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## Checklist of Lichens of Crawford County, Pennsylvania

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## Checklist of lichens of Crawford County, Pennsylvania

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**Abstract.** Twenty-eight lichens are reported new to Crawford County, Pennsylvania, providing the most recent data on lichen diversity in the county. Previously, 20 lichens were collected in the early 1900s, of which three were confirmed in this study. The lichens identified at all sampling sites are *Candelariella efflorescens*, *Cladonia ochrochlora*, *Flavoparmelia caperata*, *Lepraria finkii*, *Physcia millegrana*, *Phaeophyscia pusilloides* and *Phaeophyscia rubropulchra*, all of which are common in northeastern North America.

**Keywords.** Biological diversity, checklist, Crawford County, lichens, northwestern Pennsylvania.

### INTRODUCTION

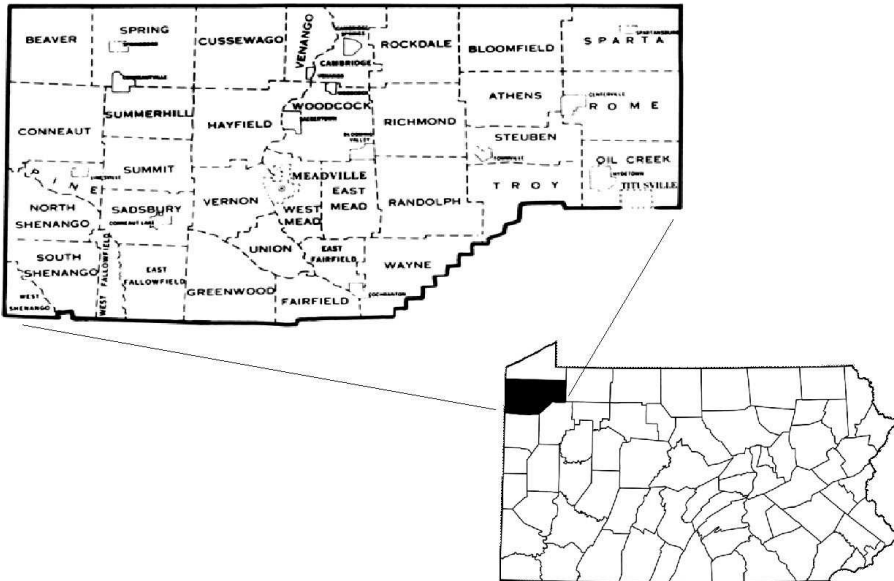
Crawford County is located in northwestern Pennsylvania (Fig. 1). The land area is about 2621 km<sup>2</sup>, which lies within the Northwestern Glaciated Plateau Section of the Appalachian Plateau (Yaworksi et al. 1979). The section consists of broad, rounded uplands divided by long, linear valleys. The relief ranges between 270 and 670 m (Sevon 2000). The underlying geology consists of siltstone, sandstone and shale with some thin, marine-based limestone. Glacial advances during the Illinoian and Wisconsinan glaciations are the most important geological events that have shaped the landscape (Wagner et al. 2008).

Braun (1950) classified the forest vegetation of northwestern Pennsylvania as the hemlock–white pine–northern hardwoods region. A more recent classification of the vegetation of northwestern Pennsylvania follows Fike (1999). The two forested communities common in Crawford County include northern hardwood forest along slopes and uplands, which gradually transition to hemlock-mixed hardwood palustrine forest in the bottomlands (Fike 1999). Approximately 40% of Crawford County is used for farming, and 46% is in commercial woodland (Yaworksi et al. 1979). The more contiguous forests are found in the bottomlands, which include palustrine forests and swampy valleys. Several Landscape Conservation Areas such as French Creek are designated within the county for their biological diversity (Wagner et al. 2008). Such biologically rich areas offer havens for lichen communities in an otherwise agriculturally-dominated landscape (Lendemer 2011).

Lichen surveys were conducted on May 26-28, 2014 on properties managed by Pymatuning Laboratory of Ecology, which is owned by the University of Pittsburgh, and in Pymatuning State Park. The objective was to establish a baseline of species diversity for lichens in Crawford County. Studies of lichen biota in Pennsylvania have increased significantly in the last several years (Lendemer 2011), including, but not limited to the Delaware Water Gap (Harris and Lendemer 2005), Bucks and Montgomery Counties (Lendemer 2005) and Worlds End State Park (Lendemer and Macklin 2006). In western Pennsylvania, McClenahan et al. (2007) and Opdyke et al. (2011) have published on the significance of lichens as indicators of air quality and land management.

Pymatuning Laboratory of Ecology has properties set-aside for ecological research located around Pymatuning Reservoir. The Sanctuary Lake Site is a 0.05-km<sup>2</sup> property that contains research laboratories and office buildings surrounded by woodlands (Pymatuning Laboratory of Ecology 2015). The southern and eastern edge of the site is adjacent to the

reservoir. The Donald S. Wood Field Laboratory is 0.54 km<sup>2</sup>, which consists of meadows and agricultural land bordered by woodlands. Wallace Woods is a 0.11-km<sup>2</sup> old-growth stand of hemlock-northern hardwoods palustrine forest. Tryon-Weber Woods and Janette Rose Tryon Reserve are adjacent to each other and are 0.36 km<sup>2</sup> and 0.32 km<sup>2</sup> in size, respectively. The former is a mature American beech-sugar maple forest, while the latter consists of second growth timber and a substantial number of wetlands within the forest mosaic. At the northern end of Pymatuning Reservoir, 0.11 km<sup>2</sup> of hemlock-northern hardwoods palustrine forest in Pymatuning State Park was surveyed.



**Figure 1.** Map of Crawford County in Pennsylvania. Pymatuning Laboratory of Ecology sampling sites were located in North Shenango, Pine and Sadsbury Townships and Pymatuning State Park sampling site was located in Conneaut Township.

## METHODS

Collections were made from Pymatuning Laboratory of Ecology properties and Pymatuning State Park. All collections came from forested areas, in the interior and along the edge. Several microhabitats were sampled, including trees, fallen branches, rotting logs, soils and rocks. Crustose, foliose and fruticose growth forms were collected.

Chemical spot tests used in the identification of lichens included a 10% potassium hydroxide solution, sodium hypochlorite solution (household bleach) and para-phenylenediamine. Stereo and compound microscopes were used to examine lichens and spores of crustose specimens. Lichens were identified to species level using Brodo et al. (2001), Hinds and Hinds (2007) and Lendemer et al. (2013).

Voucher specimens are stored in the herbarium at Point Park University. The Consortium of North American Lichen Herbaria (CNALH 2015) was accessed online to determine the presence of historical records of lichens in Crawford County.

## RESULTS AND DISCUSSION

The Consortium of North American Lichen Herbaria revealed 20 different lichen species that were collected and identified in Crawford County, Pennsylvania in the early 1900s. Of those 20 species, only three (*Cladonia ochrochlora*, *Hypogymnia physodes* and *Flavoparmelia caperata*) were found in our study; the other seventeen species found on CNALH cannot be listed

here until we have confirmed their identifications. Historical changes in the lichen community may be related to alterations in land use or air quality. For example, Wetmore (1989) compared historical lichen collections dating back to the early 1900s to 1985 collections from the Cuyahoga Valley Natural Recreation Area in northeastern Ohio and suggested that poor air quality had destroyed 79% of the historical lichen flora in the park. In more recent decades between the 1970s and 1990s, lichen recolonization has been recorded in the upper Ohio River valley (Showman 1997). Hawksworth and McManus (1989) and Seaward and Letrouit-Galinou (1991) have also reported on lichen recolonization due to improved air quality in other parts of the world. However, what has recolonized does not include all species that once occurred there.

More recent collections from western Pennsylvania and eastern Ohio indicate that the species identified in this study are ubiquitous to the region (Flenniken and Showman 1990, McClenahan et al. 2007, Opdyke et al. 2011, Wetmore 1989). A total of 31 species was collected. Of the 31 species, *Candelariella efflorescens*, *Cladonia ochrochlora*, *Flavoparmelia caperata*, *Lepraria finkii*, *Physcia millegrana*, *Phaeophyscia pusilloides* and *Phaeophyscia rubropulchra* were found at every site. Eighteen of the 31 species were found at half of the sites. The number of species at individual sampling sites ranged between 17 and 21, with 17 species identified at the Sanctuary Lake Site and Tryon-Weber Woods. Janette Rose Tryon Reserve had 18 species. The Donald S. Wood Field Laboratory site had 20 species. Wallace Woods and Pymatuning State Park each had 21 species. Lichens were found on trees, fallen branches and rotting logs but none were found on soil. Only Tyron-Weber Woods had exposed rocks with lichens. This study greatly increases the lichens known from Crawford County, and establishes a biodiversity baseline for future research.

### CHECKLIST

A total of 31 lichen species were collected from Crawford County, Pennsylvania. Names follow Esslinger (2014). Collector name and specimen number are provided following each name.

- Amandinea punctata* (Hoffm.) Coppins & Scheid. - Opdyke BJ51  
*Arthonia caesia* (Flotow) Korber - Opdyke LF71  
*Candelaria concolor* (Dickson) Stein - Opdyke BJ61  
*Candelariella efflorescens* R.C. Harris & W.R. Buck - Opdyke BJ72  
*Cladonia caespiticia* (Pers.) Florke - Opdyke JR71  
*Cladonia grayi* G. Merr. ex Sandst. - Opdyke BJ32  
*Cladonia macilenta* var. *bacillaris* (Ach.) Schaerer - Opdyke SS21  
*Cladonia ochrochlora* Florke - Opdyke JR91  
*Cladonia parasitica* (Hoffm.) Hoffm. - Opdyke BJ33  
*Flavoparmelia caperata* (L.) Hale - Opdyke WW35  
*Hypogymnia physodes* (L.) Nyl. - Opdyke TW91  
*Hypotrachyna minarum* (Vain.) Krog & Swinsc. - Opdyke BJ85  
*Lecanora strobilina* (Sprengel) Kieffer - Opdyke BJ41  
*Lecanora symmicta* (Ach.) Ach. - Opdyke BJ11  
*Lecanora thysanophora* R.C. Harris - Opdyke LF43  
*Lepraria finkii* (B. de Lesd.) R.C. Harris - Opdyke JR111  
*Melanelixia subaurifera* (Nyl.) Essl. - Opdyke WW14  
*Micarea peliocarpa* (Anzi) Coppins & R. Sant. - Opdyke SS101  
*Micarea prasina* Fr. - Opdyke WW81  
*Myelochroa aurulenta* (Tuck.) Elix & Hale - Opdyke JR101  
*Parmotrema submarginale* (Michaux) DePriest & B. Hale - Opdyke JR34  
*Parmelia squarrosa* Hale - Opdyke TW572  
*Parmelia sulcata* Taylor - Opdyke JR41  
*Parmotrema hypotropum* (Nyl.) Hale - Opdyke BJ91

*Phaeophyscia pusilloides* (Zahlbr.) Essl. - *Opdyke JR82*

*Phaeophyscia rubropulchra* (Degel.) Essl. - *Opdyke LF83*

*Physcia adscendens* (Fr.) H. Olivier - *Opdyke LF69*

*Physcia millegrana* Degel. - *Opdyke SS91*

*Physcia stellaris* (L.) Nyl. - *Opdyke SS13*

*Punctelia caseana* Lendemer & B.P. Hodkin. - *Opdyke BJ36*

*Punctelia rudecta* (Ach.) Krog - *Opdyke MP6*

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