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**Ferns and Fern Allies of Pine Hills Field Station  
and Environs (Illinois)**

ROBERT H. MOHLENBROCK AND JANE HINNERS ENGH

## Ferns and Fern Allies of Pine Hills Field Station and Environs (Illinois)

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This is one in a series of studies which have emanated from the Southern Illinois University Field Station. A check-list of vascular plants has been prepared (Mohlenbrock & Voigt, in press). The study of the ferns and their allies of the area was completed during the summer of 1961 when the junior author participated in a National Science Foundation Research Participation Program.<sup>1,2</sup> The authors are grateful to the graduate council of Southern Illinois University for assistance in this study.

### THE PINE HILLS AND ENVIRONS

Two representative areas were chosen for exhaustive study of the fern and fern ally groups native to the Pine Hills and its environs. These areas were the Pine Hills Recreation Area and the adjoining Union County Forest Preserve. Both areas are located in the Shawnee Hills of Southern Illinois.

Pine Hills Recreation Area is approximately 37 miles from Carbondale, Illinois, off of Illinois Route 3. The territory covered in the survey extended from the second set of railroad tracks on the Aldridge Levee Road to Hutchins Creek, and from the Pine Hills Recreation Area entrance to the edge of Otter Pond. All of the roads, trails, picnic areas, and the penetrable interior of the Recreation Area were covered.

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<sup>1</sup>N. S. F. Grant 16,180.

<sup>2</sup>Contribution from the Pine Hills Field Station and the Department of Botany, Southern Illinois University.

A less intensive search of the Union County Forest Preserve was conducted since there was considerable uniformity in ecological habitats in this area. Collections were made along roads, fire trails, picnic areas and a portion of the lower interior region near the entrance.

#### HISTORY OF FERN COLLECTING IN THE PINE HILLS AREA

Prior to June, 1961, only nine species of ferns had been reported from the Pine Hills Recreation Area. These were: *Asplenium pinnatifidum* (Hatcher, Oct. 21, 1949); *A. resiliens* (Hatcher, Oct. 21, 1949); *Athyrium pycnocarpon* (Mohlenbrock, July 1, 1954); *Dryopteris marginalis* (Evers, Oct. 2, 1948); *Onoclea sensibilis* (Mohlenbrock, July 1, 1954); *Pellaea atropurpurea* (Hatcher, Oct. 21, 1949); *Polypodium polypodioides* (Hatcher, Oct. 8, 1949); *Polystichum acrostichoides* (Mohlenbrock, July 12, 1954); and *Woodsia obtusa* (Hatcher, May 28, 1954). Six additional species had been found near the Pine Hills area. Five of these were collected in the Union County Forest Preserve. They were: *Adiantum pedatum* (Sanders, June 26, 1952); *Asplenium platyneuron* (Kaeiser, Spring of 1952); *Dryopteris austriaca* var. *intermedia* (Sanders, April 7, 1952); *D. austriaca* var. *spinulosa* (Hatcher, May 21, 1949); and *Botrychium dissectum* var. *obliquum* (Swayne and Bailey, Sept., 1949). *Azolla mexicana* (Bailey, Sept. 22, 1947), was found floating on the waters of Wolf Lake.

During the present study, 12 species previously unreported from the Pine Hills-Union County Forest Preserve were found: *Asplenium trichomanes*, *Athyrium filix-femina*, *A. thelypteroides*, *Botrychium virginianum*, *Camptosorus rhizophyllus*, *Cheilanthes feei*, *C. lanosa*, *Cystopteris bulbifera*, *C. fragilis*, *Thelypteris hexagonoptera*, *Ophioglossum vulgatum*, and *Pteridium aquilinum*. Only one fern ally, *Equisetum hyemale*, was found.

#### ECOLOGY OF SOUTHERN ILLINOIS FERNS AND FERN ALLIES

The ferns and fern allies of Southern Illinois that occur in our areas are listed in Table 1, with check marks to show their

usual environmental habitats. Table 2 lists ferns known from Southern Illinois, but not yet found in the Pine Hills-Union County Forest Preserve areas.

TABLE 1

FERNS AND FERN ALLIES OF SOUTHERN ILLINOIS KNOWN TO OCCUR IN THE PINE HILLS RECREATION AREA AND THE UNION COUNTY FOREST PRESERVE, IN RELATION TO HABITAT

	Dry woodlands Open fields	Limestone rock Calcareous soil	Sandstone rock	Wet rocks and ledges	On tree trunks	Moist woodlands	Ditches Stream beds	Ponds and stagnant water	Swamps and swamp margins
<i>Adiantum pedatum</i>						X			
<i>Asplenium pinnatifidum</i>			X						
<i>Asplenium platyneuron</i>		X				X	X		
<i>Asplenium resiliens</i>		X							
<i>Asplenium trichomanes</i>		X							
<i>Athyrium filix-femina</i>	X					X	X		
<i>Athyrium pycnocarpon</i>				X		X			
<i>Athyrium thelypteroides</i>						X			
<i>Azolla mexicana</i>								X	
<i>Botrychium dissectum</i>	X					X	X		
<i>Botrychium virginianum</i>	X					X			
<i>Camptosorus rhizophyllus</i>		X	X		X				
<i>Cheilanthes feei</i>		X							
<i>Cheilanthes lanosa</i>			X	X					
<i>Cystopteris bulbifera</i>		X				X			
<i>Cystopteris fragilis</i>				X		X			
<i>Dryopteris austriaca</i>						X	X		
<i>Dryopteris marginalis</i>				X		X			
<i>Equisetum hyemale</i>							X		
<i>Onoclea sensibilis</i>	X								X
<i>Ophioglossum vulgatum</i>	X								
<i>Pellaea atropurpurea</i>		X							
<i>Polypodium polypodioides</i>				X	X				
<i>Polystichum acrostichoides</i>	X					X			
<i>Pteridium aquilinum</i>	X								
<i>Thelypteris hexagonoptera</i>						X			
<i>Woodsia obtusa</i>				X					

The Pine Hills Field Station is a region of limestone bluffs, moist woodlands, and swamps. It provides a variety of ecological habitats for ferns and fern allies, limited primarily by the extreme temperature ranges ( $-22$  to  $106^{\circ}\text{F}.$ ) in southern Illinois. High temperatures during the summer cause a correspondingly high transpiration rate in the plants during the time when water supplies in the soil and creeks are diminishing. Plants that survive this seasonal drought must either be adapted to high temperatures or grow in cooler, moister habitats. The woodland and water ferns are examples of plants that occur in a more temperate environment. The woodland ferns grow in moist, shaded sites, protected from direct sunlight most of the day. They tend to be tall, dark green, and delicate in texture and cutting of leaves.

Aquatic ferns have an even greater water requirement than do woodland ferns. They grow in or on the surface of still, shallow ponds or at the swamp's edge. *Equisetum* frequently grows near creeks and rivers, not so much because it needs a great quantity of water, but because it requires large amounts of silica found in the sand and gravel of creek banks. For this reason, *Equisetum* is also common on sandstone rocks and beside well-graveled railroad tracks.

The rock ferns have become adapted to extremes in temperature. Ferns best able to live in xerophytic or desert-like conditions grow on limestone. They are protected from excessive transpiration by having thin, wiry stems and small leaves protected either by a covering of hairs or by a thick, leathery cuticle—or both. The smaller size of the plants enables them to expose less surface from which water escapes, while a thick cuticle helps to keep moisture inside the plant. Ferns that can survive with little water but not able to exist on the desert-like limestone outcrops may grow well on wet limestone, dry sandstone, or bluff-top woods. They tend to grow in mats, transpiring mainly from the undersides of their leaves and partially trapping water vapor between their bodies and the rock, thus reducing the desiccation of their leaves. They also have a cuticle and thin

TABLE 2  
 FERNS AND FERN ALLIES OF SOUTHERN ILLINOIS NOT FOUND IN THE PINE  
 HILLS RECREATION AREA AND THE UNION COUNTY FOERST PRESERVE,  
 IN RELATION TO HABITAT

	Dry woodlands Open fields	Limestone rock Calcareous soil	Sandstone rock	Wet rocks and ledges	On tree trunks	Moist woodlands	Ditches Stream beds	Ponds and stagnant water	Swamps and swamp margins
<i>Asplenium bradleyi</i>			x						
<i>Dennstaedtia punctilobula</i>				x					
<i>Equisetum arvense</i>							x		
<i>Equisetum laevigatum</i>							x		
<i>Isoetes butleri</i>			x						
<i>Isoetes melanopoda</i>							x		
<i>Lycopodium complanatum</i>			x						
<i>Lycopodium lucidulum</i>			x			x			
<i>Marsilea quadrifolia</i>								x	
<i>Ophioglossum engelmannii</i>		x							
<i>Osmunda cinnamomea</i>				x					
<i>Osmunda claytoniana</i>				x					
<i>Osmunda regalis</i>				x					
<i>Pellaea glabella</i>		x							
<i>Polypodium vulgare</i>				x			x		
<i>Selaginella apoda</i>						x			
<i>Selaginella rupestris</i>			x						
<i>Thelypteris noveboracensis</i>						x			
<i>Thelypteris palustris</i>									x
<i>Trichomanes boschianum</i>				x					

stipes, but these features are not as highly developed in the sandstone and acid soil ferns.

Rock ferns are scattered throughout bluff-top areas of the upper Pine Hills road. They are abundant nowhere, but the greatest variety of them occurs on land of the Southern Illinois University Field Station.

The woodland ferns grow tallest and are most prolific on damp, wooded hillsides and along ditches or creeks. The best

area for these ferns is near the picnic grounds at the entrance to the Pine Hills. At the Union County Forest Preserve they are abundant in all the shaded areas. Aquatic ferns occur on the wet mud or on the surface of swamps and ponds of the Pine Hills. A colony of *Equisetum hyemale*, the only fern ally found in the Pine Hills, grows on the banks of Big Muddy River near the railroad tracks.

#### LOCAL DISTRIBUTION OF SOUTHERN ILLINOIS FERNS

##### OPHIOGLOSSUM—ADDER'S TONGUE FERN

These are short, green ferns, often overlooked because of their small size. They have an erect, scaleless rhizome with a smooth, fleshy stipe and an entire leaf blade. Arising at a point about half way up the stem is a fertile stalk bearing sporangia distally. The gametophytes are tuberous and exist underground for long periods. In the spring, the young sporophytes push straight up from the soil, unlike most ferns which arise in a coiled position.

OPHIOGLOSSUM VULGATUM L. Adder's Tongue Fern.—Local in moist woods throughout southern Illinois. A colony of var. *pycnostichum* Fern. occurs in a frequently inundated woods near Winter Pond in the Pine Hills. Variety *pseudopodium* (Blake) Farwell, not known to occur in the Pine Hills, is known from only a single station in southern Illinois.

OPHIOGLOSSIUM ENGELMANNII. Prantl. Limestone Adder's Tongue Fern.—Unknown from the Pine Hills Area, although to be expected on limestone ledges. Known from Randolph, Johnson, and Hardin counties.

##### BOTRYCHIUM—GRAPE FERN

Both species of *Botrychium* found in southern Illinois grow in the Union County Forest-Pine Hills area. In our region, they are usually about 8–12 inches tall, with cut or lobed sterile blades. In one species, the leaves turn bronze-colored in the fall. They have a soft, fleshy stipe and a short, erect rhizome as in *Ophioglossum*, but their leaf veins are open and forked, unlike the closed veins of *Ophioglossum*.

*BOTRYCHIUM VIRGINIANUM* (L.) Sw. Rattlesnake Fern.—Abundant in moist woods or dry shaded areas throughout southern Illinois.

*BOTRYCHIUM DISSECTUM* Spreng. Grape Fern.—Two varieties occur in southern Illinois, the much-divided var. *dissectum*, and the less-divided and more common var. *obliquum* (Muhl.) Clute. Variety *dissectum* is restricted to moist woods, while var. *obliquum* occurs also in dry open fields and ditches.

OSMUNDA—ROYAL FERN

No representatives of this genus have been found in the Pine Hills area, although *O. regalis*, *O. cinnamomea*, and *O. claytoniana* are known from southern Illinois. Members of this group have scaleless rhizomes and fibrous roots.

*OSMUNDA REGALIS* L. Royal Fern.—Only var. *spectabilis* (Willd.) A. Gray is found in southern Illinois. It differs from var. *regalis* in the absence of black hairs from the stems. Native in swamps, bogs, and on very wet ledges, although in southern Illinois it inhabits moist sandstone ledges.

*OSMUNDA CLAYTONIANA* L. Interrupted Fern.—Reported from Union County in 1955, where it is very rare. It usually grows in moist woods and along swamp margins, although it occurs on sandstone ledges in southern Illinois. It has not been collected in the Pine Hills.

*OSMUNDA CINNAMOMEA* L. Cinnamon Fern.—Occasionally on damp ledges in southern Illinois. It is rare in this part of the state and unknown from the Pine Hills.

TRICHOMANES—FILMY FERN

In Illinois this genus has been collected only in Pope and Johnson counties. *Trichomanes boschianum* Sturm has a scaleless, branching rhizome with black root hairs. Its leaves are very fragile, being only one cell thick. They are cut into about six overlapping divisions. A distinctive feature is the character of its sori, with their tubular indusium with its included hairlike bristle. The fern grows only in damp acid soil in caves or in pockets on sandstone cliffs.

## AZOLLA—MOSQUITO FERN

*Azolla mexicana* Schlecht. & Cham., the only species reported from southern Illinois, is a tiny, moss-like plant floating on the swamp waters in the Pine Hills area. A cluster of this little fern is about as large as a thumbnail. It has branched rhizomes, tiny, twice-lobed leaves, and sporocarps at the leaf bases. The fronds often become reddish in late summer.

## MARSILEA—PEPPERWORT

*Marsilea quadrifolia* L. is also an aquatic. It has been found twice in southern Illinois, both times in ponds in Carbondale. It has a branched rhizome rooting at the nodes, a frond that resembles a four-leaf clover, twice-branched veins, and sporocarps at the base of the leaf stalks, with each sporocarp containing several spore cases.

## ADIANTUM—MAIDENHAIR FERN

*ADIANTUM PEDATUM* L.—Common in the Pine Hills area, and usually grows in wooded areas along streams and occurs commonly throughout southern Illinois.

## ASPLENIUM—SPLEENWORT

Four of the five species of this genus that occur in southern Illinois grow in the Pine Hills area. Only *A. bradleyi* is absent.

*ASPLENIUM BRADLEYI* Eaton. Bradley's Spleenwort—On sandstone in southern Illinois; known only from Piney Creek (Jackson and Randolph Counties) and Panther's Den (Union County).

*ASPLENIUM PINNATIFIDUM* Nutt. Pinnatifid Spleenwort.—This fern usually grows on non-calcareous rocks. It was reported from the Pine Hills in 1949, but was not found during our survey. It is rather infrequent even in sandstone areas. The degree of leaf-cutting is variable.

*ASPLENIUM PLATYNEURON* (L.) Oakes. Ebony Spleenwort.—The slightly serrated forma *platyneuron* is the more common form in our area. Forma *serratum* (E. S. Miller) Hoffm. is a minor variation with deeply jagged-serrate pinnae. Both forms

grow in moist woods, ditches, and on wet rocks throughout southern Illinois.

*ASPLENIUM RESILIENS* Kunze. Black Spleenwort.—This species is distinguished from *A. platyneuron*, with which it is often confused, by its black rachis and opposite pinnae. It grows in calcareous soils and on limestone rock in the Pine Hills. It is unknown elsewhere in Illinois.

*ASPLENIUM TRICHOMANES* L. Maidenhair Spleenwort. This fern is distinguished from *A. resiliens* by its smaller size, purple stipe, and non-auriculate rounded pinnae. It is found on limestone rock and in calcareous soils of the Pine Hills and elsewhere in Southern Illinois. It occurs occasionally on sandstone.

#### ATHYRIUM—LADY FERN

All three species of this genus known from southern Illinois occur in the Pine Hills area.

*ATHYRIUM FILIX-FEMINA* (L.) Roth. Lady Fern.—Only var. *michauxii* Farwell has been found in southern Illinois. It has black basal scales on the stipe, stalked glands, sori that are long, narrow, and slightly hooked apically, and a frond with the fourth or fifth pair of pinnae the largest. It is found near the Pine Hills Research Station and in many other parts of southern Illinois. It has not been found in Union County Forest. It grows in moist woods, in fields, and along stream banks.

*ATHYRIUM PYCNOCARPON* (Spreng.) Tidestr. Narrow-leaved Spleenwort.—In moist woods of Pine Hills, Union County Forest, and elsewhere in southern Illinois.

*ATHYRIUM THELYPTERIOIDES* (Michx.) Desv. Silvery Spleenwort.—In moist woods of Pine Hills, Union County Forest, and other parts of southern Illinois.

#### CHEILANTHES—LIP FERN

Both species of *Cheilanthes* reported from southern Illinois occur in the Pine Hills. They are small, rock-inhabiting ferns.

*CHEILANTHES FEEI* Moore. Slender Lip-fern.—In calcareous soils and on limestone rocks of Pine Hills and various other parts of southern Illinois. Not abundant.

CHEILANTHES LANOSA (Michx.) D. C. Eaton. Hairy Lip-fern.—On dry rocks and shale outcroppings in Pine Hills and elsewhere in southern Illinois. It is distinguished from *C. feei* by its larger size and less dense, whitish, jointed hairs.

CAMPTOSORUS—WALKING-FERN

This genus produces plantlets where the attenuated tips of the leaves touch the ground. The genus is closely related to *Asplenium*; some pteridologists consider the two genera to be the same. The only North American species, *C. rhizophyllus* (L.) Link, occurs in both limestone and sandstone areas throughout southern Illinois.

CYSTOPTERIS—FRAGILE FERN

Two species of this genus grow in southern Illinois, and both occur in the Pine Hills Area.

CYSTOPTERIS BULBIFERA (L.) Bernh. Bulblet Bladder Fern.—On limestone rocks and in calcareous soils of southern Illinois, including the Pine Hill area. It can be distinguished from *C. fragilis* by the bulb-like structures on the rachis and by having veins that run to the sinuses rather than to the teeth of the leaflets.

CYSTOPTERIS FRAGILIS (L.) Bernh. Fragile Fern.—Three varieties grow in southern Illinois. *Cystopteris fragilis* var. *mackayi* Lawson has a short rhizome and subleaflets without a petiolule and with a cleft tip; var. *protrusa* Weatherby has a long-creeping rhizome and basal subleaflets petiolulate. *Cystopteris fragilis* var. *fragilis* has rhizomes similar to those of var. *mackayi*, but the sori in var. *fragilis* are nearly twice as large as those of var. *mackayi*, these structures being only about 0.5 mm. wide in var. *mackayi*. All three varieties are found in the Pine Hills Recreation Area and in Union County Forest Preserve.

DENNSTAEDTIA—HAY-SCENTED FERN

This genus is not present in the Pine Hills area. These ferns have scaleless branching rhizomes, smooth stipes, and much di-

vided fronds that have an odor like hay. The sori are protected by a white, cup-like indusium. Only *D. punctilobula* (Michx.) Moore occurs in southern Illinois.

DRYOPTERIS—SHIELD FERN, WOOD FERN

Two species, one represented by two varieties, occur in the Pine Hills Area. All are ferns of moist woodland habitats.

DRYOPTERIS AUSTRIACA (Jacq.) Woynar. Spinulose Shield Fern.—The two varieties are briefly characterized by the following key:

Rhizome thick, suberect; stipe medium brown; subleaflets prominently lobed, the lowermost shorter than the next ones above; sori part way back from tips of veins.....	var. <i>intermedia</i>
Rhizome creeping; stipe stramineous to green; subleaflets slightly lobed, the lowermost longer than others; sori at tips of vein or nearly so.	var. <i>spinulosa</i>

Both varieties occur in Union County Forest, although neither is plentiful. They grow best in moist woods or along stream banks and ditches.

DRYOPTERIS MARGINALIS (L.) A. Gray. Marginal Shield Fern.—Considerable variation occurs in leaf morphology. This species grows in moist woods in southern Illinois. It was reported from the Pine Hills in 1948, but was not found during our survey. It is unknown in the Union County Forest Preserve.

ONOCLEA—SENSITIVE FERN

ONOCLEA SENSIBILIS L. Sensitive Fern.—This is a weedy fern in woodlands and along swamp margins of the Pine Hills area. It is the only species of the genus known from southern Illinois.

PELLAEA—CLIFFBRAKE

One of the two species native in southern Illinois is represented in the Pine Hills area. Members of this genus have shiny, wiry, red or purple stipes, leathery, once- to thrice-cut fronds, and sporangia borne near the margins and covered by the incurved edges of the leaves. *Pellaea* grows only on calcareous rocks in our area.

PELLAEA ATROPURPUREA (L.) Link. Purple Cliffbrake.—In calcareous soils and on limestone rock at Pine Hills and elsewhere in southern Illinois.

PELLAEA GLABELLA Mett. Smooth Cliffbrake.—This species, with glabrous stipes and rachises, is known in southern Illinois only from Pope County.

#### POLYPODIUM—POLYPODY

Two species occur in southern Illinois.

POLYPODIUM POLYPODIOIDES (L.) Watt. Resurrection Fern.—This species frequently is epiphytic on trees, although it occurs on rocks also. It was reported in 1949 that a large bed of this fern grew on a limestone bluff at Pine Hills. It has not been collected there or at the Union County Forest Preserve since. Our plants belong to var. *michauxianum* Weatherby.

POLYPODIUM VULGARE L. Common Polypody.—Only var. *virginianum* (L.) Eaton is known in southern Illinois. It has smaller rhizome scales and its leaves are less scaly than those of var. *vulgare*. Common Polypody grows on rocks, cliffs, and moist bluffs. Sometimes it inhabits dead trees or logs. It is fairly common in southern Illinois, including the Pine Hills area.

#### POLYSTICHUM—CHRISTMAS FERN

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott, the only species of the genus found in southern Illinois, is abundant in the Pine Hills area. Several forms or minor variations occur occasionally in southern Illinois. The forms in the Pine Hills area can be put into four groups: (1) long, deeply serrated, prominently barbed leaflets; (2) membraneous textured, rounded-barbed, very shallowly serrated leaflets; (3) short, rounded leaflets with almost entire margins and inconspicuous barbs; and (4) long, slightly serrated leaflets with a prominent barb.

#### PTERIDIUM—BRACKEN

Only one member of this genus grows naturally in southern Illinois.

*PTERIDIUM AQUILINUM* var. *LATIUSCULUM* Underw.—This variety has been reported from southern Illinois, and can be distinguished from var. *aquilinum* in having an almost totally hairless stipe and leaf surface. Our variety grows in dry fields or burned-over areas in the Pine Hills area and a few other places in southern Illinois. It is not common in this area, probably because farmers have tried to eliminate it because it is poisonous when eaten by livestock.

#### THELYPTERIS—BEECH FERN

Members of this genus have black, slender, scaly, creeping rhizomes, twice-lobed to once-cut, triangular, membranous, hairy fronds, and small kidney-shaped sori. Many taxonomists include this genus within *Dryopteris*.

*THELYPTERIS HEXAGONOPTERA* (Michx.) Weatherby. Broad Beech Fern.—Abundant in moist woods of Pine Hills, Union County Forest Preserve, and other localities in southern Illinois.

*THELYPTERIS NOVEBORACENSIS* (L.) Nieuwl. New York Fern.—Found only once in southern Illinois (Seymour, 1880). It was then growing in a woods near Giant City State Park.

*THELYPTERIS PALUSTRIS* Schott. Marsh Fern.—Grows naturally in marshy land only. It is known from a few scattered stations in southern Illinois, but has not yet been found in the Pine Hills area.

#### WOODSIA—WOOD'S FERN, CLIFF FERN

*WOODSIA OBTUSA* (Spreng.) Torr. Blunt-lobed Woodsia.—This is the only species of the genus listed from southern Illinois. It is found at Pine Hills and its environs.

#### FERN ALLIES

Although nine species of fern allies (*Lycopodium*, two species, one of them with two varieties; *Selaginella*, two species; *Isoetes*, two species; *Equisetum*, three species) occur in southern Illinois, only one grows in the Pine Hills area.

*EQUISETUM HYEMALE* L. Common Scouring Rush.—Several varieties of this species occur in the United States. In our area

var. *elatum* (Engelm.) Morton is dominant. It is distinguished from other varieties by its pointed teeth which remain attached to the sheath throughout the winter. The plant occurs in the Pine Hills area and elsewhere in southern Illinois. It is common in sandy areas, such as along river banks and railroad embankments.

#### SUMMARY

The twenty-nine ferns and fern allies from the Pine Hills Field Station Area and environs reported here constitute 62 per cent of the ferns and fern allies known to occur naturally in the southernmost 17 counties of Illinois.

SOUTHERN ILLINOIS UNIVERSITY, CARBONDALE, ILLINOIS.