



FRIENDS

OF THE UNIVERSITY
OF MONTANA

HERBARIUM

Spring 2017

WHERE ARE ALL THE MONTANA MOSSES?

Joe C. Elliott

The *Flora of North America* (FNA) Volumes 27 and 28 includes 1,415 species of North American mosses, of which more than 500 taxa (i.e., species, subspecies, and varieties) have been recorded in Montana. Encompassing two floristic provinces, Cordilleran and Great Plains, and bordering the Boreal Province, Montana has a rich moss flora created by habitat diversity that reflects the ecological integration of elevation, substrate, climate, and glaciation. Species associated with the three floristic provinces occur in Montana where ecological conditions are typical of the province over its geographic range. For example, many species with affinities for the conifer forest of western Montana (Cordilleran and Boreal species) are also present in the isolated mountain ranges of central Montana where the montane environment is cooler and wetter than the surrounding prairie and steppe.

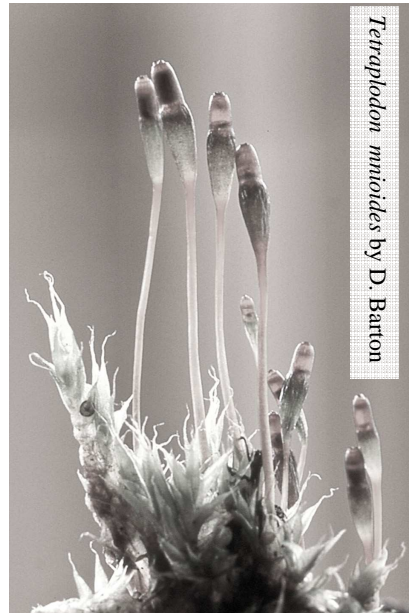
The biogeography of mosses and vascular plants differ in that mosses tend to have wider ranges of distribution, often including several continents in both hemispheres, with many species being cosmopolitan. More than 75 percent of families of bryophytes are widespread in both hemispheres, with more than half of the North American species also occurring outside of this continent. Like vascular plants, mosses exhibit one of three patterns of distribution: widespread in several floristic provinces (cosmopolitan), discontinuous among floristic provinces (disjunct), and restricted to a floristic province or part of a floristic province (endemic).

Information in the FNA and *Manual of Montana Vascular Plants* (2012) indicates differences in biogeography between Montana mosses and vascular plants (Table 1, page 3). Differences between mosses and vascular plants are most pronounced in floristic affinities that they demonstrate for the Boreal and North American Cordilleran provinces. Most Montana mosses (34 percent) are circumboreal, with only about 1 percent being restricted to North American boreal habitats. The relatively large proportion of boreal mosses is probably associated with their mode of reproduction, which requires that antheridia and archegonia be connected through a film of moisture to allow fertilization and

subsequent growth of the sporophyte. Boreal habitats tend to be cool and moist, which is compatible with the cool-season photosynthetic physiology of mosses and their need for water in the reproductive process. The circumboreal distribution on several continents is probably a result of highly mobile spores that are very small and easily carried in wind, much like pollen. Transport over large expanses of ocean, between continents, does not appear to have posed a significant barrier to this large group of mosses.

Thirty percent of Montana moss species are most often found in the North American Cordilleran Province that extends from Alaska south to California and Arizona, compared to 45 percent of Montana's vascular plants. Approximately 14 percent of mosses are mostly restricted to the Pacific Northwest part of the Cordilleran Province. Species of cosmopolitan mosses and vascular plants comprise similar proportions of the Montana flora. Cosmopolitan mosses include a group of mosses that are "weedy" and colonize disturbed soils and bare rock, concrete, and roofs. One of these is the tiny, silvery *Bryum argenteum*, the "sidewalk moss," that is ubiquitous in sidewalk cracks throughout Missoula.

Mosses differ from vascular plants in having lower levels of endemism, which is probably due to the long distance dispersal capacity of moss spores. Peaks of endemic richness of North American moss flora are in northern California, the Pacific Northwest, and in the southern Appalachians. Montana has only two species of mosses that are narrow endemics (restricted to small areas within a floristic province). *Grimmia brittoniae* was first collected in Bad Rock Canyon near Columbia Falls by R.S. Williams in 1897, and was rediscovered at the same site in 1997. This rare moss, growing on rock faces that are wet in spring, has been documented from 49 locations in western Montana and adjacent Idaho. *Drepanocladus cardotitii*, perhaps the rarest Montana moss, was collected from Avalanche Basin in Glacier National Park in 1898, and has not been found anywhere in the World since the collection of the type specimen.



(Continued on page 3)

Notes from the Board

One way or another it all boils down to politics. Given the recent political machinations regarding Russian intrusion into our election process, I asked myself, why would the Russians stop at a mere election? Could they not subvert our world of botanical systematics? And sure enough, there was the proof of Soviet meddling resting right in our precious MONTU herbarium. Herbarium sheets of winterfat, a prime winter browse of proud American sheep, had been annotated *Krascheninnikovia lanata*, ostensibly relegating *Eurotia* and *Ceratoides* to the dustbin of history and elevating a Soviet moniker. What is next—*Takhtajania tridentata* or *Putinia tridentata* for sagebrush? One can see where this infamy might go. But since our president and President Putin are such good buddies, I worry that an infusion of capital into the nation's herbaria may not be high on President Trump's to-do list of projects to "make America great again."

What MONTU lacks to effectively fulfill its mission is more cabinet space, and for significant cost effectiveness at least 10-14 cabinets are needed. I have spent many hours in three herbaria: University of New York at Albany, Washington State University, and the herbarium at Missoula's Forestry Sciences Lab. I was in the process of becoming a plant ecologist. To be credible, a plant ecologist must be certain of the identification of all specimens and the best test of an accurate identification is to compare one's determinations to herbarium specimens, particularly annotated specimens. The herbaria at the afore-cited institutions were housed in windowless, florescent-lit basements resembling catacombs with their cheerless ambiance. In contrast, the University of Montana Herbarium (MONTU) is a breath of fresh air with a prime location, natural lighting, a splendid view of campus, windows that open, and is generally well-equipped for its mission, but for this one problem of cabinet space.

Herbarium maven Shannon Kimball is proposing some stop-gap measures that call for considerable sacrifice on her part as well as that of office-mate Marilyn Marler. Making MONTU great again will require sacrifice from all of its supporters. For my part, I will be trying to annotate specimens I collected some time ago and which Peter Stickney pronounced "nice" (pretty high praise from Peter). Perhaps the accumulation of specimens lacking appropriate housing will be a spur to university administrators to consecrate space to its greatest use, an expanded, really "huge, huge" herbarium. Until then we are hoping that the Friends of the UM Herbarium will step up to the plate again. To this end, President Trump has promised to float one of his signature Tweets for every \$100 we raise. Let the contributions flow.

Steve Cooper

FRIENDS

*of the University
of Montana*

HERBARIUM



**DIVISION OF
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UNIVERSITY OF
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FRIENDS IS TO SECURE
SUPPORT FOR AND TO
ENRICH THE
COLLECTIONS AND
OPERATIONS OF
THE UM HERBARIUM*

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Edited by
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2017 FOH Annual Meeting

The annual business meeting of the Friends of the UM Herbarium will be held Saturday, November 18 from 10 AM to 2:00 PM. The meeting will be held in Rm. 202 of the Natural Sciences Building on the UM Campus. This is the annual meeting of the Board of Directors and is open to the membership.

...Moss (Continued from page 1)

Twenty-five species of moss are regional endemics with centers of distribution in the Pacific Northwest and reach Montana on the eastern edge of their range. These mosses include four species of *Homalothecium* and additional species of *Plagiomnium*, *Rhytidiopsis*, *Kindbergia*, *Roellobryon*, *Scleropodium*, *Fontinalis*, *Neckera*, *Porotrichum*, *Isothecium*, *Hypnum*, *Dichelyma*, *Sphagnum*, *Leucolepis*, *Bryolawtonia*, and *Buxbaumia*. These mosses are associated with a variety of moist substrates in Pacific maritime forests including lower tree boles, decaying logs, litter and duff, rock, and wetlands. Unlike many endemic vascular plants, most of these mosses do not appear to be restricted to a narrow range of substrates such as limestone or serpentine soils. Exceptions are two species of *Buxbaumia* (“bug-on-a-stick moss”), which are found only on large, downed logs at a specific stage of decay.

Forty-one species of mosses have been recorded from only one location in Montana, which could be explained by insufficient research or because some of these collections represent isolated populations of species that are disjunct from their primary centers of distribution. Information in the FNA indicates that four of these Montana species have disjunct North American distributions. *Grimmia pilifera*, collected in Lake County, is disjunct from the Appalachian Mountains, growing on granite and limestone in mountains. *Grimmia teretinervis* grows on limestone throughout the United States and Canada on sites that were inundated by oceans during the Cretaceous, which uplifted and eroded, exposing calcareous sediments. There is one known Montana location for this species in Ravalli County. *Pohlia lescuriana*, collected near Columbia Falls, is an inconspicuous woodland species from eastern North America.

Sanionia nivalis, from Glacier National Park, is an arctic species often associated with areas that hold snow until late in the season and along the banks of glacier-fed streams. There is little information on specific substrate characteristics of arctic-alpine mosses, but they may be like many species of arctic vascular plants that occupy restricted habitats with cold water near the surface, year-round from snow melt.

Other species known from only one location in Montana, with widely separate occurrences within the same floristic region, are restricted to specific substrates such as rich fens (*Cinclidium*

stygium), dung of forest carnivores (*Tetraplodon angustatus* and *T. mnioides*), and soils enriched with metals (*Haplodontium macrocarpum*). Rich fen habitats are present where cold water, percolating through limestone, upwells and forms peatlands. *Cinclidium stygium* is known from only two sites in the western United States, Pine Butte fen near Choteau and Cathedral Cliffs fen in the Wyoming Beartooth Range.

The *Tetraplodon* species have both been found only one time in Montana. Although carnivore dung and other suitable organic substrates with bone and feathers (such as owl pellets) are not rare in Montana, it is unlikely that the average botanist spends a lot of time checking these deposits for bryological activity. Both *Tetraplodon* species have been recorded most often from Alaska and Canada, especially along the Pacific Coast. *Tetraplodon mnioides* has also been found on leopard dung from Mount Kilimanjaro in Tanzania. These mosses are not restricted to dung from a specific carnivore species but collection records indicate that coyote dung is often cited as the host.

One of the “copper mosses,” *Haplodontium macrocarpum*, has been found at only one location in Montana. There are 18 Montana collections of this species in the database for the Consortium of North American Bryophyte Herbaria, all from Silver Gate in Park County, with the first collection in 1905 and the last in 1953. Five different bryologists made these collections, all visiting the one known location for this rare moss. I suspect the location near Yellowstone National Park was partially responsible for the focus of attention on Silver Gate. Also, for bryologists, *Haplodontium* was a trophy and its capture was probably recounted over and over again at the bars after the annual meetings of the American Bryological and Lichenological Society. To collect *Haplodontium*, one must scramble over slippery rocks near waterfalls from streams that drain areas rich in minerals. The Silver Gate/Cooke City area has historically been the site of gold mining activity, often in conflict with the ecological values associated with Yellowstone National Park.

Most reports on the biogeography of mosses have not relied on molecular, phylogenetic, and population genetic analyses to provide insight into species distribution patterns. Determinations that species with geographic separations, such as among different continents, largely assume that widely separated

(Continued on page 7)

Table 1
Biogeographic Affinities of Montana Vascular Plants and Mosses
(% of total Montana species)

Floristic Province	Vascular Plants	Mosses
Arctic Alpine	5	10
Boreal	18	34
North American Cordilleran	45	30
Great Plains	5	1
Widespread/undetermined	26	25

Twenty Years Behind Us

It was the winter of 1995. The U.S. Fish and Wildlife Service Cooperative Research Unit housed in the Natural Sciences Building had just received a large grant to map the vegetation of Montana using satellite imagery and GIS technology. The Coop Unit requested and received space that had previously been allocated to the UM Herbarium (MONTU) without any input from the Herbarium or the Division of Biological Sciences. Although there was a great deal of support for the UM Herbarium from outside the university, there was only marginal interest from the faculty. It became apparent that those of us interested in the future of Montana's largest herbarium needed to organize. Molly Galusha, Jean Parker, Peter Stickney, Dave Dyer, then curator of the collections, and Peter Lesica met at Molly's house and came up with the idea for a support group similar to The Friends of the Mansfield Library under the umbrella of the UM Foundation. Later that year our little group sent out letters to over 250 people asking for members and nominations for the Board of Directors, and by summer we had 75 members signed up. That fall we elected a Board of Directors (Joe Elliott, Peter Lesica, Jean Parker, Steve Shelly, Peter Stickney), and our first meeting was held in December. The first newsletter came out in the spring of 1996, and The Friends of the UM Herbarium (FOH) was born.

Our first order of business was to relieve the overcrowded shelves of the specimen cabinets. Our first newsletter announced the beginning of a fundraising drive for the purchase of new cabinets. Each cabinet holds approximately 2,000 specimen sheets, and MONTU was accessioning about 1,000 specimens each year. We figured that we wanted to be able to purchase enough new cabinets to relieve the overcrowding and have enough extra space for the next ten years. We received \$8,500 the first year of the drive and had \$13,000 from about 50 donors by the end of the third year of the drive. This allowed us to purchase 16 new cabinets.

The UM Herbarium grew in other ways thanks to the efforts of board members. As well as being a FOH board member, Peter Stickney was also the curator of the Missoula Research Center Herbarium (MRC) formerly housed in the Forestry Sciences Lab on the UM Campus. In 2008, the FOH Board of Directors began discussing the transfer of the MRC Herbarium to MONTU with Peter and board member Dean Pearson. This transfer took place two years later. Then in 2011, Peter Stickney initiated the UM Herbarium Endowment Fund with a generous contribution of \$44,000. Three years later the fund was up to \$60,000 and generated \$1,200 to help pay for herbarium helpers such as Virginia Vincent, who virtually ran the day-to-day activities of the herbarium and received an annual honorarium from FOH for fifteen years.

Other Friends of the UM Herbarium members made significant contributions as well. In 1999, Jim Habeck wrote

a history of the UM Herbarium for the 100th anniversary with an abbreviated version published in the newsletter. Loren Bahls began transferring duplicates of his world-class diatom collection to MONTU in 2000, and donated a high-end compound microscope in 2011 to allow visitors to view these collections. In 2004, board member Rich Producers purchased a computer for the UM Herbarium to allow the beginning of an on-line database. That same year board member Marilyn Marler set up the UM Herbarium web page and gave MONTU an on-line presence. Members of the Friends of the UM Herbarium and the Montana Native Plant Society helped dust cabinets, clean sinks, and put things in better order at two volunteer nights in 2007 and 2013.

Although they contain historical collections, herbaria are not stagnant institutions. Times change and policies must keep up-to-date. Helping establish or change herbarium policies has been one of the FOH Board of Directors' most important functions. There had been no director of the UM Herbarium since the retirement of Kathleen Peterson in 1987. In 2001, the Board convinced the Dean of Biological Sciences to include "Director of the Herbarium" in the job description for a new plant geneticist position in the hopes of having one faculty member who would speak for the Herbarium. The FOH Board worked on a specimen annotation policy starting in 2003 and adopted it in 2005. That same year the Board began work on a policy guiding future accessions that would limit the number of specimens placed in the herbarium to a narrowly circumscribed part of North America in order to maintain the quality of care for the existing collections. In 2009, the Board agreed on such a policy. As the use of molecular techniques became common, there were an increasing number of requests from researchers to use small samples from specimens in their assays. In 2007, the FOH Board developed and implemented a policy on "destructive sampling" of herbarium specimens that allowed this research but protected the integrity of the specimens as well.

It's been a great twenty years. The Friends of the UM Herbarium can be proud of the work we've done. MONTU is a vibrant institution that is frequently used by academic scientists and students, as well as public and private land managers. MONTU plays a role not only in documenting our state's biological diversity but also in protecting that diversity for future generations. We all look forward to the next twenty years.

Board of Directors past and present

Joe Elliott, Peter Lesica, Jean Parker, Peter Stickney, Steve Shelly, Barry Brown, Bonnie Heidel, Bruce Maclay, Mark Behan, James Habeck, Maria Mantas, Rich Producers, Drake Barton, Tara Carolin, Marilyn Marler, Scott Mincemoyer, Elizabeth Crone, Matt Lavin, Dean Pearson, Andrea Pipp, Peter Husby, Jessie Salix, Steve Cooper, Dave Hanna

Peter Lesica

MONTU – THE NEXT 20 YEARS

Archival natural history collections are an important source of information for scientific research. The spectrum of inquiry that relies on herbarium specimens is especially broad and diverse. Herbarium specimens have been used to assess the effects that large herbivores have on native plant populations over time (Beauvais et al. 2017), the impacts of climate change on plant populations (Primack and Gallinat 2017, Davis et al. 2015, Hart et al. 2014), and for taxonomic analyses of individual species (Spooner et al. 2016, Majure et al. 2017).

Research using MONTU's specimens is also alive and well. Many of our vascular plants have been used in recently published volumes of the *Flora of North America*, or are on loan to scientists working on the *Flora of the Pacific Northwest*. Researchers also frequently request small samples of our plant material for use in genetic sequencing. A quick glance at the list of MONTU's visitors (see page 6) shows how valuable the collection is to a wide assortment of people.

Our specimens are particularly important as reference for plant identification. Many botanists from the U.S. Forest Service, Montana Natural Heritage Program, and the County and City of Missoula have visited MONTU, using our collection to accurately determine which plants are growing on the lands that they are responsible for managing. Botanical artists have visited the herbarium to look at specimens when live material is not readily available.

Going forward we expect an increased use of herbarium specimens for molecular-genetic analysis of plant phylogenies, and for long-term research comparing old and recent collections. MONTU will also become increasingly valuable for providing reference material used in plant determinations and documenting the spread of invasive plants.

MONTU has remained active despite continued budgetary pressures at the University and Department level. Funding shortages for herbaria have occurred across North America and resulted in the closure of many facilities (page 6). However, the need for these collections continues to grow, as it does at MONTU, to house new material and provide specimens for many different types of plant-related research.

INTRODUCING THE FRIENDS OF THE HERBARIUM CABINET DRIVE 2017

The last Cabinet Drive held by the Friends of the Herbarium was in 1996. A total of \$13,000 was raised by 2000 and used to purchase 16 cabinets. With the 2017 cabinet drive FOH hopes to purchase 14 cabinets in the next 2 years at a cost per cabinet of roughly \$1,350. Our total fundraising goal is \$20,000, which includes delivery. Donors who contribute \$1,350 can choose to have their name, or the name of someone they wish to be remembered, placed on a plaque on the cabinet door (see photo above).

Contributing to the Cabinet Fund is easy. Donations by mail are preferred, sent to:

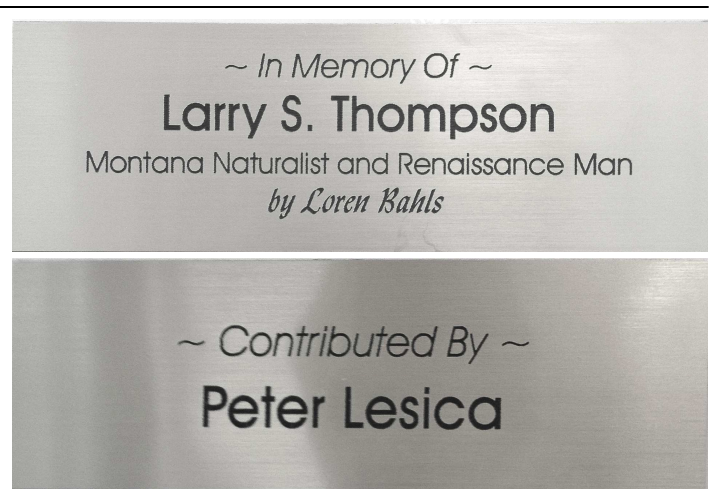
Where do we go from here? In the past the Friends of the Herbarium has raised money for new cabinets, helping MONTU grow and thrive over the past 20 years. We have continued to accession new plants that accurately reflect plant communities across Montana. Unfortunately, MONTU's cabinets have again reached capacity. To put it simply: **Our vascular plant collection is facing a critical shortage of space.**

It's important to bring in fresh specimens to document new occurrences across Montana and to provide relatively fresh DNA for genetic studies. Since we've filled the capacity of our cabinets we are currently unable to bring new plants into the collection. Although we are limited on floor space, some creative rearranging in the herbarium will allow the placement of 14 additional cabinets. **MONTU is now in need of money to purchase cabinets.**

Shannon Kimball

References

- Beauvais, M., S. Pellerin, J. Dube and C. Lavoie. 2017. Canadian Journal of Earth Sciences 95:2 pgs. 153-162.
- Davis, C., C. Willis, B. Connolly, K. Courtland and A. Ellison. 2015. American Journal of Botany 105:10 pgs. 1599-1609.
- Hart, R., J. Salick, S. Ranjitkar and J. Xu. 2014. Herbarium specimens show contrasting phenological responses to Himalayan climate. 2014. Proceedings of the National Academy of Sciences 111:29 pgs. 10615-10619.
- Majure, L., W. Judd, P. Soltis and D. Soltis. 2017. Taxonomic revision of the *Opuntia humifusa* complex of the eastern United States. Phytotaxa Vol. 290:1.
- Primack, R. and A. Gallant. 2017. Insights into grass phenology from herbarium specimens. New Phytologist 213:4 pgs 1567-1568.
- Spooner, D., A. Clausen, I. Peralta and N. Alvarez. 2016. Taxonomy of wild potatoes and their relatives in southern South America. Systematic Botany Monographs. 100:240.



University of Montana Herbarium - Curator
Department of Biological Sciences
32 Campus Drive
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Online donations can be made on the UM Herbarium webpage. Go to <http://hs.umt.edu/herbarium/> or search University of Montana Herbarium. Click the green "Renew Your Membership" button and fill out the form, indicating a Special Gift to Cabinet Fund-56I.

Thank you for your support!

MONTU NEWS BRIEFS

New Acquisitions

Peter Lesica: Approximately 150 vascular plant specimens from summer collections across northwest and southern Montana.

Joe Elliott: Approximately 175 curated moss specimens primarily from Montana.

Bruce McCune: 111 curated lichen specimens from Montana.

Peter Rice: 1 collection of *Chondrilla juncea* from Spokane County, Washington.

Marirose Kuhlman: 3 vascular plant specimens from Richland County, Montana.

Ian McDonald, University of Calgary: Curated boreal and non-boreal vascular plant specimens from Alberta.

Jessie Salix, Dorothy Wallace-Senft, and Sam Larkin, Beaverhead-Deerlodge National Forest: Various vascular plant collections from sites in southwestern Montana.

Loans for Research

Richard Halse and Barbara Wilson, Carex Working Group, Oregon State University: 26 specimens, mostly Poaceae, for accuracy of determination.

Jennifer Ackerfield, Colorado State University: 43 *Cirsium* specimens (various species) for determination.

Ken Chambers, Oregon State University: 4 specimens of *Arctostaphylos* (various species).

David Giblin, Washington State University: 4 specimens of *Minuartia austromontana*.

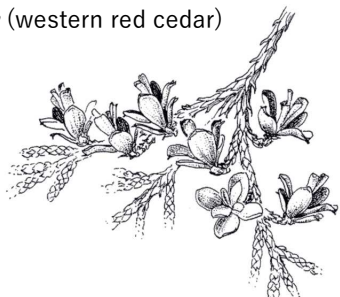
Robert Kaul, University of Nebraska: 2 *Rumex* specimens.

Don Mansfield, College of Idaho: 21 sheets of *Montia parviflora* for determination.

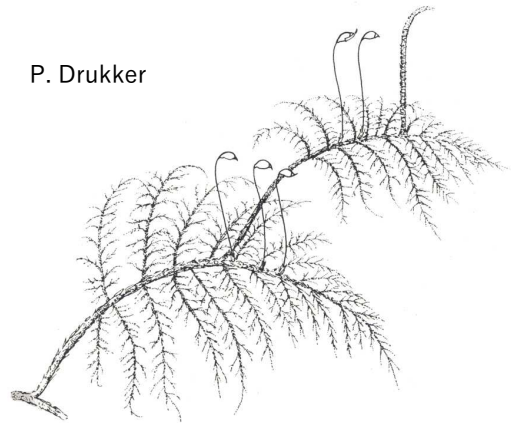
Bad News for Herbaria

A recent article in the Washington Post (March 29) announced the loss of the herbarium at the University of Louisiana at Monroe. Their museum of natural history is required to dispose of their collections to make room for expanded track facilities. If another institution will not accept their millions of plant and animal collections, they will be destroyed. According to this article, over 100 U.S. herbaria have been lost in the last 40 years. Our herbarium remains strong because of support from the general public represented by the Friends of the UM Herbarium. Let's keep up the good work.

Thuja plicata (western red cedar)



P. Drukker



Hylocomium splendens (stair-step moss)

Activities

The Clark Fork Chapter of the Montana Native Plant Society held one meeting in the herbarium during the winter of 2017. In January Peter Lesica presented on the tribes of the Grass Family.

Visitors to the MONTU Herbarium in 2016

General Public and Private Consultants

Marirose Kuhlman (MPG Ranch), Charles Hartnett, Carol Sajor, Shanna Rudio, Olivia Rudio, Barbara Rudio, B. Fitz, D. Wood, Tracy Campbell (Morrison Maierle), Julian Colescott (Catena Consulting), Tom Watson, Amy Chadwick (Great West Engineering), Kathy Lloyd, Drake Barton, Dave Hanna (TNC), Scott Mincemoyer, John Bonenitz

UM Researchers and Students

Damien Bourdon, John Harris (Anthropology), James Habeck, Plant Ecology class (UM Western), Ethnobotany class (UM), Caitlin Martin

Federal, State, Tribal, NGO Biologists

Wendy Velman (BLM), Steve Shelly (U.S. Forest Service), Andrea Pipp (Montana Natural Heritage Program), Robin Taylor-Davenport (U.S. Forest Service), Annalisa Ingegno (U.S. Forest Service), Yvette Ortega (U.S. Forest Service), Annamarie Oesterreich (U.S. Forest Service), Hillary Cimino (U.S. Forest Service), Jessie Salix (U.S. Forest Service), Dorothy Wallace-Senft (U.S. Forest Service), Justina Dumont (U.S. Forest Service), Sabrina Smits (U.S. Forest Service), Maria Mullins (U.S. Forest Service), Kathy Martin (U.S. Forest Service), Chris Carlson (Missoula Park & Rec.)

Other Academic Researchers

Nuri Bennet-Pierce (San Diego State U.), Kelly Allred (New Mexico State University)

Volunteers and Assistants in the Herbarium

Without our loyal and diligent herbarium volunteers and assistants MONTU's day-to-day operations would grind to a halt. A small team of skilled workers prepare new specimens for accession, assist with the photography project, and do other miscellaneous herbarium tasks every week. **A heartfelt thanks to Jordan Morey, Julia Douglas, Maggie Ross, Steve Sutherland, Randi de Santa Anna, Dorothea Kast, and Nora Leetch.**

Thanks also to **Joe Elliott**. Joe is working through MONTU's Montana bryophyte collection, confirming identifications and annotating specimens where necessary. Once this process is complete MONTU will add moss data and locations to our online database, on the Consortium of Pacific Herbaria portal.

We are always looking for more help. Please contact Shannon (Shannon.kimball@mso.umt.edu) if you are interested in lending a hand.



Maggie Ross



Steve Sutherland



Randi de Santa Anna



Jordan Morey

...Moss (Continued from page 3)

species are genetically similar across large barriers to genetic exchange such as oceans, deserts, and mountain ranges. With advances in research, interpretations regarding patterns of distribution could be refined.

According to a recent paper in the American Journal of Botany, the discovery of new moss species is approaching saturation in eastern North America. In western North America however, the discovery of new species has continued to steeply rise over the last decades due to traditional approaches of field and herbarium study. There is still a place in bryological research for a nerd with a hand lens, sturdy shoes, and an affinity for mossy places. "Mossy places" should not be construed to approximate the Hoh River rain forest where mosses festoon every available surface, but should include the dry prairie and steppe habitats of eastern Montana and peaks of every Montana mountain range. These habitats have been understudied and

have the most potential to harbor new Montana moss records. Get out there and start collecting.

Further Reading

Carter, B. E., B. Shaw, and A. J. Shaw. 2016. Endemism in the moss flora of North America. *Amer. J. Bot.* 103 (4): 769-779.

Hastings, R. 2002. Biogeography of *Grimmia teretinervis* (Bryopsida, Grimmiaceae) in North America. *The Bryologist* 105 (2): 262-266.

Lesica, P. 2012. *Manual of Montana Vascular Plants*. Brit Press.

Lesica, P. *Plant endemism in Montana*. 2015. Friends of the University of Montana Herbarium Newsletter.

Medina, N., I. Draper, and F. Lara. 2011. Biogeography of mosses and allies: does size matter? In: *Biogeography of microorganisms: is everything small everywhere?* Edit. D. Fontaneto. Cambridge University Press. The Systematics Association.

Schofield, W. B. 1980. *Phytogeography of the mosses of North America (north of Mexico)* In: *The mosses of North America*. Edit. R. J. Taylor and A. L. Leviton. Pacific Division American Association for the Advancement of Science.

YES! *I want to help protect the irreplaceable collections and enhance the facilities of the University of Montana Herbarium*

- | | | |
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| <input type="checkbox"/> | HONORARIUM FUND | \$_____ |



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Dues are for a period of **two** years. Dues for current members are payable in even-numbered years. New memberships are accepted at any time. All contributions to the Friends are tax deductible to the full extent provided by law. All checks should be made payable to: U.M. Foundation/Friends of the U.M. Herbarium-Fund #29H.

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