

STATUS REPORT

Taxon Name: Phyllitis scolopendrium (L.) Newm. var. americana Fern.

Common Name: American Hart's-Tongue Fern

Family: Aspleniaceae (Pteridophyta). (Alternative family name - Polypodiaceae)

Occurrence: Canada - Ontario; United States - Michigan, New York, Tennessee,
Alabama

Recommended Federal Status: Endangered

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I. SPECIES INFORMATION

1. Classification and Nomenclature

A. Species or infraspecific taxon

1. Scientific name

a. Binomial

Phyllitis scolopendrium (L.) Newm. var. americana Fernald

b. Full bibliographic citations

Fernald, M.L. 1935. Critical plants of the Upper Great Lakes region of Ontario and Michigan. *Rhodora* 37: 220.

c. Type specimen: Holotype: Canada, Ontario, Grey Co., Ingalls Falls, abundant in horizontal seams of dolomite in deciduous woods. June 19, 1934, M.L. Fernald, with R.B. Thompson and J.G. Wright, no. 3040 (GH).

2. Pertinent synonyms: none.

3. Common name: Hart's-tongue Fern.

B. Family Name: Aspleniaceae (Alternative family name -- Polypodiaceae s.l.)

D. History of knowledge of the taxon in the southeastern U.S.

The Post Oak Springs locality in Roane Co., TN was first discovered by A. Gattinger in 1849. The station was visited by Maxon and Pollard in 1900 and the ferns were not located. I visited the locality in 1965 and the fern was not located, and both before and since that time the population there has been considered extirpated. Searches have been made about caves, sinks and blowing holes in the vicinity without success.

The Marion Co., TN population was first discovered in 1879 by a

Mr. Cheatham. (There is some question which of two brothers Cheatham was the actual discoverer. See Shaver, 1954.) The number of plants have varied considerably over the years, and have been published on from time to time. Reports of 200 and 110 as counted in 1898 are reported by Maxon in 1900 and only 58 in 1911 (Graves, 1911). McGilliard (1936) reports a low of six plants in 1930, and also reports (1936) that Mr. Graves introduced spores from plants in Owen Sound, Ontario onto the clay slope at the north end of the pit in 1929 because of the decline in the local population. In 1935 there were 26 plants (McGilliard, 1936), but now we have no way of knowing whether or not the plants are from the original population or the introduced Canadian plants. Research done by myself and Dr. W.H. Wagner, Jr. (pers. comm.), indicate no taxonomic difference between Canadian, Michigan and South Pittsburg, TN plants. Visits over the past 15 years by myself indicate numbers of individuals to have stabilized at 17-19 plants.

The Jackson Co., AL population was first reported in the literature by Short (1979), although it was actually discovered a year or two earlier by Maryln Osterlund (a spelunker-naturalist currently a graduate student in the Geography Dept., The University of Tennessee-Knoxville). The Morgan Co., AL population was first discovered, again by Maryln Osterlund in 1979.

I have visited the Marion Co., TN site several times over the past 15 years; the Jackson Co., AL site in Feb. 1979, Aug. 1980 and July 1981; and the Morgan Co., AL site in Aug. 1980 and July 1981.

E. Current alternative taxonomic treatments:

Phyllitis scolopendrium var. americanum has the near relative P. scolopendrium var. scolopendrium, which occurs in Europe and is cultivated in this country, but is not known to have become naturalized in the southeastern U.S. Phyllitis bears some superficial resemblance to Asplenium rhizophyllum, but not so as to confuse the two.

2. Present Legal or Other Formal Status:

A. International: None

B. National: Proposed Endangered, Federal Register 41, No. 117: 24560.

C. State: 1978. Committee for Tennessee Rare Plants. The Rare

* Vascular Plants of Tennessee. J. Tenn. Acad. Sci. 53(4): 128-133.

Endangered, but not accorded any legal protection at this time.

3. Description:

Rhizome short-creeping, densely covered with cinnamon colored scales; leaves clustered, petioles 4-8 cm long, green, with concolorous cinnamon colored broad scales, blades entire, lanceolate, leathery, glossy, auriculate at base, acute at apex, up to 35 cm long and 4 cm wide, sparsely scaly beneath, especially along the midrib, lateral veinlets pinnate, free, ending just short of the leaf margin in linear hydathodes; sori linear, elongate along the diagonal lateral veinlets in two rows one on each side of the midrib, the double indusia arising from adjacent veinlets, overlapping when young and pushed up by the mature sporangia when mature; spores bilateral, with reticulate perispore.

Local Field Characters:

Evergreen terrestrial ferns with short creeping to erect scaly rhizomes and clusters of leathery glossy simple strap-shaped blades with free forking veinlets and two diagonal rows of elongate sori. Medium sized ferns growing primarily with mosses and thallus liverworts on ledges and mossy rock rubble in well shaded moist cool limestone sinkholes or pits. The only fern slightly resembling this, and with which it may grow, is Asplenium rhizophyllum (Walking fern) which is much smaller, has netted veins and irregular linear sori along the veins and most leaves with long attenuated leaf tips which commonly root forming new plantlets. Phyllitis scolopendrium var. scolopendrium is a European taxon which is cultivated occasionally as an indoor plant in this country. It is not known to be naturalized in the southeastern U.S. It would be difficult to differentiate the two from each other, but var. scolopendrium is usually fertile throughout 1/2 to all of the fertile leaf, and the petiole scales are mixed lanceolate and linear scales. In var. americana the sori occupy only the upper half to two thirds of the fertile leaf, and the petiole scales are all lanceolate.

E. Line drawings: See Figure 1.

5. Geographical Distribution, in the southeastern U.S.: See Fig. 2.

A. Geographical range:

1. East Tennessee (Marion Co., extirpated from Roane Co.).
2. North Alabama (Jackson and Morgan Cos.).

B. Precise Occurrences:

1. Extant Populations:

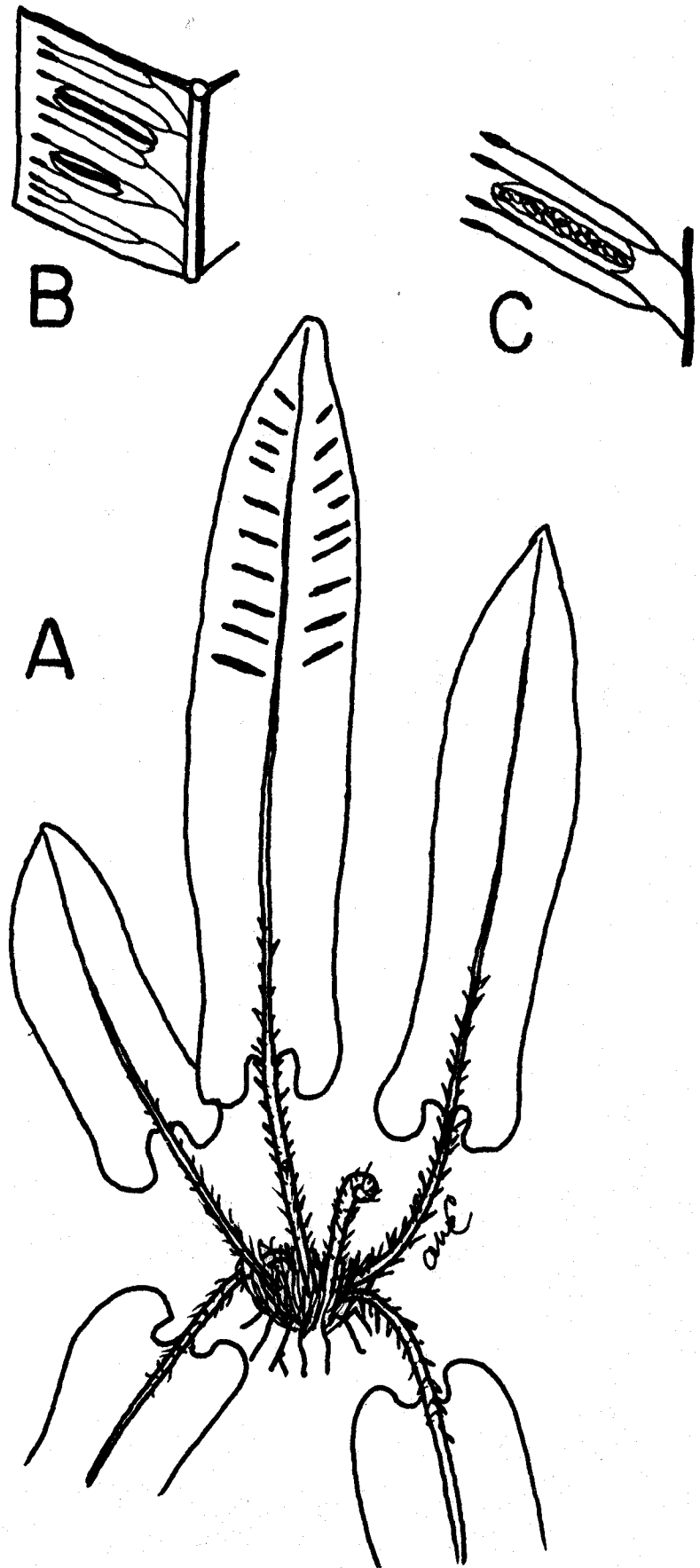


Fig. 1. *Phyllitis scolopendrium*
(L.) Newm. var. *americanum* Fern.

A. Habit sketch (X 1/2).
B. Venation pattern (X 1-1/2).
C. Sorus detail (X 2).

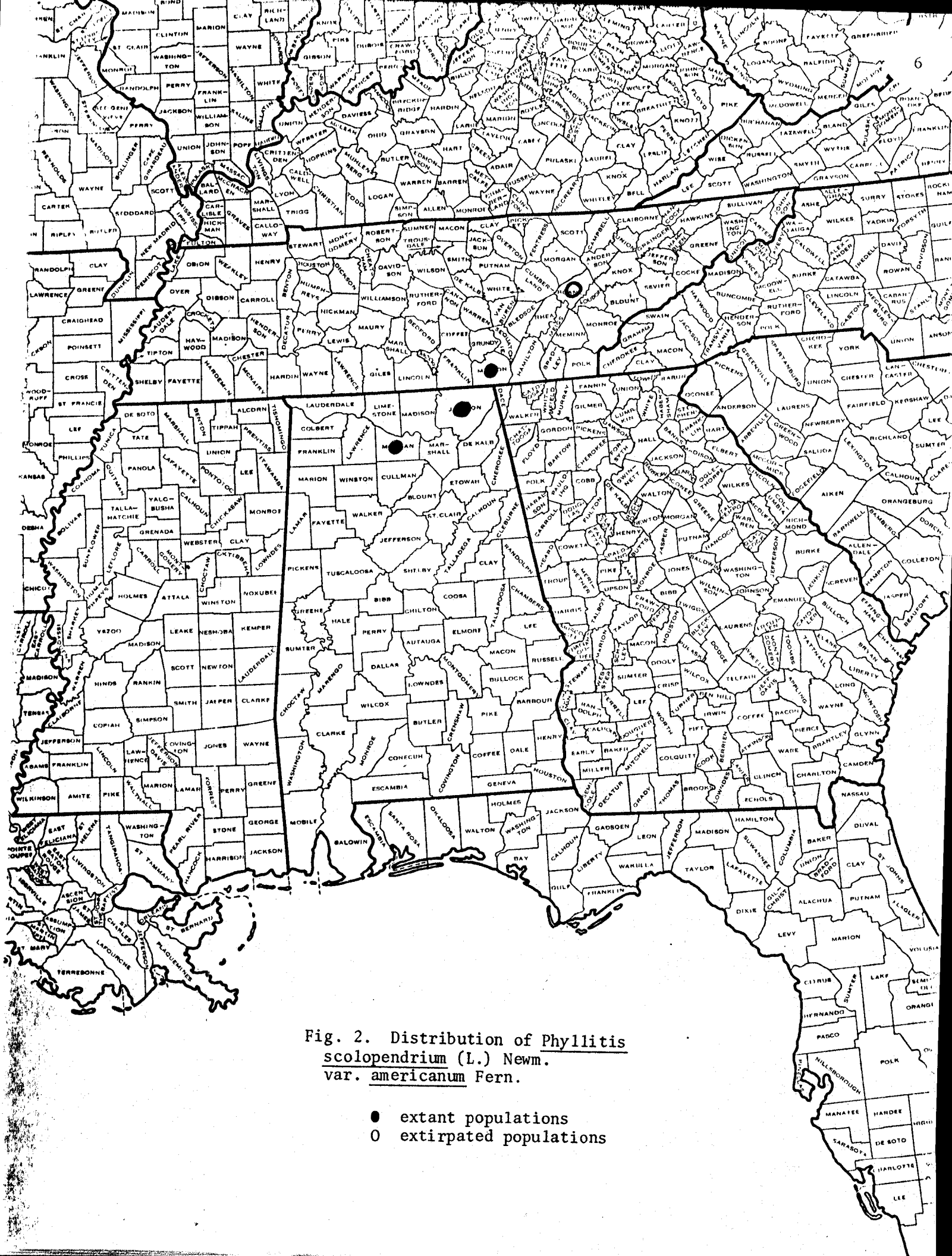


Fig. 2. Distribution of Phyllitis scolopendrium (L.) Newm.
var. americanum Fern.

- extant populations
- extirpated populations

a. TENNESSEE:

Marion Co.: South Pittsburg Quad (1942), 35°00'25" N, 85°44'19"W, elev. 800/ft., in small deep pit ca. 0.4 mi. up Poplar Spring Branch from last house, on west side of creek between creek and logging road. (Fig. 3)

b. ALABAMA:

1. Jackson Co. Paint Rock Quad (1948, revised 1974), 34°40'16"N, 86°18'44"W, elev. 1050 ft., in pit ("The Morgue") on west side of Nat Mt., ca. 450' above Paint Rock River, east 0.65 mi. on dirt rd. from Paint Rock, north 0.55 mi. on dirt road along base of mt., then east upslope ca. 450' gain in elevation. In oak-maple-hickory woods just at the upper limits of the prominent limestone ledges. (Fig. 4)

2. Morgan Co. Newsome Sinks Quad (1947, revised 1973), 34°26'38"N, 86°35'50"W, elev. 760 ft. In pit (Peterson's Pit) in Newsome Sinks, on ledges in sink with small waterfall entering from the northeast side of the pit. (Fig. 5)

2. Population assumed extirpated:

Roane Co., Tennessee, Rockwood Quad (1952), 35°51'52"N, 84°38'15"W around the mouth of a large cave at the east end of a large sink basin, with a stream running into the cave (Fig. 6). This population was first discovered by A. Gattinger in 1849. It was visited by Maxon and Pollard (Smithsonian Institution) in 1900 and Maxon reported in the literature (1900) that the plants were not found. The site has been visited several times, last by myself in 1965, and the plants have never been seen other than in the original report by Gattinger. The habitat does not match the cold deep pits in which the fern now grows, but cold air does issue from the cave. Other caves and pits in the vicinity have been visited without success.

6. General Environment and Habitat Description:

Phyllitis scolopendrium var. americanum as it presently occurs in the southeastern U.S. occurs only in pits, or deep vertical sided sink holes. These pits are deep, well shaded, moist and cool and have outcrops and rock rubble of both limestone and sandstone. Based on the three known populations in Tennessee and Alabama (and the fact that the species also

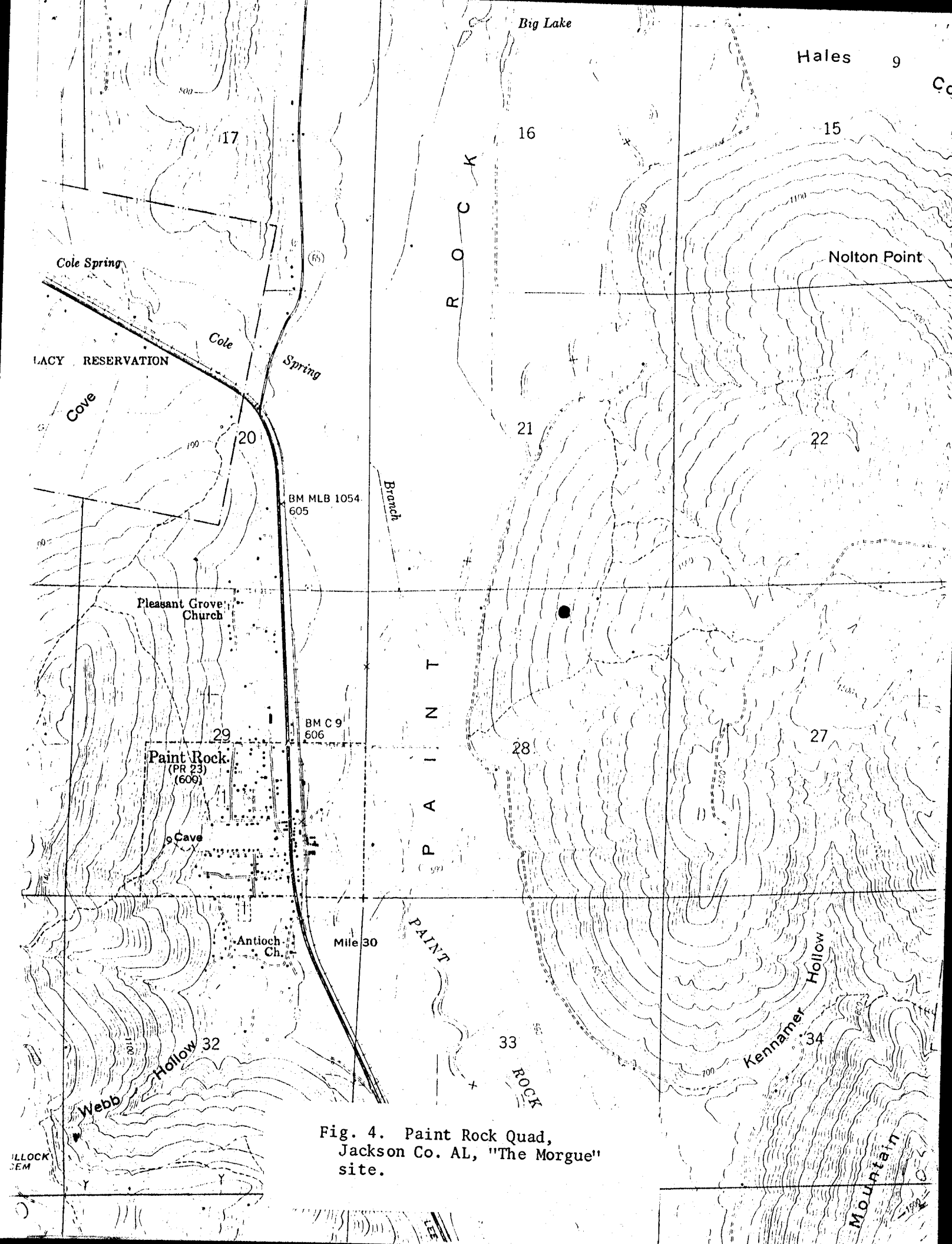


Fig. 4. Paint Rock Quad,
Jackson Co. AL, "The Morgue"
site.

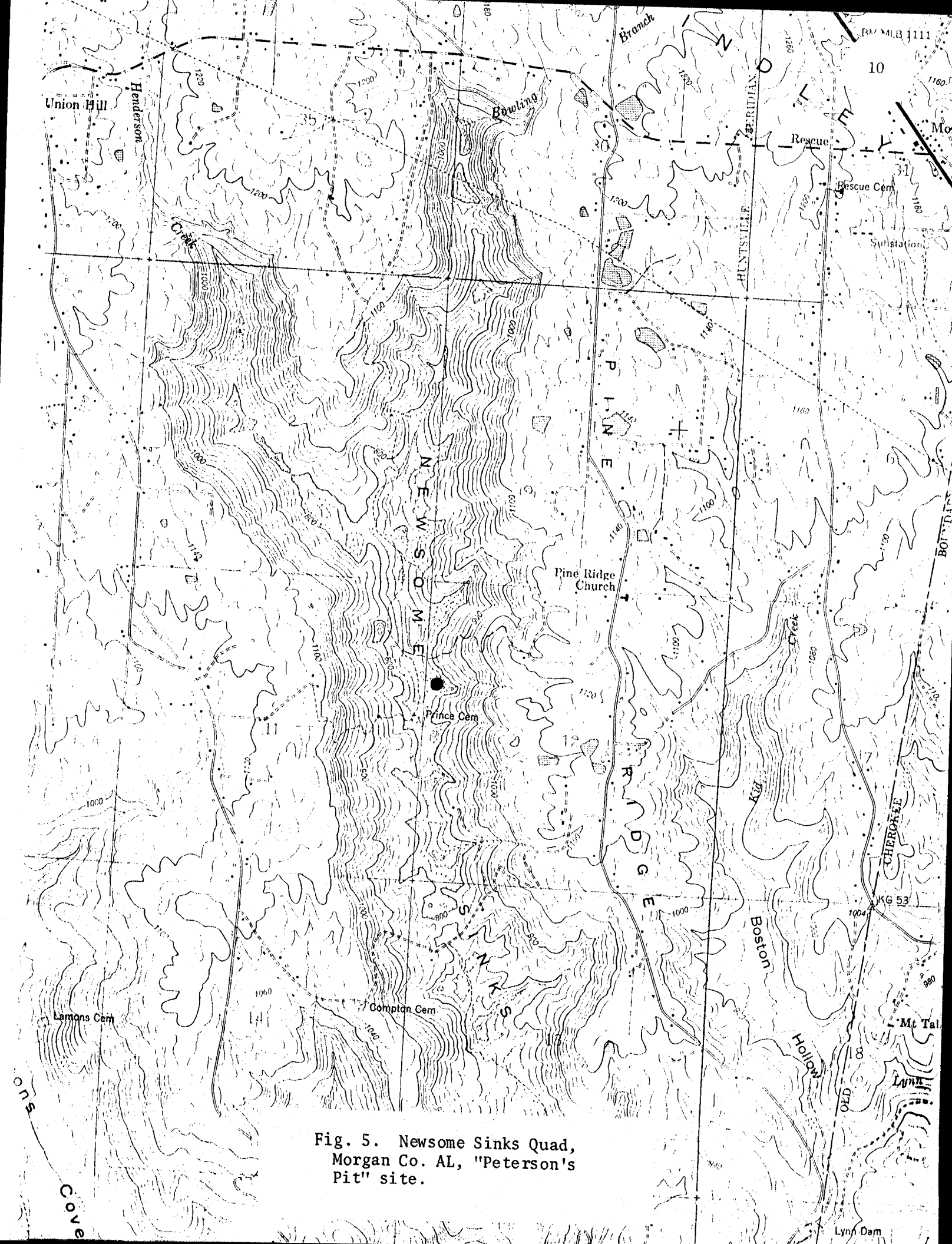


Fig. 5. Newsome Sinks Quad,
Morgan Co. AL, "Peterson's
Pit" site.



Fig. 6. Rockwood Quad, Roane Co. TN, Post Oak Springs site.

grows in Michigan, New York and Ontario on exposed limestone and dolomite outcrops in mixed deciduous and conifer forests) the essential requirements include:

1. Cool summer temperatures. All three sites have been visited twice in July 1981 and August of 1980, and the temperatures around the plants were about 15 to 20°F lower than outside the pits due to cold air flow from caverns beneath the pits. Two of the localities have also been visited in midwinter at which time the air temperature in the pits is warmer than outside, but it is assumed that cooler summer temperatures are the more critical.
2. Deep shade. The populations within the pits are all on an exposure which receives no direct sunlight in winter and over which the sun passes only briefly in midsummer. The rims of all three sinks are shaded by deciduous forest.
3. Continuous moderately high relative humidity. This is based on the fact that the population structure within each pit is different, and one of the obvious ecological differences within the pits is the humidity. The Poplar Branch pit in Marion Co., TN is as deep as the other two but smaller in diameter and more constricted at the rim. It also has the greatest year-around water flow into the pit and relative humidity is highest. The Morgue, in Jackson Co., AL has no water flow into the pit and is a wide and rather open pit. Peterson's Pit, in Morgan Co., AL also is an open pit but has a small continuous waterfall into the pit. All three pits have cool moist air continually rising from underground caverns. Peterson's Pit contains the only population which is vigorous, has many plants of many size classes

and is obviously actively reproducing new individuals. The Morgue contains only a few large over-age plants with no signs of active reproduction although the plants produce many fertile leaves.

Poplar Branch Pit contains mostly perpetually juvenile plants (based on periodic observations by myself over the past fifteen years).

Although fertile large mature specimens have been reported in the literature from this locality, and the University of Tennessee Herbarium contains a full sized fertile specimen collected in August 1900, I did not see a fertile plant until August 1980, when one medium sized plant produced one fertile leaf. In July 1981 there were four medium sized plants with fertile leaves, but no increase in the number of individuals within the total population. In many years the ferns appear threatened by being overgrown by thallus liverworts growing over the rhizomes and even leaves. It is postulated that this is due to insufficient light and excess moisture within this one pit.

4. Calcareous rocky soils. The plants may grow either on ledges or rock rubble within the pits; the rock a mixture of limestone and sandstone; the soils in two of the pits (Peterson's Pit and Poplar Branch Pit) heavy light colored clay soils with little organic matter, and the soil of The Morgue a dark blackish organic soil.

Associates: Very few vascular plants occur with the Hart's-tongue fern. They are Urtica dioica, Arisaema triphylla, Sambucus canadensis, Adiantum pedatum, Cystopteris bulbifera and C. tennesseensis, Asplenium resiliens and A. rhizophyllum, and Athyrium pycnocarpon. Each pit is different, with Peterson's Pit containing most of the vascular flora, The Morgue with only Athyrium pycnocarpon, Asplenium rhizophyllum, and

Cystopteris tennesseensis, and Poplar Branch Pit with no other vasculars within the pit. Bryophytes are somewhat more uniform and include Thamnobryum allegheniense, Mnium affine and M. hornum, Trichocolea tomentella, Dumortiera hirsuta, Conocephalum conicum, Plagiochila austinii and Campylium hispidulum, Palamocladium leskeiodes, Entodon macropodus and Bryhnia graminicolor.

7. Population Biology of the Taxon:

The population biology of the three populations is so different that they are better treated in the individual Population Status Reports.

8. Population Ecology of the taxon:

Same as #7.

9. Current Land Ownership:

All three sites are presumed to be in private ownership, although the specific owners are unknown. The Poplar Branch Pit in Marion Co., TN, belongs to the Cement Factory in Richard City, according to local people in the area although I have also heard that it is owned by a coal company. The Morgue, in Jackson Co., AL is presumed in private ownership. Because this cavern is also a Grey Bat habitat, I understand that the Federal government is negotiating purchase of the site. Peterson's Pit, in Morgan Co., AL is in private ownership according to a publication on Newsome Sinks (Decatur Caver, vol. 4, no. 3, March 1975), but the maps are not specific enough to indicate which of several possible owners.

10. Management practices and experience:

A. Habitat Management: All three pits are in second growth deciduous forest, apparently with periodic selective cutting. Poplar Branch Pit and Peterson's Pit are in currently relatively undisturbed sites. The Morgue is currently experiencing rather extensive logging in the immediate

vicinity with some trees felled right around the pit. Because the populations of ferns within the pits are so different in the three sites, it is hard to tell what effect logging would have. It is possible that increased light and the drying effect of logging in the Poplar Branch Pit might improve ecological conditions for the fern. The reverse is probably true in The Morgue. Peterson's Pit contains the most "normal" population so as little deviation from the status quo is to be preferred.

B. Cultivation: Plants from Poplar Branch Pit and Peterson's Pit have been propagated in the University of Tennessee Botany Department greenhouses with very limited success. They do not respond, as yet, to normal greenhouse care, and are just surviving. The factors retarding healthy growth are unknown, but may include high temperatures, inappropriate soil pH, and perhaps too much light.

11. Evidence of threats to survival:

The primary threat is probably disturbance of the plants by interested botanists, or spelunkers entering the caverns in the pits. The plants grow on ledges or loose rock rubble, either of which are potentially within predictable traffic patterns in the pits. Other possible threats probably depend more on the individual sites and will be discussed on a population by population basis.

POPULATION STATUS REPORT

Site Name: Poplar Branch Pit

Location: Marion Co., TN, South Pittsburg Quad, ca. 0.4 mi. up Poplar Spring Branch from last house at end of road just west of cement plant in Richard City, ca. 150 ft. W of creek. See Fig. 3 and 5B1a.

Description of the site: Poplar Branch Pit is a 75 ft. deep pit with a tear-drop shaped opening ca. 30 X 75 ft. with the long axis northwest by southeast. A permanent stream arises from springs on the hillside just above the lip and enters the pit as a waterfall and cascade spraying much of the interior of the pit and exits a cavern at the bottom of the pit. The pit is just a few feet from Poplar Spring Branch which has been a dry creek bed every time I have seen it. The bottom of the pit is well below creek level, so the local water system is subterranean. The Hart's-tongue fern grows on ledges near the waterfall and opposite the waterfall on the north and south walls, and also on the sticky clay banks above the sharply sloping bottom of the pit on the east side. Most of the pit receives no direct sunlight except for brief passage during summer along the northwest to northeast wall, passing briefly over about 1/3 of the plants under investigation. This pit is the darkest and wettest of the three sites. The plants occur on limestone ledges or a mixture of calcareous clay and rock fragments.

Population Size and Vigor: This is the site which has been known for about 100 years. At the turn of the century about 200 plants were reported here and the numbers have dwindled since. As I have known the population over the past 15 years there have been about 17 plants. Until August 1980 the plants have always been depauperate, small and juvenile with the largest leaves under

10 cm long, and none fertile. In Aug. 1980 one plant had a fertile leaf, and in July 1981 four plants were fertile although these are only of modest size; less than 20 cm long. The causes for current production of fertile leaves and increased vigor of several of the plants is not apparent; the forest has not been disturbed and stream flow into the pit appears about normal. This is the population into which foreign spores were introduced from Owen Sound, Ontario in about 1936. Therefore, we may never know if the current plants are new or from the original population. Currently, the population appears more vigorous than for many years, but it is still a depauperate population both in numbers and size of individuals, and diversity of plant sizes and age classes.

Dominant Associates: No other vascular plants occur within the pit itself although a variety of typical woody and herbaceous vegetation grow in the deciduous woods at the lip of the pit. Mosses and both thallus and leafy liverworts are abundant with the ferns sometimes appearing to almost overwhelm the ferns. They include Bryhnia graminicolor, Trichocolea tomentella, Dumortiera hirsuta and Conocephalum conicum.

Management: The population is on private land and according to Amos Kirk, who lives in the last house on the dirt road at the lower reaches of the creek, this pit is on woodland owned by the cement plant in Richard City, although I have also heard that it belongs to a coal company. It is possible that the low vigor of the population may be due in part to the low level of light in the pit or the extremely high relative humidity. This is the darkest and wettest of the three sites. It is possible that opening the forest by logging might be beneficial so long as disturbance to the pit itself did not occur. The plants occur both on the rock ledges near the bottom and also on the loose sticky clay soil banks near the bottom of the pit. Any of the plants

could easily be disturbed by any activities within the pit. Visitation to the pit should be discouraged.

Summary: This is a fragile population, of dubious long term viability.

Although one or two new plants may have appeared in the 'past year or two, the plants are all depauperate. The population should be closely monitored with minimal disturbance.

POPULATION STATUS REPORT

Site name: The Morgue

Location: Jackson Co., AL, Paint Rock Quad (1948), ca. 1.3 mi. NE of Paint Rock on western slope of Nat Mt., ca. 450 ft. above Paint Rock River, in 75 ft. deep sink hole (pit) (The Morgue) in oak-maple-hickory second growth forest. See Fig. 4 and Sect. 5B1b1.

Description of the site: The pit is an open hour-glass shape, ca. 75 ft. deep at the deepest point (at the NE cavern entrance), a wide ellipse at the top narrowing to a circular opening 40 ft. in diam. and then widening somewhat below that, but with a soil and rock rubble ridge across the middle of the pit running in a NNW by SSE direction across the pit, the ridge sloping down into the two deep cavern entrances, one to the NE and one to the SW. The Hart's-tongue fern plants grow on the rock rubble on the talus ridge facing the NE cavern entrance, and in a direct line of access to the cavern from a notch in the pit which makes a natural entrance for cavers into the pit and cavern. The plants are ca. 40 ft. below the inner circular lip of the pit. There have also been a few Phyllitis on a ledge east of the entrance notch, which are somewhat less accessible.

Population Size and Vigor: There are very few Hart's-tongue ferns at this site. The original report of the locality (Short, 1979) cites 20 plants. The first time I visited the locality there were 19 (Feb. 1979). In Aug. 1980 there were only 10 plants, eight fertile adults and two subadults. In July 1981 only nine plants were found, seven fertile adults and two subadults. Where there were five plants on the north ledge in 1979 there is now only one subadult plant remaining; where there were 14 plants on the talus rock rubble in 1979 there are now only eight. No really juvenile plants have ever been seen at the site. All the plants appear to be old plants, several of them with several apices on rather massive clumped rhizomes. The subadult plants appear to be weak adults which have regressed, rather than young maturing plants. No signs of gametophytes sexual reproduction have been seen

although the mature plants produce numerous fertile leaves and abundant spores. Laboratory studies are under way to study spore germination and gametophyte development in sterile culture but no results are available at this time. This appears to be a static and declining population, the reasons for which are not clear. The rock substrate is mixed limestone and sandstone so both calcareous and non-calcareous substrate is available, as in the other two pits. The soil of the talus slope is deep black and high in organic content, which is different from the light colored heavy clay of the other two pits, but the soils of the ledges in the pit is the same clays of the other localities. The ferns in question grow only on the eastern side of the pit, in fact no vascular plants grow on the talus slope facing toward the SW cavern entrance. There would be direct sunlight only in summer and then screened by the deciduous forest about the lip of the pit.

Dominant Associates: Athyrium pycnocarpon, Asplenium resiliens, Asplenium rhizophyllum, Cystopteris tennesseensis, Arisaema triphylla, Sambucus canadensis; and bryophytes Thamnobryum allegheniense, Palamocladium leskeoides, Mnium affine and M. hornum and M. hornum and Entodon macropodus.

Management: This is the lightest and driest of the three extant sites. Logging is being undertaken directly adjacent to the pit. The population of plants in question is not vigorous and is declining, and grow in rather fragile locations subject to erosion and disturbance by human activities within the pit. Management suggestions would be to restrict human activities with the pit; restrict logging to maintain cover, and carefully monitor the population and carry on such research as is possible to try to ascertain why the population is not actively reproducing.

Summary: This is a fragile declining population of dubious long term viability. The population should be carefully monitored with minimal disturbance.

POPULATION STATUS REPORT

Site name: Peterson's Pit; Newsome Sinks

Location: Morgan Co., AL, Newsome Sinks Quad (1947), 1.7 mi. west of Morgan City, then 0.9 mi. south to south end of loop rd., then ca. 1.5 mi. south of jeep trail into bottom of Newsome Sink, a large sink basin, east up a small dry side stream valley, just south of Wolf Cave, a prominent large pit directly on the west side of the trail, to a small pit on the east side of the valley floor with a permanent stream and waterfall entering the pit at the east end. See Fig. 5 and 5B1b2.

Description of the site: The pit is elliptical in shape, ca. 75 ft. deep at the cavern entrance at the NE end, and the bottom sloping upward toward the SW end. The low side of the lip is on the north rim, with a higher (30 ft.) wall on the opposite rim. The pit is in mixed deciduous woods, primarily of maple, oak and hickory. The pit is ca. 75 ft. long by 40 ft. wide, with an accessible ledge encircling the pit, except under the waterfall, ca. 30 ft. below the lower north rim. The ledge partly projects into the pit opening and is partly formed by undercutting of the pit wall. Therefore part of the ledge is exposed to higher light intensity and direct rainfall and part is shaded by the rock wall above and protected from direct rainfall. The Phyllitis is confined to this ledge, and to the SW half of the ledge. Further, the vegetation of the ledge is rather restricted with the vegetation of the exposed ledge conspicuously of Urtica dioica, and the Phyllitis confined primarily to the rocky clay soils of the protected part of the ledge. There would be a little direct sunlight except in summer and then restricted by the forest and the primarily west facing orientation of the pit.

Population Size and Vigor: This is a healthy vigorous population actively reproducing with a good spread of size and age classes. I have visited and taken a population census in August 1980 and July 1981. In 1980 I counted 31 fertile adults, 17 subadults and 47 juveniles. In 1981, with two helpers, we counted 26 fertile adults, 13 subadults and 58 juveniles. Many of the "juveniles" are so small that they are unquestionably sporelings, and there are undoubtedly numerous others small enough that we missed them. The plants are primarily on the light colored calcareous clay soil mixed with scattered sandstone and limestone rock rubble. None of the plants were directly on the rock ledges; all were in soil on the ledge.

Dominant associates: The conspicuous vascular plant associate is Urtica dioica, but there was also a little Adiantum pedatum, Asplenium resiliens, Cystopteris bulbifera and Arisaema triphylla. Bryophytes and liverworts included Palamocladium leskeoides, Mnium hornum, Campylium hispidulum, Thamnobryum alleghaniense, Plagiochila austinii and Conocephalum conicum.

Management: This population appears to represent a "normal" population against which to measure the other two populations. It is the only one that has a wide range of size and age classes of plants, with many juveniles progressing to about half as many adult plants. Whatever the important ecological factors may be for success of this taxon in the southeastern U.S., they apparently occur here. Management practices should include study of this population and leaving it as undisturbed as possible in its present ecological condition.

Summary: This is a healthy population which represents a "norm" for the taxon. It should be maintained in as close to its present condition as possible as a measure against which to evaluate the other two more tenuous populations.

II. ASSESSMENT AND RECOMMENDATION

Phyllitis scolopendrium var americanum is known from three populations in the southeastern U.S.; in Marion Co., TN, and Jackson and Morgan Cos., AL. A fourth historic population in Roane Co., TN has been considered extirpated for at least 80 years. The populations in Roane Co., TN, and Jackson Co., AL are considered precarious and should be carefully protected and monitored to watch changes in population dynamics. Only the population in Morgan Co., AL is not considered threatened. On this basis, I recommend that Phyllitis scolopendrium var. americanum be listed as an endangered species.

III. INFORMATION SOURCES

A. Publications:

Ferris, J. H. 1899. The Tennessee locality for the Hart's-tongue fern.

Fern Bull. 7: 98-99.

Committee for Tennessee Rare Plants. 1978. The rare vascular plants of

Tennessee. Jour. Tenn. Acad. Sci. 53: 128-133.

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Fernw. Pap. pp. 30-46.

Maxon, W. R. 1900. The Hart's-tongue in New York and Tennessee. Plant

World. 3: 129-132.

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Shaver, J. M. 1954. Ferns of Tennessee, Bureau of Publ., Geo. Peabody

College, Nashville, TN.

Short, J. W. 1979. Phyllitis scolopendrium newly discovered in Alabama.

Amer. Fern J. 69: 47-48.

Williamson, J. 1879. Scolopendrium vulgare discovered in Tennessee. Bull.

Torrey Bot. Club 6: 347-348.

B. Museum collections:

TENNESSEE. Marion Co.: Maxon and Pollard, 1900 (TENN), A. M. Evans, Aug. 14, 1980 (TENN).

ALABAMA, Jackson Co.: J. W. Short 1187 (TENN), A. M. Evans, Aug. 14, 1980 (TENN). Morgan Co.: A. M. Evans, Aug. 13, 1980, July 8, 1981 (TENN).