



Lichen Landscapes: Uncovering Ancient Secrets in the North Woods

By Jill Riddell

Lichens are a fascinating part of every terrestrial ecosystem found on earth, and the Huron Mountains are no exception. But up until recently, Huron Mountain lichens had been studied only lightly. In the late 1990s, Dr. William Manierre and his wife, Anne, collected and identified lichens; and over the decades, occasionally there were Foundation researchers whose main projects weren't necessarily about lichens, but who would do some peripheral work on lichens, collecting specimens that happened to look interesting.

Two years ago, the Foundation approved a proposal by biologist Doug Ladd to thoroughly catalogue and curate the lichen diversity of the Huron Mountains. Ladd is a research associate at the Missouri Botanical Garden and a senior lecturer at Washington University in St. Louis. For three decades before that, Ladd worked for The Nature Conservancy, serving as director of conservation for the Missouri chapter. Among the many things Ladd developed an expertise for during his tenure, one was lichens. His ongoing work with lichens in the Midwest has resulted in the discovery of several species and genera new to science.



Left: Doug Ladd. Photo by Amy Hepler Welch.

In 2022, Ladd came to the Huron Mountains on a scoping trip and to verify some of the species recorded in the Manierre lists. He accompanied mycologist Jason Karakehian, and Ladd's initial interest at that time was simply to verify some of the Manierre records. It wasn't until he'd spent time on the ground that he realized how much more there was to do. "I was astounded by the lichen diversity," Ladd said.

Subsequently, Ladd began working on assembling a systematic inventory. In the summers of 2023 and 2024, Ladd did intensive field work; in 2025, he will return briefly to "just check a few more things out," as he puts it. "By then, we'll have a much more updated and ecologically nuanced and accurate checklist of the lichen diversity of the region."

Most of Ladd's work in the Huron Mountains has been original field work but another portion of the project happens off-site in the lab. "I wish I'd had the chance to meet Dr. Manierre," Ladd said. "As part of this work, I went to Northern Michigan University where Dr. Manierre donated his entire collection of lichen specimens. I brought back all of his collection [to the Missouri Botanical Garden] and have been going through them: examining them, assessing his identifications, and in some cases annotating his assumptions. He left quite a legacy. I brought back over 600 packeted specimens from Marquette and have been working on them for a year and a half. I still probably have a half a year to go before I return them all."

"Fortunately, Dr. Manierre documented his collections very well. Each packet of lichen is well-labeled and professional in its details. He explored everywhere on the club grounds, so he picked up a lot of weird and interesting lichens—he was everywhere he needed to be. He once found a rare lichen on the rocks along the shore of Lake Superior growing on top of another lichen, actually," Ladd said.

"But in the time period since Dr. Manierre did his work, there's been a groundswell of changes of lichen names and taxonomic concepts," Ladd said. "Plus, Dr. Manierre lacked essential equipment: a compound microscope, for example, and the tools to employ chemical analysis. Lichen identification often requires analysis of the



British soldier lichen. Photo by James P. Mann.

chemical constituents of the lichens. We use a technique called chromatography, and he wouldn't have had access to that." So each of the specimens previously collected has been reevaluated with newer methods and in some cases, reassigned a new name. The specimen label continues to contain all of Dr. and Mrs. Manierre's original information along with Ladd's annotations.

When asked if there's a bit of an art to lichen identification, Ladd said, "Organismal biology is often an art because organisms are so variable depending on their environmental influences. So, it requires a lot of field experience and practice, and sometimes maybe art to interpret identifications. In the future, perhaps we'll get to the point where you can run an instant DNA test and get a molecular profile but we're nowhere near that at this point."

Currently, the Foundation lists 380 lichen species in its inventory. Fifty of those were added after Ladd's first visit in 2022, and of the remainder of species on the list, the majority are there because of Dr. Manierre's work. "I expect that Doug's work will lift the total number of lichens found in the Huron Mountains to 450 or more," said Kerry Woods, the Foundation's director of research.

When completed, Ladd's survey will be a resource that's available to future researchers. "The protected lands of the club are an incredible resource. I think every natural area on the Earth's surface should have a detailed inspection and description of its organisms because ecosystems are made of critters, and unless we know their names, we can't figure out how they work," Ladd said. "A project like this one adds to global biogeographic knowledge about lichen distribution patterns and abundance. This adds to worldwide efforts to identify the species most in need of conservation attention."

You can find the list of Huron Mountain lichen species at hmuf.org. Look for the tab "All-Taxa Biodiversity Inventory."

As far as private land holdings go, the property of the Huron Mountain Club has an unusually robust documentation of plants, animals, and other biota. That's mainly because of the long history of Foundation-sponsored work by biologists but also the result of observations made by Club members.

LICHEN Q&A

Q: "Where can I see lichens? How do I know when I have?"

A: Even if you're exceptionally woodsy, you might not always know for sure whether what you're looking at is a lichen or something else entirely. Lichens vary dramatically from one another in their appearance. Some are little more than a smudge on a stone. Others are robust and bristly and resemble a char brush in the kitchen that you'd use to scrub a pot. Some are tiny, colorful patches or crusts that live on rocks or trees. Some look a lot like mosses.

Q: "Sorry to sound obtuse here...but a lichen is *what*, exactly? A plant?"

A: Definitely not a plant. Up until 1867, lichens were considered to be a type of plant because they photosynthesize and grow in similar environments to plants and look kind of plant-like. But a lichen is a mix between a fungus and an algae (and sometimes bacteria join in the mix, too). But most familiarly, a lichen is this very surprising mutualistic combination of a fungus and an algae that in their meeting, create a form that doesn't look like either a fungus or an algae.

Q: "How old are the lichens in the Huron Mountains?"

A: It's hard to determine age in lichens, but scientists now know that lichens can live an exceptionally long time, especially ones that live in extreme environmental conditions, like in the Arctic or Antarctica. Many lichens grow incredibly slowly – sometimes only a few millimeters per year – and survive for long periods in a dormant or slow-growing state. The oldest lichens are estimated to be somewhere between 4,000 to 6,000 years old. But some lichens have a natural life span of only 20 years.



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HMWF Research Contributions

By Kerry Woods

Science is incremental and cumulative. Each piece of research adds bits, large or small, to the structure of our general understanding of the natural world. It's often impossible to predict the ultimate importance of any specific piece of research, but no research can contribute that "added value" until it is communicated to the larger scientific community. The forms of such communication are diverse. For many years, publication in peer-reviewed journals has been the "gold standard" for research communication, but other venues, like book-chapters, research theses and presentations at professional conferences, have also been important. For each fall/winter newsletter, I compile a list of these "classical" products of HMWF-sponsored research.

More recently, modern information technology has allowed creation of permanent, curated, searchable, and accessible digital archives of raw data-sets. These archives are rapidly changing the face of natural science by making data-sets, previously largely locked up in the files of individual researchers (and often lost with the retirement or death of those researchers), available to the entire research community. This has fueled a boom in synthetic and integrative analysis. Given HMWF's prioritization of development of "baseline" data-sets and their use in long-term research, we have placed special emphasis on data-archiving for current studies and on salvaging and archiving our collection of historical data-sets. I've listed some representative examples here.

For all of these lists, I've included DOI (digital object identifier) codes where possible to allow the products to be easily located on the internet.

PEER-REVIEWED JOURNAL PUBLICATIONS

- Alverson, W.A., D.A. Riege, D.W. Waller. 2024. Losing the slow race: How deer hinder growth, survival, and regeneration of juvenile hemlocks (*Tsuga canadensis*). *Forest Ecology and Management* 553:121466. DOI: 10.1016/j.foreco.2023.121466
- Fitzgibbon, A.S., D.M. Costello. 2023. Trace metal-macronutrient colimitation of algal biofilms in streams with differing ambient inorganic nutrients. *Freshwater Science* 42:3 DOI: 10.1086/726684
- Grengs, A., G. Ledesma, Y. Xiong, S. Katsey, S.W. Poulton, E.D. Swanner, and C.W. Wittkop. 2024. Direct precipitation of siderite in ferruginous environments. *Geochemical Perspectives Letters*:30,1-6. DOI: 10.7185/geochemlet.2414
- Murchie, K.J., E.S. Childress, and P.B. McIntyre. 2024. For the love of suckers: scientific benefits of engaging volunteers to monitor migrations and advocate for native non-game fishes. *Environmental Biology of Fishes*. DOI: 10.1007/s10641-024-01616-0
- Orlofske, J.M., B.R. Wilson, D.E. Tesar, C.D. Tyrrell, R. Headley. 2024. Fluvial habitat associations of riverine dragonflies (Odonata, Gomphidae) in the Huron Mountains (Michigan, USA). *River Research and Applications* 2024:1-13. DOI: 10.1002/rra.4339



- Rutherford, R.D., and C.R. Webster. 2023. Top-kill of vascular plants during a drought on granite bedrock glades in the Huron Mountains, Michigan. *The Journal of the Torrey Botanical Society*, 151(2) : 93-102. DOI:10.3159/TORREY-D-23-00008.1
- Waller, D.W. 2024. Twig Age 2.0: Adjusting twig age data for differences in palatability. *Authorea*. Oct. 14, 2024, DOI: 10.22541/au.172771706.62584015/v2
- Waller, D.W., D.A. Riege, W.S. Alverson. 2024. The regeneration ratio: Combining seedling growth and mortality data to predict regeneration success. *Forest Ecology and Management*: 553:121737. DOI: 10.1016/j.foreco.2024.121737

A SAMPLING OF THESES AND CONFERENCE PRESENTATIONS

- Chernicky, K.M., J.M. LaMontagne. "New kids on the block: tree recruitment dynamics in the boreal-temperate ecotone." Midwest Ecology & Evolution Conference. Southern Illinois University Edwardsville. Edwardsville, Illinois. 5-7 April 2024.
- Revenis, G.G. 2023. A multifaceted approach to address forest impoverishment from overabundant white-tailed deer and pervasive invasive plant spread across the eastern deciduous forests. M.S. Thesis, Chatham University, Pittsburgh, PA
- Rivers, K, S. Voelker, and J. Burton. "Trait variability within and among tree species of northern hardwood and hemlock-hardwood forests of the upper Great Lakes states." 14th North American Forest Ecology Workshop, 24-27 June, Asheville, NC

PUBLISHED DATA-SETS

- Dye, A. 2018. Tree ring data, Huron Mountain Club ver 0. Environmental Data Initiative. DOI: 10.6073/pasta/f1fb37d04e08ffcb62eca754d7950d68
- Hinkel, K. and F.E. Nelson. 2023. Hourly time series of Ives Lake (Huron Mountains, Marquette County, MI) water temperature-depth profiles, 2013-2022 (continuing study) ver 1. Environmental Data Initiative. DOI: 10.6073/pasta/501850bc0f3a5150a85f7079949fa30e

- Kielb, M.A. 2023. Breeding bird community surveys in the Huron Mountains, Marquette Co., Michigan (1997-1999). ver 1. Environmental Data Initiative. DOI: 10.6073/pasta/ee6d0c1d08e4e060e57a94765a360bea
- Marcarelli, A.M., C.J. Huckins, and S.L. Eggert. 2023. Data from sand aggradation alters biofilm standing crop and metabolism in a low-gradient Lake Superior tributary ver 1. Environmental Data Initiative. DOI: 10.6073/pasta/1e4d440f48dc21e5cd3cf1fa8daab8e3
- Richter, D. 2023. Mycorrhizal fungi of native red pine stands in the forests of the Huron Mountains (1996-2015). ver 1. Environmental Data Initiative. DOI: 10.6073/pasta/37cf0ded54b059cd46eb25ee529af511
- Riege, D. and K.D. Woods. 2023. Permanent plot data for old-growth white pine - hemlock - hardwood forests in the Huron Mountains, Marquette County, Michigan: 2006-2022 ver 1. Environmental Data Initiative. DOI: 10.6073/pasta/003a34c22865f57d6d704e52c5984593
- Swanner, E.D., N. Lambrecht, C. Wittkop, S. Katsev, G. Ledesma, T. Leung, G. Gilleaudeau, and K. Block. 2024. Water properties of Brownie Lake, MN and Canyon Lake, MI from 2015-2022 ver 4. Environmental Data Initiative. DOI: 10.6073/pasta/054c2ad159c40ff2f2374261fa937a23
- Warner, S.M. 2021. Tree ring data for *Betula alleghaniensis*, *Pinus strobus*, *Quercus rubra*: International Tree-Ring Data-Base. DOI: 10.25921/crg1-5057, DOI: 10.25921/scbj-1718, DOI: 10.25921/8xcx-sy68

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A Letter from the President

Dear Fellow Huron Mountain Wildlife Foundation Supporters:

2024 proved to be another exciting and productive year for the Huron Mountain Wildlife Foundation. Chris and Wendy, our new caretakers, hit the ground running last spring and together transformed the caretaker's house into a clean, tight, and repaired home. They identified and repaired numerous issues in our facility all while also managing our researcher's scheduling and lodging.

We hosted 25 investigations at Ives Lake this year, many ongoing from years past and some exciting new projects. From structural geology of 2.5 billion year old rock formations, to the development of a comprehensive ecosystem baseline for the Huron Mountain lakes, to identifying the adaptive trade offs of different modes of songbird migration, the studies, made possible by your generosity, continue to produce one of a kind data that is vital to our understanding of the earth and its natural functions. None of this would be possible without your continued financial support and especially your ongoing protection of one of the last remaining intact mid western forest ecosystems.

An unrelated consequence of Scott Tiegs and Elizabeth Parkinson's investigation of light pollution's effect on the emergence and behavior of aquatic insects was the unfortunate discovery of the existence of the Spiny Water Flea in Mountain Lake. This invasive crustacean has the potential to upset the food supply for many of our treasured fish species. With this knowledge we will be better suited to help mitigate its impacts on our lake ecosystems.

The Huron Mountain Wildlife Foundation, thanks to your support, has become a renown research facility among the natural science community. We continue to host cutting edge science, and the results of our efforts can be seen world wide. Thank you for making this all happen through your generous contributions.

With Continued Appreciation,
Henry Dykema
HMWF President

In Loving Memory: Barbara Manierre



Barbara and Bill Manierre in Jamaica 2018.

which she made herself) to the silent auction, and helped at many levels each year arranging the annual board meeting cocktail parties. Her personal, organizational, and artistic skills were truly remarkable. She brought extraordinary energy, humor, and friendliness to everything she worked on.

We will all miss our friend and remarkable board member Barbara.
The HMWF board

Manierre Award 2024

The Wildlife Foundation offers the endowed William and Ann Manierre Award in recognition of notable peer-reviewed publication of HMWF-sponsored research. This year, the award was presented at the Foundation's annual meeting to Jasmine Mancuso, Emily Messick, and Dr. Scott Tieg of Oakland University for their paper, "Parsing spatial and temporal variation in stream ecosystem function," published in the journal *Ecosphere*. Tieg is Professor of Biological Sciences at Oakland and Mancuso and Messick have both been students in his lab.

Tieg is a long-time HMWF researcher, and this study builds upon his earlier work on the metabolism of stream ecosystems. Streams in forested landscapes are largely "powered" by the breakdown of organic matter



HURON MOUNTAIN WILDLIFE FOUNDATION



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Since 1955, the Huron Mountain Wildlife Foundation has supported original research in a wide variety of scientific fields. The research takes place in the Upper Peninsula of Michigan. More information on the Foundation can be found at: www.hmwf.org

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inputs – leaves, twigs, etc. – from the surrounding landscape but accurate, comparative measurement of stream ecosystem energetics has, in the past, required complex and expensive methods and tools. In a long-term study, Tieg and colleagues developed an affordable and reliable tool for measuring stream ecosystem function by measuring decay rates for standardized cloth strips in situ. The technique was developed, in part, using multi-year studies at 26 stream sampling sites in the Huron Mt. Area, and has since been widely adopted.

Mancuso, Messick, and Tieg used data from these 26 streams over nine years of measurement to show that stream ecosystem function varies much more from stream to stream, even in close proximity, than from year to year. This important result emphasizes the importance of considering specific conditions at individual streams, and the risks of generalizing regionally from only one or a few streams.

Mancuso and Tieg were able to attend the annual meeting of the Foundation to receive the award personally.