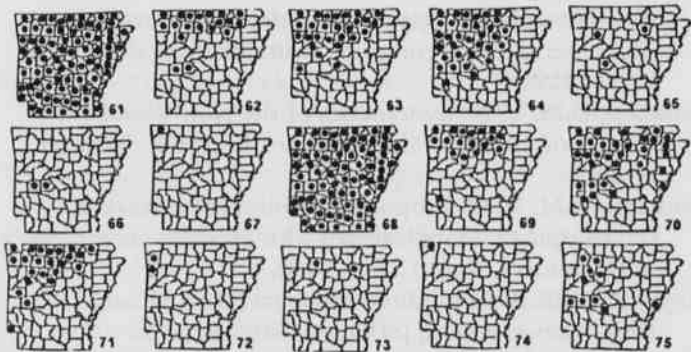
MAPS 76-90: 76. *Diplazium pycnocarpon*, 77. *Dryopteris carthusiana*, 78. *Dryopteris celsa*, 79. *Dryopteris ludoviciana*, 80. *Dryopteris marginalis*, 81. *Dryopteris Xaustralis*, 82. *Dryopteris Xleedsii*, 83. *Onoclea sensibilis*, 84. *Polystichum acrostichoides*, 85. *Woodsia obtusa* subsp. *obtusata*, 86. *Woodsia obtusa* subsp. *occidentalis*, 87. *Woodsia scopulina* subsp. *appalachiana*, 88. *Polypodium virginianum*, 89. *Pleopeltis polypodioides* var. *michauxiana*, 90. *Marsilea vestita*.



MAPS 46-60: 46. *Pteris multifida*, 47. *Trichomanes boschianum*, 48. *Trichomanes petersii*, 49. *Dennstaedtia punctilobula*, 50. *Pteridium aquilinum* var. *latiusculum*, 51. *Pteridium aquilinum* var. *pseudocaudatum*, 52. *Macrothelypteris torresiana*, 53. *Phegopteris hexagonoptera*, 54. *Thelypteris kunthii*, 55. *Thelypteris noveboracensis*, 56. *Thelypteris palustris* var. *pubescens*, 57. *Woodwardia areolata*, 58. *Woodwardia virginica*, 59. *Asplenium bradleyi*, 60. *Asplenium pinnatifidum*.



MAPS 91-92: 91. *Pilularia americana*, 92. *Azolla mexicana*.



MAPS 61-75: 61. *Asplenium platyneuron*, 62. *Asplenium resiliens*, 63. *Asplenium rhizophyllum*, 64. *Asplenium trichomanes* subsp. *trichomanes*, 65. *Asplenium Xebenoides*, 66. *Asplenium Xgravesii*, 67. *Asplenium Xkentuckiense*, 68. *Athyrium filix-femina* var. *asplenioides*, 69. *Cystopteris bulbifera*, 70. *Cystopteris protrusa*, 71. *Cystopteris tennesseensis*, 72. *Cystopteris tenuis*, 73. *Cystopteris bulbifera* X *Cystopteris tennesseensis*, 74. *Cystopteris protrusa* X *Cystopteris tennesseensis*, 75. *Deparia acrostichoides*.

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