NEW ENGLAND FERNS (FILICALES)

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This list of species of the New England ferns and their hybrids documented in the New England Botanical Club Herbarium has been compiled to provide names to be used for computer documented distribution maps. Comments included under some genera pertain to changes in application of names, particularly in regard to usage in *Gray's Manual of Botany*. References are also included to special studies supplying data on cytology or geography of the species that is pertinent to their systematics. There is a greater correspondence to the treatment of C. V. Morton in *Britton and Brown's Illustrated Flora of the Northeastern United States and Adjacent Canada* (1952) than to the treatment by M. L. Fernald in *Gray's Manual*. Many forms and varieties were recognized in Fernald's work, as was often done during his period when lesser variants were considered of greater importance than at present. None of the forms and only two of the varieties he used are included here, although as more systematic work is done some may merit recognition. There are few modern monographic works on New England species that encompass their entire geographic range. Many New England ferns have broad circumboreal affinities involving the same species or species groups occurring in eastern Asia and (or) Europe. The general geographic patterns of New England ferns are discussed in relation to studies on *Thelypteris* (Tryon & Tryon, 1974).

Preparation of distribution maps

Maps for all of the pteridophytes of Europe have been issued in the *Atlas Flora Europaeae* (1972) and for the British species in *Atlas of Ferns of the British Isles* (1978). Preparation of distribution maps for New England ferns has been stimulated by these recent publications, and work is in progress by the Plant Distribution Committee of the New England Botanical Club. Club records of the committee's work show that it has been active since its formation at the instigation of M. L. Fernald in April, 1917. This originally was named the Committee on the Topographical Survey of the Flora of New England and consisted of C. E. Knowlton, Chairman, C. A. Weatherby and W. S. Ripley, Jr. The purpose of the committee as

directed to the Club membership, in the minutes of the meeting, was for "determining the limits of the different floral areas and the great advantage which would accrue from all plants observed in any given region being turned in. This committee would compile the results and in time be able to establish the limits of each species. It is quite as important moreover in this sort of work to know what does not grow in a region as what does." The title of the committee was shortened to the Plant Distribution Committee in 1920, and in 1927 the membership changed to C. A. Weatherby, Chairman, C. E. Knowlton and R. C. Bean. As a result of work of the committee over the years a series of manuscript distribution maps was prepared for species in the New England flora through the Rosaceae. These are maintained in the Club herbarium. An early series was completed for the ferns about 1920. The present series of maps are designed to document each locality with a particular collection. The state, county, town and date have been recorded for each specimen. The New England Botanical Club herbarium is regarded as the core collection for the region. The work of recording the data was done by members of the Plant Distribution Committee consisting of: Judith Vickers Burlingame, Clifford David, Martha Fisher, Walter Judd, Aminta Kitfield, Michael Lamson, Larry Morse, Mary Perry, Alice Tryon, and Russell Walton, Chairman. Larry Morse, Walter Judd and Michael Lamson have worked out methods of recording the data. Larry Morse wrote the initial program for the computer and has followed the entire project through the final phase of editing the tape. Preparation of printed material and conversion of data from cards to tape was done by Michael Lamson. The distribution records are currently being transferred to maps by Russell Walton.

Accepted names are listed in bold face type at the left, the common names at the right, and abbreviations used in computer processing are in the center column. Synonyms under the accepted names are mainly from the eighth edition of *Gray's Manual of Botany* (1950) and indicated by an asterisk; others from state or regional floras are indicated by a number in parentheses corresponding to the numbered references.

OSMUNDACEAE

OSMUNDA

A number of aberrant forms have been recognized in *Gray's Manual* in each of the species of *Osmunda* but they are not of sys-

tematic consequence. American plants of *O. regalis* are not as robust as those of Europe and have been distinguished as var. *spectabilis* but the difference in stature and some other characters may not be taxonomically significant.

Osmunda cinnamomea L.	Osmun cinn	Cinnamon Fern
O. Claytoniana L.	Osmun Clay	Interrupted Fern
O. regalis L.	Osmun reg	Royal Fern

SCHIZAEACEAE

LYGODIUM

Lygodium palmatum (Bernh.) Sw.	Lygo palm	Climbing Fern

POLYPODIACEAE

ADIANTUM

Adiantum pedatum L.	Adian ped	Maidenhair

ASPLENIUM

Two of the five New England species of *Asplenium, A. montanum* and *A. platyneuron,* and also the closely related *Camptosorus rhizophyllus,* are considered as basic diploids and hybrids are well known between them (Wagner, 1954). The most notable of the hybrids in New England, *Asplenium platyneuron* × *Camptosorus rhizophyllus,* is commonly called Scott's Spleenwort. Hybrids between species and related genera have been intensively studied in Europe. Cytological work on American plants is largely based on plants of the southern United States and the Appalachian region. The American plants of *A. Ruta-muraria* are differentiated from those of Europe as *A. cryptolepis* in *Gray's Manual.* The American material was distinguished largely on quantitative characters that appear to fall within the range of those of Europe. The species is tetraploid with $n = 72$ in North America and most of Europe except for diploid plants in northern Italy (Lovis & Reichstein, 1964).

Asplenium montanum Willd.	Asple mont	Mountain Spleenwort
A. platyneuron (L.) Oakes	Asple platy	Ebony Spleenwort

A. platyneuron × Camptosorus rhizophyllus		Scott's Spleenwort
A. Ruta-muraria L.	Asple Rut-m	Wall-rue Spleenwort
A. cryptolepis Fern.*		
A. Ruta-muraria × A. Trichomanes	Asple Rut-m × Trich	
A. Trichomanes L.	Asple Trich	Maiden-hair Spleenwort
A. viride Huds.	Asple viri	Green Spleenwort

ATHYRIUM

Athyrium Filix-femina is considered a highly variable, widely distributed species in North America and Eurasia. The treatment of four varieties and six forms in *Gray's Manual,* adapted from the work of Butters, notes the extreme variability of the plants. The species has been studied in Europe by J. J. Schneller (pers. comm., 1975) and it has been shown that the red color of the petioles and rachis, which characterizes forma *rubellum,* is a simple genetic trait without taxonomic significance.

Athyrium Filix-femina (L.) Roth	Athyr Fi-fe	Lady Fern
Asplenium Filix-femina (L.) Bernh. (6)		
Athyrium angustum (Willd.) Presl (14, 6)		

CAMPTOSORUS

Camptosorus rhizophyllus (L.) Link	Campt rhiz	Walking Fern

CHEILANTHES

This genus centers in the southwestern United States and Mexico and is represented in New England by a single species known from an early collection from the face of cliffs at West Rock, New Haven, Connecticut, where it has long been extinct.

Cheilanthes lanosa (Michx.) D. C. Eaton	Cheil lano	Hairy Lip Fern
C. vestita (Spreng.) Sw.*		

CRYPTOGRAMMA

Cryptogramma Stelleri (Gmel.)
Prantl — Crypt Stell — Slender Cliff-brake

CYSTOPTERIS

American plants of *Cystopteris fragilis* appear to be largely tetraploid and distinct from the diploid *C. protrusa* which occurs west and south of New England. *Cystopteris fragilis* var. *Mackayii* has been distinguished by the shape of the indusium and segments. It is not recognized here since the characters do not appear to be sufficiently constant.

Cystopteris bulbifera (L.)
Bernh. — Cyst bulb — Bulblet Fern

C. fragilis (L.) Bernh. — Cyst frag — Fragile Fern

DENNSTAEDTIA

Dennstaedtia punctilobula
(Michx.) Moore — Denns punct — Hay-scented Fern

DIPLAZIUM

These species are clearly distinct from *Athyrium* where they have been treated in many of the works on New England ferns. *Diplazium acrostichoides* has been placed in *Lunathyrium* Koidz. and *D. pycnocarpon* in the monotypic genus *Homalosorus* Small ex Pic. Ser. Studies on Asiatic species by Sledge (1962) and Kato (1977) distinguish *Diplazium* and its segregates from *Athyrium*. However, a broader survey of this large complex is required to confirm the appropriate generic groups.

Diplazium acrostichoides (Sw.)
Butters — Dipla acros — Silvery Spleenwort

Asplenium acrostichoides Sw. (6)
Athyrium thelypterioides (Michx.) Desv.*

D. pycnocarpon (Spreng.)
Broun — Dipla pycno — Narrow-leaved Spleenwort

Asplenium angustifolium Michx. (6)
Athyrium pycnocarpon (Spreng.) Tidestr.*

DRYOPTERIS

Dryopteris is the largest and most complex genus of ferns in New England where there are nine species with cytological levels from diploid with $n = 41$ to hexaploid with $n = 123$. Complexity is due to hybridization between most of the species. Other species occur to the north and west of New England but the largest concentration of species and hybrids is in the Appalachian area. The New England species *D. cristata, D. Filix-mas,* and *D. spinulosa* also occur in Europe and hybridize there with other species. Problems of relationships of the species are compounded by their designation by different names. The well known name, *D. spinulosa,* used in *Gray's Manual* and many other floras, is retained here in the traditional sense although it is not correct according to the present rules of nomenclature. *Dryopteris austriaca* (Jacq.) Woynar was substituted by Morton and *D. carthusiana* (Vill.) H. P. Fuchs has been used in the *Atlas Florae Europaeae* (1972). However, *D. austriaca* is probably a synonym of another fern, perhaps *Pteridium,* and the application of *D. carthusiana* is uncertain until the type can be verified. The genus has been intensively studied in Europe and to a lesser extent in America. The work of Wagner (1971) and Hickok and Klekowski (1975) in this country and Gibby (1977) and Gibby and Walker (1977) in England brings out new cytological and genetic evidence but different concepts on the relationships of the species. These recent studies emphasize the need for additional field work and experimental studies especially in the New England region.

Dryopteris campyloptera (Kze.)
Clarkson — Dryop camp — Mountain Wood Fern

D. spinulosa var. *americana* (Fisch.) Fern*

D. Clintoniana (D.C. Eaton)
Dowell — Dryop Clint — Clinton's Wood Fern

D. cristata var. *Clintoniana* (D.C. Eaton) Underw.*

Aspidium cristatum var. *Clintonianum* D. C. Eaton (6)

D. Clintoniana × Goldiana — Dryop Clint × Gold

D. Clintoniana × D. intermedia — Dryop Clint × inter

D. Clintoniana × **D. marginalis**	Dryop Clint × margi	
D. Clintoniana × **D. spinulosa**	Dryop × spin	
D. cristata (L.) A. Gray	Dryop crist	Crested Wood Fern
D. cristata × **D. Goldiana**	Dryop crist × Gold	
D. cristata × **D. intermedia**	Dryop crist × inter	Boott's Wood Fern
D. cristata× **D. marginalis**	Dryop crist × margi	
D. cristata × **D. spinulosa**	Dryop crist × spin	
D. Filix-mas (L.) Schott	Dryop Fixma	Male Fern
D. Filix-mas × **D. marginalis**	Dryop Fixma × margi	
D. fragrans (L.) Schott	Dryop frag	Fragrant Fern
D. Goldiana (Hook.) A. Gray	Dryop Gold	Goldie's Fern
Aspidium Goldianum Hook. (6)		
D. Goldiana × **D. intermedia**	Dryop Gold × inter	
D. Goldiana × **D. marginalis**	Dryop Gold × margi	
D. Goldiana × **D. spinulosa**	Dryop Gold × spin	
D. intermedia (Willd.) A. Gray	Dryop inter	Glandular Wood Fern
D. spinulosa var. *intermedia* (Willd.) Underw.*		
D. austriaca var. *intermedia* (Muhl.) Morton (12)		
D. intermedia × **D. marginalis**	Dryop inter × marg	
D. intermedia × **D. spinulosa**	Dryop inter × spin	
D. marginalis (L.) A. Gray	Dryop margi	Marginal Shield Fern
Aspidium marginale (L.) Sw. (6)		
D. marginalis × **D. spinulosa**	Dryop margi × spin	

D. spinulosa (Muell.) Watt Dryop spin Spinulose Wood Fern

D. spinulosa var. *spinulosa**
D. austriaca var. *spinulosa* (Muell.) Fiori (12)
Aspidium spinulosum (Muell.) Sw. (6)

GYMNOCARPIUM

This species was treated in *Dryopteris* in *Gray's Manual* but it and the related *Gymnocarpium Robertianum* (Hoffm.) Nieuwl. are morphologically distinct and the chromosome number $n = 80$ also differs from the series based on 41 in *Dryopteris*.

Gymnocarpium Dryopteris (L.) Newm. Gymno Dryop Oak Fern

Dryopteris disjuncta (Ledeb.) Morton*
Phegopteris Dryopteris (L.) Fée (6)

MATTEUCCIA

Matteuccia Struthiopteris (L.) Todaro Matte Strut Ostrich Fern

M. pensylvanica (Willd.) Raym. (15, 23)
Onoclea Struthiopteris (L.) Hoffm. (6)
Pteretis pensylvanica (Willd.) Fern.*

ONOCLEA

Onoclea sensibilis L. Onoc sensi Sensitive Fern

PELLAEA

Pellaea is one of the exceptional genera of New England ferns in that its geographic range extends northward from a concentration of species in the southwestern United States and Mexico. Both species of New England are apogamous, *P. atropurpurea* is triploid with n, $2n = 87$, and the tetraploid *P. glabella* var. *glabella* with n, $2n = 116$ is the only one of the three varieties of the species in this region.

Pellaea atropurpurea (L.) Link Pella atro Purple Cliff-brake

P. atropurpurea var. *atropurpurea* (12)
P. glabella Mett. Pella glab Smooth Cliff-brake

P. atropurpurea var. *Bushii* Mack. (12)

POLYPODIUM

Plants of eastern America allied to the *Polypodium vulgare* complex have been studied cytologically along with those of Europe by Shivas (1961). The investigation of American material was based largely on plants from the southeastern United States but a collection from Smuggler's Notch, Lamoile County, Vermont was reported as a diploid with $n = 37$. Diploids and tetraploids are known from eastern Canada, and in the southern United States both of these levels as well as a triploid are reported. The diploid is morphologically distinct with broader, somewhat deltoid lamina with acuminate segment lobes in contrast to the tetraploid with a relatively linear lamina and rounded segment lobes. Cytotypes may have been recognized in the designation of several forms as *acuminatum, deltoideum* or *elongatum* in the treatment of the species in *Gray's Manual.* Cytological work on the species complex in New England similar to studies on *P. vulgare* in Europe will clarify relationships.

Polypodium virginianum Poly virg Polypody
Polypodium vulgare (L.) (12)

POLYSTICHUM

The American complex of *Polystichum Braunii* is comprised of two disjunct elements, the eastern var. *Purshii* which occurs in New England and the western var. *alaskense* (Maxon) Hult. Both of these varieties and the European element of the species are consistently tetraploid with $n = 82$. In western America and Europe there are complexes involving hybridization. A hybrid has been proposed between our two species on morphological characters (Thompson & Coffin, 1940) but neither this nor the parents have been cytologically studied in New England.

Polystichum acrostichoides
(Michx.) Schott Polys acros Christmas Fern
P. Braunii (Spenn.) Fée Polys Braun Braun's Holly Fern

PTERIDIUM

Pteridium is exceptional among New England ferns in the occurrence of two geographic varieties within the region. The coastal plain variety *pseudocaudatum* extends north to Cape Cod. The more common New England plants are var. *latiusculum,* a wide-ranging variety in eastern North America with disjunct stations in the west, and also northern Europe and eastern Asia.

Pteridium aquilinum var. **latiusculum** (Desv.) Underw.	Pteri aqui v lat	Bracken
P. aquilinum var. **pseudocaudatum** (Clute) Heller	Pteri aqui v pseud	Bracken

THELYPTERIS

Five species treated under *Dryopteris* in *Gray's Manual* represent discrete elements in *Thelypteris* based on morphological aspects and especially different chromosome numbers. *Thelypteris Phegopteris* is an apogamous triploid with *n, 2n* = 90, and *T. hexagonoptera* is diploid with *n* = 30. Three other species formerly regarded as an allied group are readily distinguished on differences in spores and chromosome numbers: *T. noveboracensis n* = 27, *T. palustris n* = 35, and *T. simulata n* = 64. A study of populations in New England (Tryon & Tryon, 1973) indicated the species are more closely related to species in western North America or eastern Asia than to each other.

Thelypteris hexagonoptera (Michx.) Weatherby	Thely hexa	Broad Beech Fern
Dryopteris hexagonoptera (Michx.) C. Chr.*		
Phegopteris hexagonoptera (Michx.) Fée (6)		
T. noveboracensis (L.) Nieuwl.	Thely nove	New York Fern
Dryopteris noveboracensis (L.) A. Gray*		
Aspidium noveboracensis (L.) Sw. (6)		
T. palustris Schott	Thely palus	Marsh Fern
Dryopteris Thelypteris (L.) A. Gray*		
Aspidium Thelypteris (L.) Sw. (6)		

T. Phegopteris (L.) Slosson	Thely phego	Long Beech Fern
Dryopteris Phegopteris (L.) C. Chr.*		
Phegopteris connectilis (Michx.) Watt (23)		
P. polypodioides Fée (6)		
T. simulata (Davenp.) Nieuwl.	Thely simu	Massachusetts Fern
Dryopteris simulata (Davenp.) Underw.*		
Aspidium simulatum Davenp. (6)		

WOODSIA

Woodsia alpina (Bolton) S. F. Gray	Woods alpin	Northern Woodsia
W. alpina × **W. ilvensis**	Woods alpin × ilven	
W. glabella R. Br.	Woods glab	Smooth Woodsia
W. ilvensis (L.) R. Br.	Woods ilven	Rusty Woodsia
W. obtusa (Spreng.) Torr.	Woods obtus	Blunt-lobed Woodsia

WOODWARDIA

Woodwardia areolata (L.) Moore	Woodw areo	Netted Chain Fern
Lorenseria areolata (L.) Presl (23)		
W. virginica (L.) J. Sm.	Woodw virg	Virginia Chain Fern

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