

OBELISK

**Ohio Bryology et Lichenology, Identification, Species, Knowledge
Newsletter of the Ohio Moss and Lichen Association. Volume 20 No. 1. 2023.**

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LEFT HAND CORNER: CURIOSITY

According to the old saying, curiosity killed the cat. Curiosity might be bad for cats but it is good for humans. Curiosity leads to questions, which lead to answers and new knowledge. What if Archimedes, Galileo, Newton, Darwin, etc., etc., etc. were never curious? For that matter, what if our very early ancestors never wondered what was that hot spot started by lightning, or what was over the next hill?

I guess that I am naturally curious, but I also try to cultivate it. If I see something unusual, I try to determine what it is, either by research (the internet is great for this) or by experimentation. Most of the time this only leads to some personal enlightenment, or even a failed experiment. But a few times this has led to a genuine discovery.

The thing that prompted me to think about curiosity and write this editorial was an unusual flower seen in my wife's flower garden. The accompanying photo shows a bearded iris. Please take a moment and study the picture before reading on. Does everyone see what is wrong with it?



Photo by Ray Showman

Iris are genetically programmed to have three-part flowers – three sepals, three petals and three pistils. Why does this one have four of each? I consulted a horticultural expert and he hypothesized that this could have been caused by an injury (insect or perhaps freezing) to the very young developing flower bud. Maybe not a definitive answer, but the best I have found so far.

I think folks in OMLA are already curious, or they wouldn't be in the organization. But try to enhance it and pass it on to other people, especially kids just starting to be aware of nature. Lichens and mosses are wonderful organisms and well deserving of curiosity. Who knows what new discoveries might result?

- Ray Showman

MOSS MUSINGS – TWENTY YEARS OF OMLA

With twenty years of forays, meetings, fellowship, and good times in our past, and beginning to realize that it was time to turn the organization over to younger hands, I spent a day re-reading the OBELISK. From those issues, I am summarizing the history and accomplishments of the Ohio Moss and Lichen Association.

At the 2004 Botanical Symposium, Ray Showman and I announced that we wanted to form an Ohio organization that would focus on bryophytes and lichens. The first meeting of the OMLA was held on June 3, 2004, at Gorman Nature Center, Lexington, Ohio. Founding members were Mark Zloba, Rich McCarty, Roger Troutman, Diane Lucas, Steve McKee, Donn Horscher, Don Flenniken, Janet Traub, Jim Toppin, Jim McClenahan, Alvan Jose, Tara Poling, Ray Showman, Barb Andreas, Merrill Tawes, Jim McCormac, Rick Gardner, and Barbara Lund. The names underlined became life-long members.

Following the organizational meeting, the group went on its first foray to Mohican State Park, Richland County. No collections or species lists were made from this foray.

The OBELISK. The following year, 2005, Don Flenniken began writing and publishing the newsletter. He named our annual newsletter the OBELISK (Ohio Bryophytes

et Lichens: Identification, Species, Knowledge). Don was editor from 2005 – 2007. Two issues were published in 2007. The first, like the previous three, were mailed to OMLA members.

Beginning with the second 2007 edition, the newsletter became digital, and Ray Showman joined Don as a second editor. Ray and Don produced the OBELISK until 2009. From 2009 – 2016, Janet Traub joined Ray as editors. From 2017 – 2020, Bob Klips joined Ray as editors. From 2021 to present, Carole Schumacher and Brandon Ashcraft are editors.

For almost every issue, there were four staples: The Left Hand Corner (usually written by an editor), Moss Musings (written by me), species lists from our forays, and photos of the forays' participants (usually taken by Bob Klips). The issues ranged in size from 6 pages to 44 pages. Often, there were columns on "Wanted Alive", where members would describe a species of a bryophyte or lichen that had not been collected in Ohio in many years. We were all excited when a "Found Alive" column was written.

OMLA Website:
www.ohiomosslichen.org

In 2008, Brian Gara and Bob Klips, with technical assistance from Steve McVey, developed the website for OMLA. This site provides historical information of the forays, copies of the OBELISK, distribution maps for mosses and lichens, and announcements of upcoming meetings and forays. Important publications and an abundance of photographs are available. The website has been maintained by Bob Klips.

Remembrances of Members. To date, four remembrances have been published in the OBELISK. Mike Kangas joined OMLA in 2010 to learn lichen identification skills. He passed away on April 6, 2012. Bob Burrell

joined OMLA in 2009, and for the next 4 years contributed at least one article to the OBELISK. He passed away on July 23, 2012. Founding member Don Flenniken, first editor of the OBELISK, and author of numerous articles and poems, passed away on October 12, 2012. Diane Lucas, a founding member of OMLA, passed away on July 16, 2022. She was a major contributor to the OBELISK.

Forays. Since its beginnings, OMLA has conducted two forays each year. Typically, the spring/summer foray is one day long, and the fall foray varies from 2 – 4 days. One of OMLA’s purposes is to collect in each of Ohio’s 88 counties. In 2024, we will have completed forays in half of Ohio’s counties.

Until 2022, each foray had a “host” that selected the county to visit and explored potential collecting sites within the county. The first “official” fall foray was hosted in 2004 by Mark Zloba at the Edge of Appalachia Preserve, Adams County. Jim Toppin and Janet Traub hosted the first spring foray to Lucas County, 2005.

The hardiness of the group was demonstrated when, in the presence of Covid-19, forays were still held. For both the summer and fall 2020 forays, members wore masks when meeting for instructions and lunch.

The primary mission of the OMLA is to add to the knowledge of lichen and bryophyte distribution in Ohio. Since 2004, the numbers of new county records for these groups have been fantastic. As indicated in the tables below, the total for macrolichens is 550, with 995 new records for mosses and 181 for liverworts. In addition to these new county records, OMLA forays have added six new state records for mosses:

Brachythecium velutinum (Darke), ***Pohlia bulbifera*** (Lucas), ***Schistidium***

crassithecium (Miami); ***Leratia exigua*** [***Orthotrichum exiguum***] (Ashtabula), ***Thuidium delicatulum*** var. ***radicans*** (Pickaway), and ***Tortella fragilis*** (Sandusky).

New County Records for Bryophytes

OMLA Event, County	Moss	Liverwort
04 Fall Foray, Adams	4	0
05 Summer Foray, Lucas	10	5
05 Fall Foray, Lawrence	37	14
05 Fall Foray, Jackson	0	1
06 Summer Foray, Vinton	31	7
06 Fall Foray, Washington	28	11
07 Fall Foray, Pike	7	3
07 Fall Foray, Ross	1	0
08 Summer Foray, Gallia	14	2
08 Fall Foray, Erie	5	0
09 Summer Foray, Darke	57	0
09 Fall Foray, Meigs	41	8
10 Summer Foray, Henry	43	0
10 Fall Foray, Muskingum	65	10
11 Sum. Foray, Defiance	44	1
11 Fall Foray, Crawford	30	8

11 Fall Foray, Morrow	10	6
12 Summer Foray, Fayette	21	2
12 Fall Foray, Monroe	34	10
13 Summer Foray, Allen	31	0
13 Fall Foray, Columbiana	30	15
14 Summer, Pickaway	25	8
14 Fall Foray, Adams	3	2
14 Fall Foray, Pike	8	0
15 Summer, Brown	44	3
15 Summer, Highland	6	0
15 Fall, Montgomery	50	0
16 Summer, Carroll	44	16
16 Fall, Miami	32	13
17 Summer, Licking	15	0
17 Fall, Morgan	61	0
18 Summer, Wayne	13	0
18 Fall, Hocking	3	0
19 Summer, Wood	18	0
19 Fall, Ashtabula	15	0
20 Summer, Fulton	11	6
20 Fall, Noble	42	6
21 Summer, Belmont	12	3
21 Fall, Lake	10	12

22 Summer, Sandusky	22	1
22 Fall, Athens	18	8
Total Number	995	181

OMLA members have also been very successful in finding new lichens for Ohio: macrolichens *Canoparmelia amabilis* (Washington), *Hyperphyscia confusa* (Defiance), *Physciella melanchra* (Darke), *Usnea cornuta* (Vinton), *Usnea substirilis* (Lawrence), *Xanthoparmelia angustiphylla* (Montgomery), *Usnea hirta* (Summit), *Usnea dasaea* (Portage); and crustose species *Acarospora obpallens* (Washington), *Acarospora oreophila* (Trumbull), *Lecanora caesiorubela* (Vinton), *Lecanora cenisia* (Vinton), and *Lecanora muralis* (Miami).

New County Records for Macrolichens

OMLA Event, County	Macrolichen
04 Fall Foray, Adams	0
05 Summer Foray, Lucas	9
05 Fall Foray, Lawrence	16
05 Fall Foray, Jackson	9
06 Summer Foray, Vinton	1
06 Fall Foray, Washington	20
07 Fall Foray, Pike	9
07 Fall Foray, Ross	6
08 Summer Foray, Gallia	1
08 Fall Foray, Erie	14
09 Summer Foray, Darke	16
09 Fall Foray, Meigs	5
10 Summer Foray, Henry	14

10 Fall Foray, Muskingum	19
11 Sum. Foray, Defiance	25
11 Fall Foray, Crawford	18
11 Fall Foray, Morrow	11
12 Summer Foray, Fayette	24
12 Fall Foray, Monroe	23
13 Summer Foray, Allen	12
13 Fall Foray, Columbiana	29
14 Summer, Pickaway	15
14 Fall Foray, Adams	0
14 Fall Foray, Pike	3
15 Summer, Brown	6
15 Summer, Highland	1
15 Fall, Montgomery	0
16 Summer, Carroll	11
16 Fall, Miami	23
17 Summer, Licking	14
17 Fall, Morgan	16
18 Summer, Wayne	7
18 Fall, Hocking	4
19 Summer, Wood	8
19 Fall, Ashtabula	4
20 Summer, Fulton	20
20 Fall, Noble	8
21 Summer, Belmont	20
21 Fall, Lake	11

22 Summer, Sandusky	38
22 Fall, Athens	60
Total Number	550

The 2006 Combined Crum/Tuckerman Workshops. Although we were a new organization, OMLA offered a joint Crum/Tuckerman Workshop in southern Ohio. It was held from May 19 – 22, 2006. The Crum/Tuckerman workshop attracts professionals and skilled amateurs from the United States and Canada.

One hundred and thirteen species of macrolichens, 127 species of crustose lichens, 8 species of lichenicolous fungi, 159 species of mosses, and 32 species of liverworts were collected. Three macrolichens were reported as new to the state: *Heterodermia pseudospeciosa*, *Parmotrema gardneri*, and *Physcia plumilior*. Four presumed extirpated species of mosses were re-discovered: *Anomodon viticulosus*, *Drummondia prorepens*, *Weissia sharpii*, and *Thuidium allenii*. [The above information is taken from Andreas, B.K., R.E. Showman, and James C. Lendemer. The 2996 Combined Crum/Tuckerman Workshop in Ohio. *Evansia* 24 (3) p. 55 – 59.]

Summary. Ray Showman and I used to joke that OMLA was the “Barb and Ray” show. In the early years, with much input from Don Flenniken, Diane Lucas and Bob Klips, we took care of the forays, finances, annual meetings, and the majority of articles contributed to the OBELISK. Those days are over. Ray and I have slowly slid into OMLA obscurity, knowing that a new crew, under the leadership of Tomás Curtis, will carry the organization onward.

-Barb Andreas

THE 2024 JOINT CRUM AND TUCKERMAN WORKSHOP

Overview

The 2024 joint Crum/Tuckerman Workshop will be held May 16 – 21, with May 16 as the arrival day, and May 21 as the departure day. May 17 - 20 will be for collection and identification. It will be based in Corydon, Indiana. Corydon is the county seat of Harrison County Indiana, with a population of about 3500.

The workshop will be held mainly in the Shawnee Hills & Highland Rim Natural Regions of South-Central Indiana. Most of the area was unglaciated. A couple of sites are also located in the Blue Grass Natural Region and are in an Illinoian glacial area.

Sites for this area include sand stone cliffs, mature and old growth forests, cave openings and other karst features, limestone outcrops, streams, wet flat woods, areas along the Ohio River, and knobstone escarpments. Areas are located in national and state forests, state parks, and nature preserves managed by Indiana Department of Natural Resources or The Nature Conservancy.

Who should consider attending

The Crum/Tuckerman workshop is more geared towards experienced individuals and data gathering rather than education for beginners. However, people who have the necessary equipment (see below) and have had some experience learning to key material out, and are willing to work on their own on specimens are welcomed.

It should be understood though that you should bring your own scopes (both dissecting and compound scopes for bryophytes, dissecting only for lichens). Other equipment needed would be fine pointed forceps, drop/squirt bottle, slides, coverslips, collecting bags, and appropriate floras to key specimens out.

Lodging, Food, etc. in Corydon

There are 5 hotels and one bed and breakfast located there. There are also many restaurants, grocery and other stores located in town.

Below are possibilities for lodging, camping and restaurants.

Hotels: The Hampton Inn and the Clarion Point Hotels will have a block of rooms (20 rooms each) reserved for the event until April 16 for the Hampton and May 6 for Clarion Point Hotel. Mention the Crum/Tuckerman Foray. If that changes, information will be provided as soon as possible.

Hampton Inn

Website: <https://tinyurl.com/y36bmbcb>

Phone: (812) 738-6688

Price: 130-140 per night

Clarion Point Hotel

Website: <https://www.choicehotels.com/indiana/corydon/clarion-hotels/in155?mc=llgoxxpx>

Phone: (812) 225-7406

Price: 80-90 per night

Other Lodging

There are numerous other places to stay in the Corydon/Harrison County area, including other hotels, bed and breakfast, and camping. The link below provides information.

<https://www.thisisindiana.org/places-to-stay/>

Dining

Many options for eating out, see <https://www.thisisindiana.org/restaurants/>

-Bill Schumacher

SPECIAL FORAY IN NW INDIANA

Introduction

April 28-30, 2023 OMLA broke new ground and had an out of state foray in NW Indiana, in Laporte and Porter Counties.

Highlights

- 108 bryophyte species collected and identified for Laporte and Porter Counties combined
- 72 bryophyte species for Laporte County, of which 33 are county records; lists below
- 78 bryophyte species for Porter County, of which 15 are county records; lists below
- 2 bryophyte state records: *Hypnum fauriei* (Ambler old growth forest area) and *Polytrichum longisetum* (Moraine (Chicago Woods) & Ambler (old growth portion))
- Besides state records, numerous other IN bryophyte relative rarities were collected (described in more detail in next to last table)
- 41 lichen species collected for Laporte County, 26 of which are county records; list below
- 1 lichen state record: *Agonimia flabelliformis* (Sebert)
- Beside state record, several other IN lichen relative rarities were collected (described in more detail in last table)
- None of the sites previously had bryophyte or lichen lists

Attendees included Derek Nimetz, regional ecologist for IDNR (Indiana Department of Natural Resources) Division of Natural Areas, Coastal Region. He manages several of the sites we visited, and did a great job of facilitating our foray. Along with participants from IN and IL interested in learning more about bryophytes and lichens, there were five OMLA attendees who collected and identified specimens (Barb Andreas, Tomas Curtis, Becky Smucker, Carole Schumacher, and Bill Schumacher).

Preparation for the foray was also assisted by Shirley Heinz land trust personnel who also help manage some of the preserves that were sampled.

This area has population pressure, due to proximity to Chicago. Yet numerous high-quality habitats have been protected in nature preserves and parks, with high vascular plant diversity. These two counties border Lake Michigan, with the National and State Dunes Parks bordering it in the northern parts of the counties. South of that is the Valparaiso end moraine, with hilly and varied topography and many different soil substrates characterizing the area.

Unlike the majority of counties in Indiana, there has been some significant collection in this area, more so in Porter County. Most of the sampling, though, occurred in the dunes area beside Lake Michigan. Relatively little sampling had occurred elsewhere in the counties. One of the goals of the foray was to explore previously unexamined nature preserves located south of the dunes areas to see what the bryophyte and lichen communities looked like in those areas.

Five sites were visited. In Porter County: Moraine and John Coulter Nature Preserves. In Laporte County: Ambler and nearby Sebert Nature Preserve, and Little Calumet Headwaters Nature Preserve. Wintergreen Nature Preserve, right across from Sebert only had a few specimens from earlier scouting as time ran out to see it during the foray. The largest nature preserves were examined in several sections. Moraine had four sections examined – upland & ravines, a wetland area, a wooded kame, and Chicago Woods (a mature wooded area). Ambler had three sections examined – an old growth portion and two secondary wooded areas south and north of the old growth portion. Detailed descriptions of these sites can be found later in the “Site Descriptions” section. All but

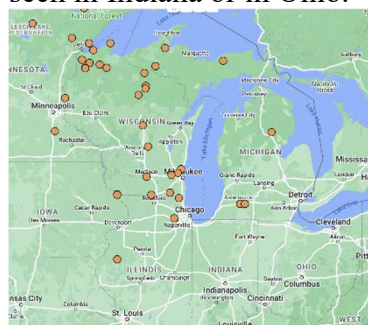
one of these sites were located outside the dunes area. These sites have varied habitats and substrates.

Discussion

The number of species collected, both for bryophytes and lichens, as well as the number of species with few prior records point to several things.

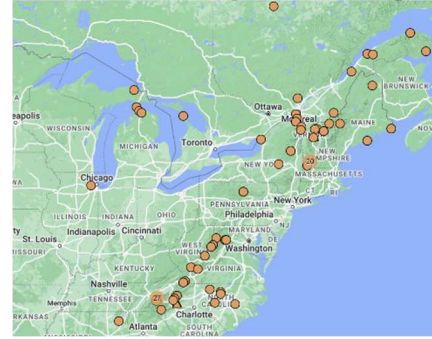
The sites looked at were high quality sites. The larger sites looked at, Moraine and Ambler Nature Preserves at 900+ and 500+ acres respectively, contained a diversity of habitats and substrates, as well as being old growth areas to harbor high quality bryophyte communities. The other nature preserves, although smaller, were also of high quality and complimented what was seen in the larger reserves.

Also, the relatively close proximity to Lake Michigan helped to provide for a cooler climate. This probably was a factor in finding a species like *Hypnum fauriei* – a state record. It is not a common species. It is usually found in cooler climates. It is found at lower altitudes in more northerly areas, and at higher elevations in the mountains to the south; see map to the right. It should be noted that there was also a record for this species just over the Illinois border close to the Chicago area and close to Lake Michigan, even though not previously seen in Indiana or in Ohio.

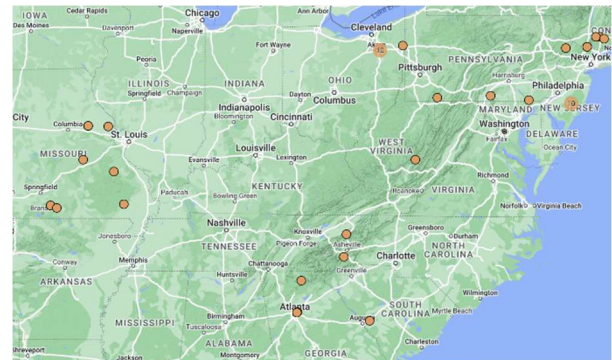


Polytrichastrum longisetum, the other state record bryophyte, tends to be found on acid soils, like those found in Ambler and Moraine Nature Preserves where it was found. It is scattered over parts of North

America. Numerous records for it are in NE IL, SE WI and SW MI, so its occurrence in NW IN seems logical; see map to the left.



The herbarium record distribution for *Agonimia flabelliformis* is shown to below. One can note it has records from the NE to the SE US and then a 2nd distribution found mainly in Missouri, including the Ozarks.



The collections and various records point to the need for wider collections. Even though both counties had a relatively high number of species, different habitats were being neglected outside the dunes areas.

Even with the number of species collected, there certainly is more room for future collection in these areas. The probability for more records within these areas is, probably fairly high.

Site descriptions

This area is dominated by outwash soils of a sandy texture and by end moraine. The latter soils tend to be very mixed up with soil textures of clay, loam and sandy all within close proximity. Topography is quite hilly and varied in these areas. Sandy

outwash soils near the lake were whipped into dunes soon after glaciation.

Porter County

John Coulter Nature Preserve is an ~80-acre complex of sand prairie, oak savanna, and wetlands in northern Porter County, close to Indiana Dunes national and state parks.

Moraine Nature Preserve is an ~900-acre site in the Valparaiso end moraine, south of the dunes area. It contains a combination of rolling ridges, steep hills, muck pockets, pot holes, and a shallow pond. Mature beech-maple forest is found on some of the uplands and ravines. Buttonbush and black willow surround a number of pot holes and ponds.

Laporte County

Ambler Flatwoods Nature Preserve is an ~520-acre forest community known as boreal flatwoods, which is characterized by poorly drained soils on a relatively level landscape. Overstory trees include red maple, northern pin oak, black gum, tulip tree, and white pine. Many plant species occurring here are typically more northern in distribution, and some barely reach within Indiana's northern border, being restricted in the state to these flatwoods. Several plants found here are rare to the state, usually found much further north. This includes *Sphagnum* on scattered hummocks.

Sebert and Wintergreen Nature Preserves are two relatively small (~40 and 20+ acres respectively) nature preserves beside each other, and close to Ambler Nature Preserve. Both are remnant northern boreal flatwoods natural communities. Wintergreen is wetter and often has standing water. Sebert has mesic forest and shrub swamp as well as a small sand dune area. Both preserves also have plants that are usually found much further north, similar to Ambler.

Little Calumet Headwaters Nature Preserve is a 100+ acre nature preserve on the

headwaters of the Little Calumet River. The area contains seeps, spring runs, and upland forest.

In the species lists below, N designates a new county record; S designates a new state record.

LAPORTE COUNTY, IN

Lichens

Agonimia sp.
Agonimia flabelliformis N, S
Anisomeridium leucochlorum N
Anisomeridium polypori N
Arthonia helvola N
Arthonia susa N
Bacidina egenula N
Buellia erbuescens N
Candelaria concolor
Candelariella efflorescens
Canoparmelia texana N
Chaenothecopsis debilis N
Cladonia cylindrica N
Cladonia cf. chlorophaea complex
Cladonia macilenta
Cladonia subcariosa
Coenogonium pineti N
Crespoa crozalsiana
Dictyocatenuata alba N
Flavoparmelia caperata
Graphis scripta
Lecania croatica N
Lecanora hybocarpa N
Lecanora strobilina N
Lecanora thysanophora N
Lepraria caesiella
Lepraria finkii N
Myelochroa aurulenta N
Myelochroa galbina N
Ochrolechia arborea N
Parmelia sulcata
Parmotrema hypotropum N
Parmotrema reticulatum N

Peltigera didactyla N
Phaeophyscia pusilloides N
Phaeophyscia rubropulchra
 Physcia stellaris
 Physcia millegrana
 Punctelia rudecta
Scoliciosporum pensylvanicum N
Xanthocarpia feracissima N

Liverworts

 Calypogeia muelleriana N
 Calypogeia neogaea
Conocephalum salebrosum
 Frullania eboracensis N
 Frullania inflata N
Lophocolea heterophylla
 Nowellia curvifolia N
 Pallavicinia lyellii
 Porella pinnata N
 Radula complanata N

Mosses

 Anomodon attenuatus
 Anomodon rostratus
 Atrichum angustatum
 Atrichum crispulum N
 Aulacomnium pallustre
 Barbula unguiculata N
Brachythecium acuminatum
 Brachythecium laetum
 Brachythecium rivulare
Brachythecium rutabulum N
Brachythecium campestre N
Bryoandersonia illecebra N
 Callicladium haldanianum
 Calliergon cordifolium
 Calliergonella curvifolia
 Calliergonella lindbergii N
Campyliadelphus chrysophyllus N
 Ceratodon purpureus N
Climacium americanum
 Climacium kindbergii
 Dicranella heteromalla

 Dicranum polysetum
 Dicranum scoparium N
 Dicranum viride N
 Entodon cladorrhizans
 Entodon seductrix
 Fissidens osmundioides
 Helodium paludosum
 Homomallium adnatum N
Hygroamblystegium varium
 Hypnum fauriei N, S
 Hypnum pallescens
 Leptodictyum riparium
 Leskea gracilescens
 Leucobryum glaucum
 Orthotrichum ohioense N
 Oxyrrhynchium hians N
 Plagiomnium cuspidatum
 Plagiothecium cavifolium N
 Plagiothecium denticulatum
 Plagiothecium laetum N
 Plagiothecium latebricola N
 Platydictya subtilis N
 Platygyrium repens
 Pleurozium schreberi N
 Pohlia annotonia N
 Pohlia nutans
 Polytrichum commune
Polytrichum longisetum N, S
 Polytrichum ohioense
 Polytrichum piliferum N
 Raiiella scita N
Rhynchostegium serrulatum N
 Sphagnum compactum
 Sphagnum cuspidatum
 Sphagnum lescurii N
 Sphagnum palustre
 Sphagnum recurvum
Taxiphyllum deplanatum N
 Tetraphis pellucida
 Thuidium delicatulum
 Tortella humilis N

PORTER COUNTY, IN

Liverworts

Frullania eboracensis
Frullania inflata N
Lophocolea heterophylla

Mosses

Amblystegium serpens
Anomodon attenuatus
Anomodon minor N
Arrhenopterum heterostichum
Atrichum altecristatum
Atrichum angustatum
Atrichum crispulum
Atrichum undulatum
Aulacomnium pallustre
Brachythecium acuminatum
Brachythecium falcatum N
Brachythecium laetum
Brachythecium rivulare
Brachythecium rutabulum
Brachythecium velutinum N
Brachythecium campestre
Bryhnia gramminicolor
Bryhnia novae-anglie
Bryoandersonia illecebra
Bryum argenteum
Bryum creberrimum
Bryum flaccidum
Bryum pseudotriquetrum
Callicladium haldanianum
Calliergonella curvifolia
Calliergonella lindbergii
Campyliadelphus chrysophyllus
Campyliadelphus stellatus
Campylophyllum hispidulum
Ceratodon purpureus
Dicranella heteromalla
Ditrichum pallidum
Drepanocladus polygamus
Entodon brevisetus N
Entodon seductrix
Eurhynchiastrum pulchellum

Fissidens bryoides N
Fissidens bushii
Fissidens taxifolius N
Haplocladium virginianum
Helodium paludosum
Homomallium adnatum
Hygroamblystegium varium
Hygroamblystegium varium var. humile
Hypnum pallescens
Leptodictyum riparium
Leskea gracilescens
Leucobryum glaucum
Orthotrichum ohioense N
Orthotrichum pumilum N
Orthotrichum stellatum N
Oxyrrhynchium hians N
Physcomitrium pyriforme
Plagiomnium ellipticum
Plagiomnium cuspidatum
Plagiothecium denticulatum
Plagiothecium laetum N
Platygyrium repens
Pleurozium schreberi
Pogonatum pensilvanicum N
Polytrichum commune
Polytrichum longisetum N
Polytrichum ohioense
Polytrichum pallidisetum
Rhizomnium punctatum
Rhynchostegium serrulatum
Schistidium apocarpum
Sciuro-hypnum populeum N
Sphagnum fallax
Sphagnum recurvum
Taxiphyllum deplanatum
Taxiphyllum taxirameum
Thuidium delicatulum
Tortella humilis
Tortella tortuosa

Mosses found with 4 or less prior herbarium records for state		
Species/County	Notes	Sites
<i>Dicranum polysetum</i> – Laporte Co.	5 records – but all 4 with locality information are from Laporte/Porter Cos.	Ambler, Sebert
<i>Frullania inflata</i> – Laporte and Porter Co.	2 records from 1937 and 1940	Moraine, Ambler, Sebert, Wintergreen, Headwaters of LC
<i>Hypnum fauriei</i> – Laporte Co.	State record; one record from IL in DuPage County, near Chicago; also found in N MI	Ambler (old growth portion)
<i>Plagiothecium latebricola</i> – Laporte Co.	1 record from 1894 in Montgomery Co	Ambler (old growth portion)
<i>Pohlia annotonia</i> -Laporte Co.	One record from 1970 in Parke Co	Sebert
<i>Polytrichum longisetum</i> -Laporte and Porter Co.	State record; records for Chicago area and SW MI	Moraine (Chicago Woods) & Ambler (old growth portion)
<i>Brachythecium falcatum</i> – Porter Co.	2 records from 1937 same locality in Putnam Co.	Moraine ravine and fen; John Coulter
<i>Brachythecium velutinum</i> – Porter Co.	5 records - from three counties	Moraine ravine
<i>Entodon brevisetus</i> – Porter Co.	3 records all from 1948 in same area (Porter/Lake Co line)	Moraine kame
<i>Polytrichum pallidisetum</i>	3 records all in the dunes area from Porter and Lake Counties	John Coulter
<i>Sciuro-hypnum populeum</i> – Porter Co.	4 records - latest 1930	John Coulter

Lichens found with less than 4 prior herbarium records for state		
Species/all Laporte Co	Notes	Sites
<i>Agonimia flabelliformis</i>	State record	Sebert
<i>Anisomeridium leucochlorum</i>	1 record from Monroe Co. in 2017	Sebert
<i>Ochrolechia arborea</i>	1 record from Morgan Co. in 1993	Sebert
<i>Arthonia helvola</i>	2 records from Brown & Morgan Cos.	Sebert
<i>Arthonia susa</i>	3 records, all from Brown Co. in 2023	Sebert
<i>Chaenothecopsis debilis</i>	3 records, from Brown & Morgan Cos. In 2017 & 2023	Ambler

-Bill Schumacher



Left to Right: Becky Smucker, Bill McKnight, Tomas Curtis, Ken Klick, Derek Nimetz, Bill Schumacher

Not shown: Barb Andreas, Andrew Gibson, Alison Harrington, Laura Henderson, Nathanael Pilla, Carole Schumacher

SPRING FORAY AT CAESAR CREEK

Caesar Creek Lake, U.S. Army Corps of Engineers, hosted our spring foray on June 17, 2023. The site, near Waynesville, in Warren County, is underlain by limestone and shale 438 million years old, with abundant fossils. The emergency spillway of the dam is a popular place to collect fossils, including brachiopods and trilobites.

One of our collecting sites was the Gorge Loop Trail, which is downstream of the dam that forms the lake. The area has a variety of habitats, including bottomland along Caesar Creek and mesic uplands on glacial deposits. Another site was scenic Horseshoe Falls, a favorite destination for hikers.

After lunch, we held a workshop on the basics of bryophyte and lichen identification at the Caesar Creek Lake Visitor Center.

Foray participants have identified 23 lichen taxa and 25 bryophyte taxa, including 14 new county records for lichens and 5 for bryophytes. Identification of specimens continues and we will post updated results on our website, <https://ohiomosslichen.org/past-forays/>

SPECIES LIST

N = new county record

LICHENS

Agonimia sp. N
Cladonia ochrochlora
Crespoa crozalsiana
Flavoparmelia caperata
Graphis scripta N
Lepraria finkii N
Myelochroa aurulenta
Parmotrema hypotropum
Pertusaria pustulata N
Phaeophyscia pusilloides N

Phaeophyscia rubropulchra
Physcia americana N
Placidium squamulosum N
Protoblastenia rupestris N
Pseudosagedia cestrensis N
Punctelia missouriensis
Punctelia rudecta N
Pyxine sorediata
Sarcogyne regularis
Squamulea subsoluta N
Verrucaria nigrescens N
Verrucaria calkinsiana N
Willeya diffractella N

BRYOPHYTES

Anomodon minor
Barbula unguiculata
Brachythecium acuminatum
Brachythecium laetum
Bryoandersonia illecebra
Callicladium imponens
Campyliadelphus chrysophyllus
Campylophyllum hispidulum
Claopodium rostratum
Entodon cladorrhizans
Entodon seductrix
Fissidens taxifolius
Hygroamblystegium varium
Hypnum pallescens N
Leskea gracilescens
Leucobryum glaucum N
Lophocolea heterophylla
Plagiomnium cuspidatum
Polytrichastrum ohioense
Pseudanomodon attenuatus
Ptychostomum creberrimum N
Schistidium apocarpum N
Taxiphyllum deplanatum
Thuidium delicatulum
Weissia controversa N

-Jim Topin



Back row Left to Right: Bill Schumacher, Dean Porter, Jim Toppin, Cynthia Dassler, Jody Garber, Tomas Curtis, Ray Showman, Marita King, Camryn Ford
 Front row L to R: Rachel Fuller, Janet Traub, Megan Osika, Bob Klips

FALL FORAY AT SALT FORK

Our fall foray on September 23-24, 2023, took us to Salt Fork State Park in Guernsey County, in the unglaciated Allegheny Plateau region of southwest Ohio.

Salt Fork is the largest state park in Ohio, with more than 27,000 acres. The bedrock geology of the area includes sandstone, conglomerate, coal, shale, siltstone, and limestone.

One of our collecting sites on Saturday was Hosak's Cave, a large shelter cave formed by the erosion of coal and shale underlying thick layers of more resistant sandstones and conglomerates. Another Saturday morning site was Stone House Loop Trail, which had a variety of mesic wooded habitats with numerous sandstone slump blocks. Saturday afternoon we collected at Morgans Knob, a mesic forest that includes a small pine plantation and an open meadow at the top of the knob.

Our microscope room for Saturday night, at the Best Western Hotel in Cambridge, was well attended and powered by a great abundance of the best local pizza.

Sunday morning we concluded our collecting at the Horse Camp, which is an open area with lichen-covered trees, and along the adjacent Blue Loop Bridle Trail, primarily a hilly mesic forest.

Foray participants have identified 24 lichen taxa, including 9 new county records. Identification of specimens continues and we will post updated results on our website, <https://ohiomosslichen.org/past-forays/>

SPECIES LIST FOR SALT FORK STATE PARK

N = new county record

LICHENS

Candelaria concolor

Cladonia furcata

Cladonia macilenta

Cladonia squamosa N
Crespoa crozalsiana
Dermatocarpon luridum N
Flavoparmelia baltimorensis
Flavoparmelia caperata
Hypotrachyna minarum
Lecanora muralis N
Myelochroa aurulenta
Parmelia sulcata
Parmotrema hypotropum N
Parmotrema reticulatum N
Phaeophyscia adiascola
Phaeophyscia pusilloides N
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris N
Punctelia caseana N
Punctelia rudecta
Pyxine sorediata
Pyxine subcinerea N
Usnea mutabilis

BRYOPHYTES

Climacium americanum
Pellia epiphylla

As part of the foray, Ian Adams visited Old Washington Cemetery (Reminiscing Field #12) in Guernsey County and noted the following lichens (N = new county record):

Aspicilia cinerea N
Candelaria concolor
Flavoparmelia caperata
Gyalolechia flavovirescens N
Parmelia sulcata
Parmotrema hypotropum N
Phaeophyscia rubropulchra
Physcia americana
Physcia millegrana
Physcia stellaris N
Physconia deterosa N
Punctelia rudecta
Xanthomendoza weberi N

-Jim Topin



Back row Left to Right: Bob Klips, Steve McKee, Jim Toppin, Ray Showman, Bob Long, Jason Duffield, Tom McCoy, Dean Porter

Front row Left to Right: Megan Osika, Ian Adams, Janet Traub, Brandon Ashcraft, Heather Gilford

EXAMINING QUALITY ASSESSMENT INDEXES FOR BRYOPHYTES AND LICHENS

Ohio is fortunate in being a leader in the study of bryophytes and lichens in the United States, largely due to the work of the Ohio Moss and Lichen Association and its individual members. Below are two articles that hopefully will start a discussion on looking at data produced through an additional ecological lens: going beyond lists and searches for rarer species, and considering data collected for usability in Quality Assessment Indexes, similar to what is done for the Floral Quality Assessment Index (FQAI), which is based on vascular plants, and is widely used in the eastern and

Acronym	CofC	Scientific Name
ASTLUD	ua	<i>Astomum ludovicianum</i>
ASTMUH	2	<i>Astomum muehlenbergianum</i>
ATRALT	3	<i>Atrichum altecristatum</i>
ATRANG	2	<i>Atrichum angustatum</i>
ATRCRI	4	<i>Atrichum crispum</i>

central US.

Articles discussing this are presented below:

- 1) An Example for Doing a Moss Quality Assessment, With Implications for Future OMLA Work
- 2) Lichens as an Ecological Indicator: A Summary of a Lichen Communities Article, With Implications for Ohio

-Bill Schumacher

AN EXAMPLE OF DOING A MOSS QUALITY ASSESSMENT INDEX, WITH IMPLICATIONS FOR FUTURE OMLA WORK

Introduction

The Floristic Quality Assessment Index (FQAI) is an index that helps to provide a more objective look at the quality of different vegetative habitats. It has been widely used to evaluate vascular plant communities in parts of the US. This is an improvement over saying that site looks good or that site does not look so great. This kind of valuations can differ from individual to individual.

The FQAI works through the use of coefficients of conservatism (CofC). On a scale from 0 to 10, these range from plants with very wide ecological tolerances to very narrow tolerances. Once the CofCs have been assigned, the FQAI can be determined by the following formula:

$FQAI = (\sum CofC) / \sqrt{N}$ where the CofCs for a site are added up and divided by the square root of the number of species.

Examining Google Scholar, it appears that Ohio may be the only state having an established and published list of CofCs developed for mosses, although there has been past talk of doing so for a couple other states. This is due to the work of OMLA's Barb Andreas, who pioneered their use for mosses. She also did significant work for developing the FQAI for vascular plants in Ohio. See the publication: *Floristic quality assessment index (FQAI) for vascular plants and mosses for the State of Ohio* by Andreas, Mack and McCormack. In addition to a link below, a snippet of it is included (See under Citations: Andreas, et.al., 2004)

https://epa.ohio.gov/static/Portals/35/wetlands/Ohio_FQAI.pdf

Those values were used in an Ohio EPA wetland project that I worked on with Brian Gara, former Ohio EPA wetland ecologist. Exploring the quality of 50 wetlands with selected 10X10 meter plots per site, across Ohio over a four year period, the use of an FQAI for mosses and bryophytes (Moss QAI and Bryophyte QAI since mosses and liverworts have no floral parts), sites across Ohio showed a high correlation between vascular plants and bryophytes as indicators of wetland quality in Ohio. The study, *Intensification of the National Wetland Condition Assessment for Ohio: Final Report* by Gara and Schumacher can be viewed at the link below (See under Citations: Gara, et.al., 2015).

https://epa.ohio.gov/static/Portals/35/wetlands/Ohio_Intensification_Final_Report_2015_1014.pdf

Note: From this study, three peer reviewed articles have been published in regards to using mosses and bryophytes (including liverworts). See under Citations: Schumacher, et. al, 2016; Stapanian, et.al., 2016a; Stapanian, et.al., 2016b.

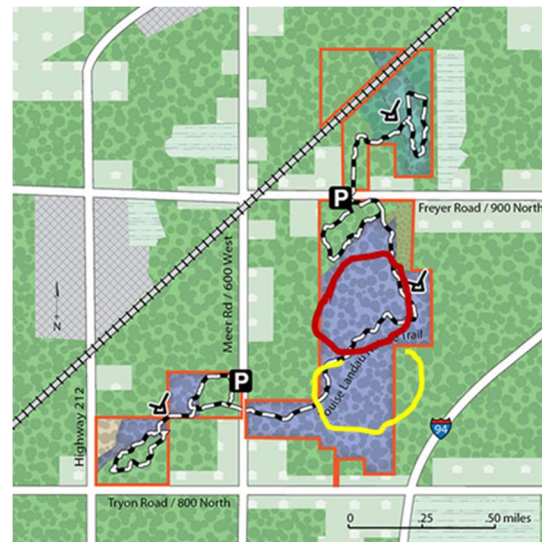
Case Example

I decided to try to show an example of how CofC and the resultant Moss QAI score could be used to compare different sites. In the Laporte/Porter County Foray that we did in April 2023 (see proceeding article), one of the sites collected was Ambler Flatwoods Nature Preserve. The analysis below is for illustrative purposes only. Although the CofCs were developed for Ohio, since Indiana is right beside Ohio with similar ecological conditions, they are being used although with a bit of caution if used on a regular basis.

For proper methodology, application and cautions, read introductory material in the Andreas et. Al. report mentioned above.

Ambler Flatwoods Nature Preserve is a boreal flatwood, which is characterized by poorly drained soils on a relatively level or “flat” landscape. In general terms it is a forested wetland. Being in northern IN and right beside Lake Michigan give it an unusually colder habitat than is usual for IN. This boreal flatwood natural community is found nowhere else in Indiana and is a haven for plants typically found much farther north.

The preserve has several sections. The sections compared here are: 1) a section in the middle that is an older mature forest and 2) a section just to the north which is more secondary in nature. In the map, the more secondary section is red and the more mature forest section is yellow. Both are roughly similar in size. Both sites were



Map of Ambler Flat Woods Nature Preserve

explored primarily by two people, for several hours. Both sites had large quantities of moss plants.

The number of species collected in the mature portion was 37, with a sum of CofC

at 142 (Table 1 below). The number of species collected in the secondary portion was 16, with a sum of CofC of 55 (Table 2 below). Each table also shows the species collected with their corresponding CofC.

Doing the calculations results in a Moss QAI score of 23.3 for the mature area and 13.75 for the secondary area.

Discussion

We now have a value that provides a more objective way of determining the quality of these areas. From past work with Ohio forested wetlands, the value for the Ambler mature area indicates a wetland that provides a high level of functions, whereas the secondary tract Moss QAI indicates a lower level of functions. That does not mean that the secondary site is a poor site, but in this case it probably means it is still relatively immature and has not developed all the niches that the more mature forest has for moss diversity. In 10 or 20 years it could be revisited and a new Moss QAI done to see how it has changed. Without that or a similar index, we would be left making more subjective guesstimates.

In addition to the Moss QAI value itself, it is useful to look at the individual species in the lists and their corresponding CofC values. The mature area has 10 species with CofC values ≥ 5 . This indicates a high percentage species found in niches that have a narrower ecological tolerance, something more likely to be found in older growth forests. The secondary tract has 4 such species, less than the older growth area, which is expected. However, their presence also indicates that this area is on a trajectory that will eventually lead to a stable mature forest, especially with its close proximity to the mature area.

The Moss QAI can also tell us other things about a site. Mosses (and liverworts) are

more sensitive to disturbance than vascular plants. If a site has a relatively high vascular plant FQAI but a Moss QAI that shows a lower quality site, there could be something going on that the vascular plant FQAI has not picked up. And it should be noted that using mosses can be done most of the year as an indicator, unlike vascular plants that have a limited growing season.

Such examples have been observed several times in my experience. Old growth forests have shown very good vascular plant diversity, both trees and forbs, but mediocre bryophyte diversity. This has been seen when the forested area has experienced a significant amount of air pollution or been surrounded by agricultural row crop land. Pollutants from factories, cars or from herbicide drift come in and affect the bryophyte community much harder. In these cases, the bryophyte community acts like a canary in the coal mine showing a danger to the forested area before the vascular plant community can respond.

Other damaging activity that a lower Moss QAI could signal is soil disruptions that slow down reforestation efforts, a very serious and widespread problem with reforestation efforts after clear cutting or from ag land where the soil was not adequately protected. Lowering of the water table in a sensitive area, something I have seen at some premier nature preserves, is another example.

Importance of sampling the community

Sampling the bryophyte community is key to the ability to make the observations above. There is a lot of useful information provided by just looking at small areas for what can be found, or looking for certain species. I do this a lot myself. But that cannot provide a substitute for looking at the community. In fact, the information

provided by individual or rare species is, in my opinion, more valuable if provided in the context of community of the larger natural area. Looking at the community takes work collecting all the species in an area and then identifying them, but it is important work and provides information that cannot be gotten other ways.

Conclusions

Ohio is blessed to have CofCs and ability to do Moss QAIs, something hardly any other state has. In addition, we have a high amount of bryophyte data that most states do not have due to the hard work of OMLA. Ohio also has successful work using the Moss CofC information for research in using mosses and liverworts as an indicator for wetland quality.

In addition to making collections lists, looking at this data with an ecological lens and doing additional analysis with CoC could be very productive and rewarding. The logical next steps, if there was interest, are to see if a moss or bryophyte CoC could be used as an indicator for other habitats besides wetlands (e.g. upland forests). Also, having a set of CofCs for liverworts for Ohio would be helpful in complementing the moss set of CofCs for Ohio.

Note: For the Ohio EPA study, Barb Andreas and Diane Lucas helped to provide estimates for CoC values for liverworts and a few mosses that previously did not have CofC scores.

Table 1: Moss Species collected at Ambler

– Mature tract

<i>Name</i>	<i>CofC</i>
Anomodon attenuatus	3
Anomodon rostratus	4
Atrichum angustatum	2
Aulacomnium pallustre	3
Brachythecium laetum	2
Brachythecium campestre	5
Bryoandersonia illecebra	3
Callicladium haldanianum	4
Calliergon cordifolium	6
Calliergonella lindbergii	6
Dicranella heteromalla	2
Dicranum viride	4
Entodon cladorrhizans	5
Entodon seductrix	2
Fissidens osmundioides	7
Helodium paludosum	6
Hygroamblystegium varium	2
Hypnum fauriei	5
Hypnum pallescens	3
Leptodictyum riparium	2
Leskea gracilescens	3
Leucobryum glaucum	4
Plagiomnium cuspidatum	2
Plagiothecium denticulatum	4
Plagiothecium laetum	4
Platohiecium latebricola	9
Platydictya subtilis	5
Platygyrium repens	3
Polytrichum commune	3
Polytrichum longisetum	3
Polytrichum ohioense	2
Raiiella scita	5
Rhynchostegium serrulatum	3
Sphagnum palustre	3
Taxiphyllum deplanatum	6
Tetraphis pellucida	4
Thuidium delicatulum	3

Number of Species 37, Sum of CofCs 142

Table 2: Moss Species collected at Ambler

- Secondary tract

<i>Name</i>	<i>CofC</i>
Atrichum crispulum	5
Aulacomnium pallustre	3
Barbula unguiculata	1
Bryoandersonia illecebra	3
Callicladium haldanianum	4
Dicranella heteromalla	2
Dicranum polysetum	6
Dicranum scoparium	3
Helodium paludosum	6
Leucobryum glaucum	4
Plagiomnium cuspidatum	2
Polytrichum commune	3
Polytrichum ohioense	2
Rhynchostegium serrulatum	3
Sphagnum recurvum	5
Thuidium delicatulum	3

Number of Species 16, Sum of CofCs 55

Citations

1. Andreas, Barbara K., John J. Mack, and James S. McCormac. 2004. Floristic Quality Assessment Index (FQAI) for vascular plants and mosses for the State of Ohio. Ohio Environmental Protection Agency, Division of Surface Water, Wetland Ecology Group, Columbus, Ohio. 219 p.
2. Gara, Brian and Schumacher, Bill. 2015. Intensification of the National Wetland Condition Assessment for Ohio: Final Report. Ohio EPA Technical Report WET/2015-1. Ohio Environmental Protection Agency, Wetland Ecology Group, Division of Surface Water. Columbus, Ohio.
3. Schumacher W., Stapanian M.A., Andreas B.K., Gara B. 2016. Number of genera as a potential screening tool for assessing quality of bryophyte

communities in Ohio wetlands. *Wetlands* **36**:771–776.

4. Stapanian M.A., Schumacher W., Adams J.V., Gara B., Viau N. 2016a. Moss and vascular plant indices in Ohio wetlands have similar environmental predictors. *Ecological Indicators* **62**: 138–146.
5. Stapanian M.A., Schumacher W., Gara B., Viau N. 2016b. Mosses in Ohio wetlands respond to indices of disturbance and vascular plant integrity. *Ecological Indicators* **63**:110–120.

LICHENS AS AN ECOLOGICAL INDICATOR: A SUMMARY OF A LICHEN COMMUNITIES ARTICLE, WITH IMPLICATIONS FOR OHIO

*We'll start with a summary of this article: Miller, Jesse E.D., John Villella, Daphne Stone, and Amanda Hardman. "Using lichen communities as indicators of forest stand age and conservation value." *Forest Ecology and Management* 475 (2020): 118436.*

Summary

Research was done in developing a continuous lichen conservation index for the Pacific NW, modeled closely after the development of Coefficients of Conservatism (CofC) used in the Floristic Quality Assessment Index (FQAI) for vascular plants. To the best of the author's knowledge, this is the first continuous index for testing lichen affinities to forest stand age.

The intent was to explore if lichens could be effective indicators of forest conservation value and successional status.

Steps in developing the lichen conservation index were as follows:

- 1) Three expert regional lichenologists (each with years of lichen field experience) independently assigned values 1-10 to each epiphytic macrolichen species included in the authoritative regional lichen identification guide. As with development of vascular plant and moss CofCs, the values reflect a species' affinity for undisturbed, late-successional or remnant habitats. Species that tend to occur in disturbed or anthropogenically modified habitats receive lower values, while species associated with late successional habitats receive higher values.

Note: macrolichens were used, as opposed to other lichen groups, since: a) they are the most commonly surveyed type of lichens; b) they are relatively easy to ID compared to other groups of lichen taxa; c) non-experts can be trained to ID them fairly rapidly; d) distribution and ecology of these groups are much better understood than other groups.

- 2) Rankings between the three experts were strongly correlated, and from their values a master index based on the three sets of individual rankings was developed. (The master list is shown at the end of the journal article; a snippet is shown here.)
- 3) A large forest survey dataset was used to test whether the community-level lichen

Species (McCune)	Authority (McCune)	Species (Esslinger)	Authority (Esslinger)	Conservation index value
Ahtiana sphaerosporella	(Müll. Arg.) Goward	Ahtiana sphaerosporoella	(Müll. Arg.) Goward	7
Alectoria imshaugii	Brodo & D. Hawksw.	Alectoria imshaugii	Brodo & D. Hawksw.	6
Alectoria lata	(Taylor) Lindsay	Alectoria lata	(Taylor) Lindsay	7
Alectoria sarmentosa	(Ach.) Ach.	Alectoria sarmentosa	(Ach.) Ach.	5

conservation index is related to forest stand age in a continuous fashion.

The research showed a positive linear relationship between the resulting macrolichen conservation index and forest stand age. This relationship was stronger than that between forest stand age and a

simple count of lichen species or between forest stand age and a binary indicator (where species are simple flagged as old growth forest indicators or not).

It was concluded that a lichen conservation index, analogous to CofCs used for the FQAI, can be a useful indicator of stand age, as well as late successional habitats of conservation concern, and can have strong biological relevance.

Comments on implications for Ohio

- The study was based on west coast forests where there has been little in the way of reversion from agriculture to forests. (They have been mostly continuous forests since regeneration after forest cuttings.) The authors suggest additional studies with lichens in regions where there was forest regeneration from agriculture. Heterogeneous histories of forest continuity could provide more evidence about how forest continuity or lack of continuity can influence lichen communities relative to stand age.
- The above would be very pertinent to Ohio, where regeneration from agriculture has been very common. This is a large problem in Ohio and in other states in eastern North America. Agricultural lands very often have soils that suffer from many problems related to long term farming, including severe soil compaction, erosion and other related problems that provide for a lower trajectory of forest regrowth, resulting in an extended period of time in the juvenile and secondary stages of development. My thought is that both bryophyte and lichen QAIs would be valuable indicators for researching this concern.
- It seems that the logical place to start, if there was interest in developing and

using a Lichen QAI, would be to develop a set of CoCs for macrolichens of Ohio. This state has the expertise to do so and it probably could be done with a minimum of resources. Ohio, as discussed in another article, already has CofCs for bryophytes, and this expertise could be used in determining how to produce the lichen CofCs

- . By doing so, we would have the main mechanism in place for determining Lichen QAIs, whether from databases or from on the ground community monitoring.
- There could subsequently be a discussion and research to see if macrolichens could be used as an indicator for other habitats besides forests.
- The study authors just divided the sum of CofCs of species found by the number of species (producing an average CofC), whereas the FQAI divides the sum of CofCs by the square root of the number of species. This small adjustment could easily be done, thus providing a Lichen QAI. This would also provide greater distance between scores than a straight average does.

-Bill Schumacher