

FOLIOSE AND FRUTICOSE LICHENS OF THE CEDAR GLADES IN STONES RIVER NATIONAL BATTLEFIELD PARK (RUTHERFORD COUNTY, TENNESSEE)

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ABSTRACT

Twenty-four foliose and 12 fruticose lichen species were recorded from cedar glades and adjacent wooded areas in Stones River National Battlefield Park near Murfreesboro, Tennessee (Rutherford County). Taxonomically, 18 genera and 7 families were represented with *Cladonia* being the most common genus and Cladoniaceae the most common family. All species recorded have previously been reported from Tennessee, but only one has been reported from Rutherford County.

INTRODUCTION

Despite numerous studies on cedar glade flora, little attention has been given to the lichens. Early descriptions of cedar glade flora either ignored lichens altogether (Harper, 1926) or made only passing reference to their presence (Freeman, 1933). A more recent study, Quarterman (1950), noted the presence of foliose lichens in unshaded, bare-rock areas and reindeer moss (*Cladonia* sp.) in shaded areas with soil. Literature references to glade lichens are rare, however, and there has apparently been no serious attempt to inventory them. The purpose of this study was to collect and identify the foliose and fruticose lichens of cedar glade communities in Stones River National Battlefield Park near Murfreesboro, Tennessee.

Stones River National Battlefield Park encompasses approximately 350 acres. It lies in the Central Basin of Middle Tennessee which is, in turn, surrounded by the rim of the Interior Low Plateau. At many places in the Park, and throughout the Basin, Lebanon limestone (Ordovician) lies at or near the surface (Quarterman, 1950). The resulting rock outcrops and shallow soils are incapable of supporting large trees and thus appear as open areas, or glades, within what might otherwise be a wooded area.

Glade soil remains saturated from November through April but is relatively dry during most of the remainder of the year. The mean annual temperature and precipitation are 59.5° F and 46 inches, respectively. However, maximum temperatures in open glades are commonly 10°-30° F above the official U.S. Weather Service temperature (Hemmerly, 1976). Precipitation reaches a maximum in early spring and a minimum in the fall (U.S. Dept. of Commerce, 1978).

The Battlefield possesses numerous glades, many of which are relatively undisturbed. The wooded areas surrounding the glades are dominated by red cedar

(*Juniperus virginiana* L.), winged elm (*Ulmus alata* Michx.), and hackberry (*Celtis laevigata* Willd.) Quarterman, 1976).

PROCEDURE

Lichen samples were obtained by taking a one meter wide north-to-south transect and a one meter wide east-to-west transect intersecting in the bare rock zone of each glade studied. Transects varied in length depending upon the glade, but always extended well into the outer zones of the glade. All transects were oriented by use of a compass and temporarily marked using quadrat pins and twine.

Adjacent glades in the Battlefield were sometimes so close together that no intervening wooded area was present. To compensate, additional samples were taken from wooded sites. The sampling procedure used for these additional sites was similar to that used for the open glade sites except that the length of all transects taken was 20 meters. This was determined to be the most practical length in order that the transects be kept reasonably straight. Lichens were collected along each transect until no more could be found which were discernably different from those already collected in the sample area.

In both open glade and wooded areas, sampling was judged to be adequate when samples from three successive sites revealed no new lichens. Application of this criterion for adequacy of sampling resulted in the procurement of lichens from 13 sites—seven open glade sites and six wooded sites.

Lichens were evaluated on the basis of morphological and chemical criteria (K, C and P) and identified using the taxonomic keys of Fink (1935), Taylor (1967), and Hale (1961, 1969, 1979). Thin-layer chromatography was used to differentiate between isomorphic species of *Cladonia*. Chromatograms were prepared in accordance with the procedure outlined by Culberson and Kristinsson (1970).

Several identifications were verified by comparison to previously identified specimens in the University of Tennessee Herbarium (Knoxville, TN). In addition, four identifications were confirmed by Mason E. Hale of the Smithsonian Institution (Washington, D.C.). Nomenclature follows the recent taxonomic treatment by Hale (1979).

RESULTS

Thirty-six lichen species were identified. Twenty-four of these were foliose while 12 were fruticose. Taxonomically, 18 genera and 7 families were represented—all of the Class Ascomycetes. The foliose and fruticose taxa identified are listed in Tables 1 and 2, respectively.

DISCUSSION

All species identified in this study are previously reported for Tennessee (Skorepa, 1972). Since Tennessee's lichen flora has not been adequately inventoried, all species identified, with the exception of *Dermatocarpon lachneum*, represent new records for Rutherford County. Although a clear cut floristic pattern was not evident, it is noteworthy that 10 of the 36 species identified (27.8%) belong to the family Cladoniaceae. Based on Skorepa's (1972) catalog of Tennessee lichens,

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TABLE 1. Foliose lichens of the cedar glade communities in Stones River National Battlefield Park.

ORDER-LECANORALES	
Family: Collemataceae	<i>Collema subflaccidum</i> Degel.
Family: Parmeliaceae	<i>Candelaria concolor</i> (Dicks.) Stein. <i>Cetraria ciliaris</i> Ach. <i>Hypotrachyna livida</i> (Tayl.) Hale <i>Parmelia bolliana</i> Mull. Arg. <i>Parmelia rudecta</i> Ach. <i>Parmelia subrudecta</i> Nyl. <i>Parmelia sulcata</i> Tayl. <i>Parmelina aurulenta</i> (Tuck.) Hale <i>Parmelina galbina</i> (Ach.) Hale <i>Parmotrema austrosinense</i> (Zahlbr.) Hale <i>Parmotrema michauxianum</i> (Zahlbr.) Hale <i>Parmotrema perforatum</i> (Jacq.) Mass. <i>Pseudoparmelia caperata</i> (L.) Hale
Family: Physciaceae	<i>Heterodermia speciosa</i> (Wulf.) Trev. <i>Phaeophyscia adiantola</i> (Essl.) Essl. <i>Phaeophyscia rubropulchra</i> (Degel.) Moberg <i>Physcia aipolia</i> (Ehrh.) Hampe. <i>Physcia americana</i> Merr. <i>Physcia millegrana</i> Degel. <i>Physcia stellaris</i> (L.) Nyl. <i>Physconia detersa</i> (Nyl.) Poelt. <i>Pyxine caesiopruinosa</i> (Nyl.) Imsh.
ORDER: VERRUCARIALES	
Family: Verrucariaceae	<i>Dermatocarpon lachneum</i> (Ach.) A. L. Sm.

TABLE 2. Fruticose lichens of the cedar glade communities of Stones River National Battlefield Park.

ORDER:LECANORALES	
Family: Cladoniaceae	<i>Cladina rangiferina</i> (L.) Harm. <i>Cladonia bacillaris</i> (Ach) Nyl. <i>Cladonia capitata</i> (Michx.) Spreng. <i>Cladonia cristatella</i> Tuck. <i>Cladonia furcata</i> (Huds.) Schrad. <i>Cladonia grayi</i> Merr. <i>Cladonia polycarpia</i> Merr. <i>Cladonia robbinsii</i> Evans <i>Cladonia strepsilis</i> (Ach.) Vain. <i>Cladonia polycarpoides</i> Nyl.
Family: Ramalinaceae	<i>Ramalina americana</i> Hale
Family: Usneaceae	<i>Usnea strigosa</i> (Ach.) Eaton

the Cladoniaceae constitute 18.2% of the State's foliose and fruticose lichens. A comparison of these two percentages suggests that either additional work would increase the total number of species of Stones River National Battlefield Park or the glade lichen flora is characterized by a high number of representatives of the family Cladoniaceae.

Quarterman (1950) reported *Leptogium dactylinum* and *Leptogium cyanescens* (formerly *Leptogium tremelloides*) on unshaded rock surfaces for glade localities in Davidson and Rutherford Counties and com-

mented on their abundance. She also reported the presence of *Cladonia turgida* on shaded rock surfaces. These species were not found, however, in our samples from the Battlefield.

Perhaps the most unexpected species found was *Dermatocarpon lachneum*. According to Hale (1979), the established range of *D. lachneum* is to the north, east, and west of Middle Tennessee; and it might not be expected to occur in and south of Middle Tennessee. This lichen has been previously reported from Middle Tennessee only once (Quarterman 1950), under the name *Dermatocarpon hepaticum*.

Intensive research on the vascular flora of the cedar glades, especially since 1950, has resulted in the recognition of several species which are endemic to the glades of Middle Tennessee (Baskin et al., 1968; Baskin and Baskin, 1975; Hemmerly, 1976). Although no endemic lichen species were identified in this study, Dey (1978) reported seven endemic species in the high-mountain areas of the Southern Appalachians. Dey's findings suggest that lichen endemics may occur wherever locally specialized plant communities exist. It is conceivable, therefore, that future surveys conducted in the cedar glades may reveal the presence of one or more endemic lichen species.

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