

A preliminary checklist of lichens for Lawrence County, Pennsylvania

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Abstract. Our collecting of lichens in Lawrence County, Pennsylvania has increased the known diversity to nearly 50 taxa. Before this study, the most recent published reports on lichens for the county were recorded nearly 60 years ago; hence, many of these records were historic. These aforementioned studies combined with the CNALH database have identified more than 30 taxa that have occurred in Lawrence County which totals 24 lichen species reported for the county. In this study, a collection of nearly 50 lichens were acquired in 2016 and 2017 from Lawrence County. Seventeen lichen species are reported as new to the county. This study demonstrates that lichen diversity in Lawrence County is underestimated.

Keywords: Lichens, Pennsylvania, floristics, Lawrence County.

INTRODUCTION

Lawrence County is located on the western side of Pennsylvania bordering Ohio (Fig. 1). The total land area is 927.67 km² in which the majority of the land is forests, farmland and small residential developments (Garoogian 2013). A recent increase in the harvesting of natural gas in the Marcellus Shale bed has ultimately led to disturbances in the environment in Pennsylvania (Sumell 2016). Moore et al. (2014) reported that the emissions from natural gas wells impact air quality as they release both air toxins and particulates into the local environment. Since the early 1900s several studies demonstrated that air pollution adversely impacts lichens, namely, from the burning of fossil fuels (Gries 1996). Recent studies continue to document that specific species are sensitive to changes in air quality (Nash and Gries 1991, McDermott 2016). Regarding high-volume hydraulic fracturing and air quality, the NY DEC (2015) reports that this form of hydraulic fracturing will lead to excessive emissions of airborne nitrogen oxides. It has been established that copious levels of airborne nitrogen dioxides are a pollutant that will kill some lichen species (McDermott 2016). Due to the increase in natural gas extraction and the possible impacts upon the environment with respect to lichen diversity, new floristic studies in the region are increasingly important.

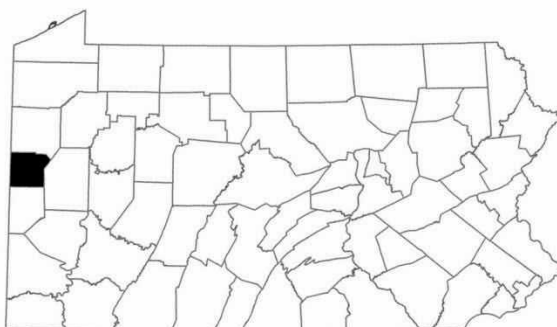


Figure 1. Location of Lawrence County in Pennsylvania.

The purpose of this study was twofold. Given that less than 25 species of lichens were known from Lawrence County, our goal was to more accurately catalog the county's lichen diversity (CNALH 2017, Dix 1942, Giardini 1922, Mozingo 1948). Many of the records for the county are historic (i.e. more than 75 years old), and this study was also conducted to determine if these species still occur within the county following the change in land uses over the past 60+ years.

METHODS

More than 50 collections were made in Lawrence County in the summer and fall of 2016 as well as the winter of 2017. The majority of the collections were taken from both early and late successional forests in private and public lands. These aforementioned forest types included Beech-maple, Appalachian oak, and Northern hardwood forests (PA DCNR 2017). The Consortium of North American Lichen Herbaria (CNALH 2017) online database [<http://lichenportal.org/portal/>] was also utilized to review previous reports from Lawrence County that are not in the literature, and we assumed the collections in the database to be correctly identified. All newly collected specimens were deposited in the herbarium at Slippery Rock University (SLRO). The taxonomy of the lichens reported in this study follows Esslinger (2016). Manuals used to identify the lichens in this study included a combination of Brodo et al. (2001) and Brodo (2016).

RESULTS AND DISCUSSION

New county records were identified and several historic county records were confirmed during this study. The review of the most recent lichen reports for northwestern Pennsylvania revealed that only 24 lichen species were known from Lawrence County (CNALH 2017, Dix 1942, Giardini 1922, Mozingo 2016). Our collections increased the known diversity in the county by 17 species. Additionally, one of these species represents only the second record of this taxon occurring in Pennsylvania, namely, *Xanthomendoza fallax* (Hepp ex. Arnold) Schting, Kärnefelt, & S.Y. Kondr (Pennsylvania Biological Survey 2017). Hale (1979) indicated that *X. fallax* occurs in Pennsylvania, but other than the collections from this study we could locate no other vouchered material for this taxon from the commonwealth. According to Brodo et al. (2001) *X. fallax* occurs in both Ohio and New York, but is absent from both Pennsylvania and New Jersey and all eastern states southward. With these findings, it has increased the number of known species in Lawrence County to 41, and if we continue to report the infraspecific taxa, from previous studies, there are approximately 50 lichen taxa within the county.

As this study has almost doubled the known diversity of lichen species in Lawrence County, it strongly indicates that the county's lichen diversity is underestimated. It is our belief that the underestimate is due to the county being under-collected for lichens. This is supported in part by the fact that some of the new records are quite common, namely, *Candelaria concolor* (Dickson) Stein, *Flavoparmelia baltimorensis* (Gyelnik & Foriss) Hale, *Flavoparmelia caperata* (L.) Hale, *Collema furfuraceum* (Arnold) Du Rietz, and *Lepraria finkii* (B. de Lesd.) R. C. Harris. Additionally, *Cladonia cristatella* Tuck. a species of common occurrence in Pennsylvania was only known as an historic collection from Lawrence County; as we report modern occurrences of this species, from the county, it further suggests in part that the county in all likelihood is under-collected.

CHECKLIST

Lichens from Lawrence County, Pennsylvania are listed below. Those species with an asterisk (*) indicate a new county record.

Ahtiana Goward

Ahtiana aurescens (Tuck.) A. Thell & Randlane * [SLRO JLB14]

Candelaria A. Massal.

Candelaria concolor (Dickson) Stein* [SLRO JLB13; SLRO JLB22]

Collema F. H. Wigg.

Collema furfuraceum (Arnold) Du Rietz.* [SLRO JLB23]

Cladonia P. Browne

Cladonia stellaris (Opiz) Pouzar & Vezda [as *Cladonia alpestris* (L.) Rabenk In: Mozingo 1948]

Cladonia chlorophaea (Florke ex Sommerf.) Sprengel [SLRO JLB29]

Cladonia chlorophaea f. *simplex* (Hoffm.) Arn. [In: Mozingo 1948] [CNALH Bissett s.n. 1969]

Cladonia coniocraea (Flk.) Spreng. [In: Mozingo 1948] [SLRO JLB26]

Cladonia coniocraea f. *ceratodes* (Flk.) Dalla Torre & Sarnth. [In: Mozingo 1948]

Cladonia cristatella Tuck. [In: Giardini 1922] [CNALH Brodo5518 1964] [SLRO JLB28]

Cladonia cristatella f. *vestita* Tuck. [In: Mozingo 1948]

Cladonia cylindrica (A. Evans) A. Evans [as *Cladonia borbonica* f. *cylindrica* Evans., In: Mozingo 1948]

Cladonia furcata (Hud.) Schrad. [In: Giardini 1922]

Cladonia furcata var. *pinnata* f. *foliolosa* (Del.) Vainio [In: Mozingo 1948]

Cladonia furcata var. *racemose* (Hoffm.) Floerke. [In: Dix 1942]

Cladonia macilenta Hoffm. [In: Giardini 1922]

Cladonia macilenta f. *styracella* (Ach.) Vainio [In: Mozingo 1948]

Cladonia macilenta var. *bacillaris* (Ach.) Schaerer [as *Cladonia bacillaris* (Ach.) Nyl., In: Mozingo 1948]

Cladonia parasitica (Hoffm.) Hoffm.* [SLRO JLB25]

Cladonia pyxidata (L.) Hoffm. [CNALH Bissett s.n. 1969]

Cladonia ramulosa (With.) J. R. Laundon [as *Cladonia squamosa* f. *levicorticata* m. *pityrea* (Arn.) Evans., In: Mozingo 1948]

Cladonia rangiferina (L.) F. H. Wigg. [as *Cladonia rangiferina* (L.) Web., In: Mozingo 1948]

Cladonia squamosa f. *epiphylla* (Arn.) Sandst. [In: Mozingo 1948]

Cladonia squamosa f. *levicorticata* m. *rigida* (Del.) Evans [In: Mozingo 1948]

Cladonia subcariosa f. *evoluta* Vainio [In: Mozingo 1948]

Cladonia verticillata f. *evoluta* (Th. Fr.) Stein [In: Mozingo 1948]

Dermatocarpon Eschw.

Dermatocarpon luridum (With.) J. R. Laundon [as *Dermatocarpon aquaticum* (Weis.) Zahlbr., In: Mozingo 1948] [SLRO JLB15]

Flavoparmelia Hale

Flavoparmelia baltimorensis (Gyelnik & Foriss) Hale* [SLRO JLB20]

Flavoparmelia caperata (L.) Hale* [SLRO JLB10; SLRO JLB11; SLRO JLB12; SLRO JLB19]

Heterodermia Trevis.

Heterodermia speciosa (Wulfen) Trevis.*[SLRO JLB16]

Hypogymnia (Nyl.) Nyl.

Hypogymnia physodes (L.) Nyl. [as *Parmelia physodes* (L.) Ach., In: Mozingo 1948] [SLRO JLB21]

Hypotrachyna (Vainio) Hale

Hypotrachyna livida (Taylor) Hale* [SLRO JLB1]

Lepraria Ach.

Lepraria finkii (B. de Lesd.) R. C. Harris* [SLRO JLB27]

Lepraria membranacea (Dickson) Vainio [as *Amphiloma lanuginosum* (Hoffm.) Nyl., In: Mozingo 1948]

Parmelia Ach.

Parmelia sulcata Tayl. [In: Mozingo 1948] [SLRO JLB5]

Parmotrema A. Massal.

Parmotrema hypotropum (Nyl.) Hale* [SLRO JLB2]

Parmotrema perlatum (Hudson) M. Choisy* [SLRO JLB3]

Peltigera Willd.

Peltigera didactyla (With.) J. R. Laundon [as *Peltigera spuria* (Ach.) DC., In: Mozingo 1948]

Peltigera evansia Gyelnik [CNALH Brodo5516 1964]

Peltigera praetextata (Flörke ex Sommerf.) Zopf* [SLRO JLB6]

Phaeophysia Moberg.

Phaeophysia ciliata (Hoffm.) Moberg [as *Physica obscura* (Ehrh.) Hampe., In: Mozingo 1948]

Punctelia Krog

Punctelia borreri (Sm.) Krog [as *Parmelia borreri* Turn., In: Mozingo 1948]

Punctelia caseana Lendemer & Hodgkinson* [SLRO JLB7; SLRO JLB8; SLRO JLB9]

Punctelia rudecta (Ach.) Krog [as *Parmelia rudecta* Ach., In: Mozingo 1948]

Physcia (Schreber) Michaux.

Physcia subtilis Degel.*[SLRO JLB17]

Stereocaulon Hoffm.

Stereocaulon vesuvianum Pers. [as *Stereocaulon denudatum* Flk., In: Mozingo 1948]

Tuckermanella Essl.

Tuckermanella fendleri (Nyl.) Essl. [as *Cetraria fendleri* (Nyl.) Tuck., In: Mozingo 1948]

Usnea Dill. ex Adans.

Usnea mutabilis Stirton* [SLRO JLB4]

Xanthomendoza S. Y. Kondr. & Kärnefelt

Xanthomendoza fallax (Hepp ex Arnold) Schting, Kärnefelt, & S. Y. Kondr.* [SLRO JLB18; SLRO JLB24]

Xanthoparmelia (Vainio) Hale

Xanthoparmelia conspersa (Enrh. ex Ach.) [as *Parmelia conspersa* (Enrh.) Ach. In: Mozingo 1948]

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