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Ferns and Fern Allies of Brown County

BARBARA J. R. GUDMUNDSON*

ABSTRACT—In collecting ferns and fern allies in Brown County, Minnesota, during the 1964 summer, six of the seven species previously recorded were found again and six fern species and seven horsetail species and varieties new to the records were collected.

Taxa newly found in 1964 are: *Botrychium virginianum* var. *virginianum*, *Osmunda claytoniana*, *Woodsia obtusa*, *Woodsia oregana* var. *cathcartiana*, *Athyrium filix-femina* var. *michauxii*, *Cystopteris bulbifera*, *Equisetum hyemale* var. *pseudohyemale*, *Equisetum hyemale* var. *elatum*, *Equisetum scirpoides*, *Equisetum fluviatile*, *Equisetum palustre*, *Equisetum pratense*, and *Equisetum sylvaticum*.

Voucher specimens of the nineteen taxa were deposited in the herbarium of Mankato State College. Duplicate specimens are in the University of Minnesota herbarium.

This study of ferns and "fern allies" was undertaken because it seemed that, even in an area of open farm land having little suitable habitat for the lower vascular plants, more species should be represented than previous studies had disclosed.

In Tryon's *The Ferns and Fern Allies of Minnesota* (1954) seven species were listed for Brown county. In 1963 in adjacent Blue Earth County, Stokes found ten species not represented in the University of Minnesota herbarium and thus not included in Tryon's work (Figure 1). Subsequent studies by other Mankato State College graduate students in adjacent and nearby counties turned up sufficient new species to indicate that an intensive study of Brown county could be expected to add substantially to the small list of five fern and two ally species given by Tryon to this county.

In addition to Tryon and Stokes, reports of collections of ferns made by Deming (1964) in Waseca County, Erickson (1965) in Cottonwood County, and Romness (1964) in Redwood and Renville counties, were used. Tryon's distribution maps (by county) gave useful clues to possible additional species to expect in Brown County. Tryon's dates included the locations where plants were found in 1891 and 1938.

Terms

FERN ALLIES—include three groups: whisk ferns, club mosses, and horsetails.

Whisk ferns (Psilopsida) are subtropical and tropical and therefore absent in Minnesota. Club mosses and spike mosses (Lycopsida) and horsetails (Sphenopsida) are so distinctive that the term "fern allies" has fallen into disfavor as it implies their greater similarity and, when used with its "fern" complement (within the now obsolete taxon "Pteridophyta"), implies too wide a separation between ferns and seed plants (Foster and Gifford, 1959). The term is used here to emphasize the parallel nature of this investigation with Tryon's. The best mod-

ern term replacing it is "lycosphen," a combination of club moss and horsetail taxa names.

PTERIDOPHYTES—an informally used term which includes ferns and fern allies. It is synonymous with the "lower vascular plants."

HYDRIC—very moist or wet

MESIC—moderately moist

XERIC—moderately to very dry

The Survey Area

Brown County is located in south central Minnesota, its center at approximately 44° 15' North and 94° 45' West. Most of its 618 square miles is at an average elevation of 1,050 feet, with a variation from 1,250 feet in the southwest corner to 900 feet in the northeast corner Minnesota River bottomlands. There is an abrupt drop in elevation near the northeast corner resulting in steep stream and river valleys up to 175 feet deep. In other parts of the county, the Cottonwood River usually flows about 50 feet below the surrounding land, and the Little Cottonwood and other streams from 15 to 30 feet below. Bordering slopes of the latter are gentle, and the land is used for pasture. Because of pressure for agricultural land, the slope has great bearing on where wild plants are found. Two main rivers and two or three large streams course through the county from west to east: the Minnesota and Cottonwood rivers, and the Little Cottonwood River, Sleepy Eye Creek, and Mounds Creek (Figure 2).

Only one small area in the northeast corner has basic rock (limestone) on the surface and, since no ferns were present there, many species may not be found within this county.

The original vegetation on the upland was the mature community for this climate: the tall grass prairie. Ravines and bottomlands supported the mesic-habitat hardwoods typical farther east where the evaporation is not as great (McMiller and Rost, 1951). A good representation of the original forest is preserved in Flandrau State Park near New Ulm. Here the steep, high banks of the Cottonwood and its small tributaries harbor the native forest species in their greatest variety within the county.

Except for the river valleys, Brown County's topography resembles most of southern Minnesota: undulating

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prairie which is intensively farmed, dotted with many sloughs and a few lakes, and sparingly drained by natural waterways. (The lack of natural drainage in this county is compensated for by a network of more than 1,000 miles of private and public drainage ditches.) The typically poor drainage areas of relatively recent glacial deposits are the rule, however, and the exceptions which occur are 1) along the northern-bordering Minnesota River, 2) some areas along the Cottonwood River, and 3) in the southwest corner of the county where the Mounds Creek drainage cuts sharply into Sioux quartzite to form falls and clefts in solid rock.

Sampling and Selection Procedure

Since it was too ambitious a project to collect intensively throughout the entire 618 square miles of the county, careful sampling was used in the five corner townships and collections were made in other townships which seemed to offer good habitats for pteridophytes. As much as possible, specimens were gathered for the

University of Minnesota herbarium in addition to the thesis specimens, and in Flandrau Park specimens also were gathered for a permanent collection there. Forms were drawn up in advance for three lists: 1)—species already placed in the University of Minnesota herbarium and recorded by Tryon; 2)—species “probable” for the county since they had been found in the general surrounding area; and 3)—species only “possible” for this county by their records from elsewhere in Minnesota and in surrounding states and provinces. (Table 1).

Results of One Summer's Work

During one summer collecting, ten species of ferns, seven species of horsetails (two varieties of one of the species), and one spike-moss species were found (Table 2). Of those previously found, I collected all but *Woodisia ilvensis*. Eight new species credited to the probable list were in this collection and two for the possible list. Three which were on none of the pre-collecting lists also were found.

TABLE 1.—PRE-COLLECTING LIST OF BROWN COUNTY FERNS AND FERN ALLIES RECORDED (by Tryon in 1954)

	POLYPODIACEAE	<i>Adiantum pedatum</i> <i>Woodisia ilvensis</i> <i>Matteuccia struthiopteris</i> <i>Cystopteris fragilis</i> <i>Dryopteris spinulosa</i>
	EQUISETACEAE	<i>Equisetum arvense</i>
	SELAGINELLACEAE	<i>Selaginella rupestris</i>
	PROBABLE	POSSIBLE
OPHIOGLOSSACEAE	<i>Botrychium virginianum</i>	<i>B. matricariaefolium</i> <i>B. simplex</i> <i>B. lanceolatum</i>
OSMUNDACEAE	<i>Osmunda claytoniana</i>	
MARSILEACEAE		<i>Marsilea mucronata</i>
POLYPODIACEAE	<i>Cryptogramma stelleri</i> <i>Pellaea glabella</i> <i>Woodisia obtusa</i> <i>Woodisia oregana</i> <i>Woodisia scopulina</i> <i>Onoclea sensibilis</i> <i>Dryopteris goldiana</i> <i>Dryopteris spinulosa</i> <i>Thelypteris palustris</i> var. <i>pubescens</i> <i>Athyrium filix-femina</i> var. <i>michauxii</i> <i>Cystopteris fragilis</i> var. <i>protrusa</i> <i>Cystopteris fragilis</i> var. <i>mackayi</i> <i>Cystopteris bulbifera</i> <i>Camptosorus rhizophyllus</i> <i>Polypodium virginianum</i>	<i>Pteridium aquilinum</i> <i>Cheilanthes feei</i> <i>Gymnocarpium dryopteris</i> <i>Athyrium thelypteroides</i> <i>Asplenium trichomanes</i>
EQUISETACEAE	<i>Equisetum hyemale</i> var. <i>psuedohyemale</i> <i>E. laevigatum</i> <i>E. kansanum</i> <i>E. nelsoni</i> <i>E. fluviatile</i>	<i>E. scirpoides</i> <i>E. sylvaticum</i>
LYCOPODIACEAE	<i>Lycopodium selago</i>	<i>L. lucidulum</i> <i>L. complanatum</i> <i>L. obscurum</i>
ISOËTACEAE		<i>Isoëtes melanopoda</i>

TABLE 2. SPECIES OF FERNS AND ALLIES COLLECTED - SUMMER 1964

OPHIOGLOSSACEAE

†*Botrychium virginianum* var. *virginianum* (L.) Sw. Rattlesnake fern

OSMUNDACEAE

†*Osmunda claytoniana* L. Interrupted fern

POLYPODIACEAE

**Adiantum pedatum* L. Maidenhair fern

†*Woodsia obtusa* (Spreng.) Torr. Blunt-lobed Woodsia

†*Woodsia oregana* D.C. Eat. var. *cathcartiana* (Robins.) Morton. Cathcart's Woodsia

**Matteuccia struthiopteris* (L.) Todaro var. *penylvanica* (Willd.) Morton. Ostrich fern

†*Athyrium filix-femina* (L.) Roth var. *michauxii* (Spreng.) Farwell. Lady fern

**Cystopteris fragilis* (L.) Bernh. var. *fragilis*. Fragile fern

†*Cystopteris bulbifera* (L.) Bernh. Bulblet fern

**Dryopteris spinulosa* (O.F. Müll.) Watt var. *spinulosa x americana* (Fischer) Fern. Spinulose shield-fern

EQUISETACEAE

†*Equisetum hyemale* L. var. *pseudohyemale* (Farw.) Morton. Tall scouring-rush

Equisetum hyemale L. var. *elatatum* (Engelm.) Morton. Tall scouring-rush

‡*Equisetum scirpoides* Michx. Dwarf scouring-rush

†*Equisetum fluviatile* L. Water horsetail

Equisetum palustre L. Marsh horsetail

Equisetum pratense Ehrh. Meadow horsetail

‡*Equisetum sylvaticum* L. Wood horsetail

**Equisetum arvense* L. var. *arvense*. Field horsetail

SELAGINELLACEAE

**Selaginella rupestris* (L.) Spring. Rock spike-moss

* = previously recorded

† = probable list

‡ = possible list

In Cottonwood Township, which contains Flandrau State Park, eleven species were found. Milford Township produced six species and North Star, Eden, and Lake Hanska townships four species each. Fewer than four each were found in five other townships.

Representatives of families Ophioglossaceae, Polypodiaceae and Equisetaceae were found throughout the county (though Ophioglossaceae was not present in the southwestern corner). *Cystopteris bulbifera* and *Adiantum*

pedatum were represented by the most individuals, and those were in well-shaded sites. *Botrychium virginianum* was nowhere represented by many individual plants, but appeared at many sites in limited numbers. *Equisetum arvense* and *Equisetum hyemale* were both abundant and widespread. Most ferns were found on slopes of 19-25% on Storden and Lakeville soil types - those which support most of the forest cover in Brown County (McMiller and Rost, 1951).

ANNOTATED LIST OF SPECIES

- Abbreviations:** FSP Flandrau State Park
 FGC Flandrau Group Camp, south of the Cottonwood River
 Twp Township
 MSCH Mankato State College Herbarium (thesis collection)
 UMH University of Minnesota Herbarium
 FSPC Flandrau State Park Collection
 Numbers refer to field numbers of each specimen

Sub-division Pteropsida

Family Ophioglossaceae

Botrychium virginianum (L.) Swartz. Rattlesnake fern.

Adjacent counties: Blue Earth, Nicollet, Cottonwood, Renville.

Distribution (all data from Tryon): Labrador to British Columbia, south to Florida and Mexico; East Asia.

- 4 FGC Well-shaded hydric brook terrace UMH
- 7 FGC Hydric brook terrace in sandy loam (much humus) FSPC
- 21 FGC Mesic well-shaded woods in sandy loam MSCH
- 46 Milford Twp Steep shaded bank, mesic MSCH
- 85-9 FSP Mesic wooded slope in deep leaf mold 85, 86 UMH; 87, 89 FSP
- 117 (N.) Home Twp Mesic wooded north-facing slope MSCH

119 (N.) Eden Twp Mesic wooded slope in leaf mold UMH

The only member of the Ophioglossaceae found by me in Brown County. Found on the northern border and in the northeastern river valleys. Not in great numbers any place, but a few individuals were found in each one of many locations. Often found in depressions and rill beds, sometimes in association with poison ivy and never with Virginia creeper.

Family Osmundaceae

Osmunda claytoniana L. Interrupted fern. Adjacent county: Blue Earth.

Distribution: Newfoundland to Manitoba, south to Georgia and Arkansas.

104-7 FGC Hydric brook terrace in deep shade 104 FSPC 106 UMH 107 MSCH

The only member of the Osmundaceae found in the county. Note: No fertile pinnae were present on any specimen found.

Family Polypodiaceae

Adiantum pedatum L. Maidenhair fern.

Adjacent counties: Blue Earth, Nicollet. Distribution: Nova Scotia and Quebec to

Alaska, south to Georgia, Louisiana and California.

- 25 FGC Hydric woods in sandy loam with much humus FSPC
- 27 FGC Hydric woods in sandy loam with much humus UMH
- 43 Milford Twp Steep shaded mesic bank MSCH
- 110-1 (N.) Home Twp Shaded mesic-hydric north-facing road cut 110 UMH 111 MSCH
- 152-3 Cottonwood Twp Steep mesic-hydric wooded slope 152 UMH 153 MSCH

One of the most abundant and widespread ferns. All locations were mesic slopes.

Woodsia obtusa (Spreng.) Torr. Blunt-lobed Woodsia.

Adjacent counties: Blue Earth, Cottonwood, Redwood, Nicollet.

Distribution: Maine to Minnesota, south to Florida and Texas.

112-4 (N.) Home Twp Shaded mesic north-facing road cut 112 MSCH 114 UMH

120 (N.) Home Twp Shaded mesic north-facing road cut UMH

Woodsia oregana var. *cathcartiana* (Robins.) Morton. Cathcart's Woodsia.

Adjacent counties: Blue Earth, Cottonwood, Redwood, Nicollet.

Distribution: New York to Minnesota and Iowa.

(L. E.)A Stately Twp. On quartzite cliffs bordering Mounds Creek MSCH

This specimen was collected by Leland Erickson just inside the county line from Cottonwood County and the Red Rock Dells.

Matteuccia struthiopteris (L.) Todaro var. *pensylvanica* (Willd.) Morton.

Adjacent counties: Blue Earth, Redwood, Nicollet.

Distribution: Newfoundland to Alaska, south to Virginia, Missouri and British Columbia.

42 Milford Twp Mesic-xeric open weed patch on river alluvium MSCH

This species is common in borders on the north sides of buildings, but I could not report it until I found it in the wild.

Dryopteris spinulosa (O. F. Müll.) Watt var. *spinulosa* x *americana* (Fisch.) Fernald. Spinulose shield-fern.

Adjacent county: None (Note: A UMH specimen was labelled erroneously as being collected in Cottonwood County. The location recorded is in Brown County.)

Distribution: Quebec to British Columbia, south to Kentucky and Missouri.

(L.E.)B Stately Twp. On quartzite cliffs over Mounds Creek MSCH

Found by Leland Erickson just east of the Cottonwood-Brown line, the identification was difficult and puzzling, but it must stand until successfully challenged.

Athyrium filix-femina (L.) Roth var. *michauxii* (Spreng.) Farwell. Lady fern.

Adjacent counties: Blue Earth, Renville, Nicollet.

Distribution: Quebec to South Dakota, south to Tennessee and Missouri.

100-2 FGC Mesic steep wooded slope 100 UMH 101 MSCH 102 FSPC

126-8 (N.) Eden Twp Shaded mesic NE-facing road cut 126 UMH 127 MSCH 128 UMH

148 Cottonwood Twp Steep mesic wooded slope UMH

Was abundant at the few sites where it was found.

Cystopteris fragilis (L.) Bernh. Fragile fern.

Adjacent counties: Cottonwood, Redwood, Renville, Nicollet.

Distribution: Labrador to Alaska, south to North Carolina and California.

1 FGC Mesic wooded slope MSCH

2 FGC Mesic wooded slope FSPC
Cystopteris bulbifera (L.) Bernh. Bulb-let fern.

Adjacent counties: Blue Earth, Nicollet.
Distribution: Newfoundland to Utah, south to Georgia and Arizona.

14 FGC Hydric sandy loam near brook (much humus) MSCH

16 FGC Hydric sandy loam near brook (much humus) UMH

22 FGC Hydric-mesic sandy loam, shady brookside FSPC

51 Milford Twp Steep mesic shaded bank MSCH

156a Cottonwood Twp Steep mesic-hydric wooded slope UMH

In the few locations where it was found, it was very abundant. All four locations were in deep shade, on steep slopes free of rocks.

Sub-Division Sphenopsida

Family Equisetaceae

Equisetum hyemale var. *pseudohyemale* (Farw.) Morton. Tall scouring-rush.

Adjacent counties: Blue Earth, Redwood.
Distribution: Quebec to British Columbia, south to Georgia, Texas and Washington.

37 Milford Twp Xeric sunny Cottonwood R. bank in clayey soil MSCH

66 North Star Twp Mesic excavation near RR track in light shade MSCH

131a-b FGC Hydric brook terrace in rich soil a UMH b FSPC

138 (N.) Eden Twp Open roadside ditch in mesic sandy soil UMH

158 Cottonwood Twp Mesic N-facing lightly shaded bank by L. Ctwd UMH

164 Cottonwood Twp Mesic open creek bank UMH

171 Lake Hanska Twp Small mesic-hydric depression near N shore UMH

Equisetum hyemale var. *elatum* (Engelm.) Morton. Scouring-rush.

Adjacent counties: None.

Distribution: Ontario to Idaho, south to Florida and California.

129a FGC Hydric brook terrace in rich soil MSCH

Equisetum scirpoides Michx. Dwarf scouring-rush.

Adjacent counties: None.

Distribution: Greenland to Alaska, south to New York, Montana and Washington.

71 North Star Twp Steep N-facing brook bank in rich mesic soil MSCH

84 North Star Twp Steep shady hydric brook bank UMH

Equisetum fluviatile L. Water horsetail.

Adjacent county: Blue Earth.

Distribution: Newfoundland to Alaska, south to Pennsylvania, Minnesota and Oregon.

11 FGC Mesic to hydric sandy loam forest soil near brook MSCH

Equisetum palustre L. Marsh horsetail.

Adjacent county: None.

Distribution: Quebec to Alaska, south to Pennsylvania, Nebraska and California; Eurasia.

20 FGC Mesic-hydric sandy loam by brook MSCH

28b Mulligan Twp Mesic roadside near Wood Lake, growing up thru asphalt UMH

31 Burnstown Twp Clayey north bank of Cottonwood River MSCH

146a-b Lake Hanska Twp East-facing bank of Lake Hanska in clayey soil in open shallow water 146a UMH 146b MSCH

Equisetum pratense Ehrh. Meadow horsetail.

Adjacent county: None.

Distribution: Newfoundland to Alaska, south to New Jersey, Iowa and B.C.

59 Milford Twp Hydric roadside MSCH

169a Lake Hanska Twp Steep north-facing lightly shaded bank MSCH

Equisetum sylvaticum L. Wood horsetail.

Adjacent county: Blue Earth.

Distribution: Labrador to Alaska, south to Maryland, Nebraska, and Oregon.

95 FSP between large parking lot and campground; mesic-xeric open woods MSCH

96 FSP between large parking lot and campground; mesic-xeric open woods UMH

Equisetum arvense L. Field horsetail.

Adjacent counties: Blue Earth, Nicollet.

Distribution: Widespread in the United States and Canada.

8 Linden Twp Xeric roadside in sandy, clayey soil 50 yds. from slough MSCH

30 Burnstown Twp North bank of Cottonwood River in clay soil MSCH

33 Stately Twp Hydric roadside ditch MSCH

81-2 North Star Twp Steep shaded hydric brook bank 81 MSCH 82 UMH

91-3 FSP Between parking lot and campground; mesic-xeric open woods 91 UMH 93 FSPC

98-9 FSP Between parking lot and campground; mesic-xeric open woods 98 UMH, FSPC 99 UMH

144 Lake Hanska Twp Shaded steep hydric N-facing bank in rich soil UMH

141 (N.) Eden Twp Open roadside ditch in mesic sandy soil UMH

133-6 FGC Hydric brook terrace in rich soil 133 FSPC 136 UMH

160-1 Cottonwood Twp Mesic N-facing lightly shaded bank 160 MSCH 161 UMH

166 Lake Hanska Twp Hydric E-facing bank UMH

175 Lake Hanska Twp In offshore

marsh among stiff marsh grasses
UMH

This was by far the most abundant and widespread horsetail, found under different conditions and in 14 different locations.

Sub-Division Lycopsidea

Family Selaginellaceae

Selaginella rupestris (L.) Spring. Rock spike-moss.

Adjacent counties: Blue Earth, Cottonwood, Nicollet, Renville.

This great increase in recorded species is expected when an area is carefully investigated for the first time. The prospects for future collecting in this area can be estimated (Table 3) from a consideration of habitat preferences of each species and the availability of those habitats in the county, as well as the distribution data used in drawing up the lists. In Table 3, the *probable* list species that were not found in this study are divided according to the likelihood of their being present in Brown County.

The best collection sites were wooded slopes of river valleys, even those at a considerable distance from their rivers (this occurs when the river which originally cut the valley was much larger than the present one). Ferns

Distribution: Greenland to Alberta, south to Georgia and Oklahoma.

176-7 Stately Twp On quartzite outcrop in shallow sandy soil 176 MSCH
177 UMH

Pteridophyte collecting in Brown County: Past, present and future.

Tryon (1954) listed these six species for Brown County: *Adiantum pedatum*, *Matteuccia struthiopteris*, *Cystopteris fragilis*, *Woodsia ilvensis*, *Equisetum arvense*, and *Selaginella rupestris*. I excluded the *Woodsia ilvensis* upon finding

its location was "Red Rock," near New Ulm but in Nicollet County. When Leland Erickson checked the Cottonwood County specimens, his finding two misplaced Brown County specimens reinstated *Woodsia ilvensis* and added *Dryopteris spinulosa*. Thus, a total of seven was considered the *recorded* species list.

In addition to six of the seven recorded species, 13 other taxa (species and varieties) were found. Of the 19 taxa collected, nine had been on the *probable* list and two on the *possible* list. The other two were unpredicted finds.

were often found where wild ginger (*Asarum canadense*) was abundant. The collecting on river and stream banks was very poor because the broad floodplains make these lands desirable for pastures. Drainage ditches would seem to be a fair habitat since they are V-shaped and fairly stock-proof, but herbicides are applied regularly to the ditch areas to increase their efficiency and the length of time between dredgings. Weed control is another factor in the reduction of pteridophytes. Horsetails and bracken fern are on the county weed list and might therefore be harder to find.

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TABLE 3. — Probability of Finding *Probable* Pteridophytes in Brown County

FUTURE PROBABLES	
<i>Woodsia ilvensis</i>	
<i>Onoclea sensibilis</i>	
<i>Thelypteris palustris</i> var. <i>pubescens</i>	
<i>Equisetum laevigatum</i>	
<i>Equisetum kansanum</i>	
<i>Equisetum nelsoni</i>	
FUTURE POSSIBLES	
	REASON FOR LOWER PROBABILITY OF OCCURRENCE
<i>Camptosorus rhizophyllus</i>	on cliffs; rarely tree bases
<i>Polypodium virginianum</i>	different rock types or the ground (rare)
<i>Lycopodium selago</i> var. <i>patens</i>	rock ledges; less often in woods or swamps
FUTURE UNLIKELYS	
<i>Cryptogramma stelleri</i>	calcareous rocks; on edge of its range
<i>Pallaea glabella</i>	calcareous rock or leached sandstone
<i>Woodsia scopulina</i>	calcareous rocks
<i>Dryopteris goldiana</i>	rich, mostly calcareous woods
<i>Cystopteris fragilis</i> var. <i>mackayi</i>	various rock types, in shade