Black Hills Bryophytes:
Surveys, Identification, and Compilation of Species Data

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Abstract:

Based on a review of the literature, herbaria records, and individual records, a checklist of the bryophytes of the Black Hills of Wyoming and South Dakota is presented. The Black Hills bryoflora includes some 351 species and varieties: 45 liverworts and 307 mosses. Given the number records found (3787 records representing no more than 2870 collections), and the fact that approximately one-third of the species recorded have only been collected once, it is apparent that the Black Hills is exceedingly under-recorded bryologically. A better knowledge of the species diversity, distribution, frequency and ecology of bryophyte species in the Black Hills will be a prerequisite for proposals of appropriate conservation measures in this unique island on the plains.

Keywords. Bryophytes, Black Hills

Work Completed:

1. **Surveys and Identification:**

   During the summer of 2012, I collected bryophyte specimens from 6 sites in the Black Hills in southeastern Lawrence County, South Dakota.

   The specimens have been identified by James Walton of Port Alsworth, Alaska, Peter Nelson of Kyle, South Dakota, and me. Although my proposal was to collect 150-180 packets, I actually made 234 collections with many of the packets containing multiple species. About 207 identifications have been made within the packets and approximately 60 of the packets still need some id work. The majority of the packets are presently in route from Alaska to South Dakota. Arrangements have been made with Dr. Mark Gabel for housing the specimens at the Herbarium at Black Hills State University once they all in my hands again. One packet has been forwarded to Martin Hutten in California for verification on a liverwort species.

   My 2012 collections may be viewed in the main database: Key #28520-31250 and in the database file report '2012 Zimmerman'.

Here is a summary of the number of species from each site surveyed:

Site 1: Jim Creek, collections 1-35	16 spp.
Site 2: Unlogged Plateau, collections 36-70	17 spp.
Site 3: Ephemeral Tributary, collections 71-105	21 spp.
Site 4: Steep North-facing, collections 106-161	25 spp.
Site 5: Plateau Logged, collections 162-182	7 spp.
Site 5a: Edge of Plateau Logged, collections 183-198	9 spp.
Site 6: Soils Under Grasses, collections 199-224	10 spp.
Site 6a: Edge of Soils Under Grasses, collections 225-234	8 spp.

It appears that these collections from **2012** *combined* with those that were made with Grace Kostel in 2008 and Jill Larson Wellborn in 2011 have added taxa to the list of bryophytes known to the Black Hills:

Homomallium adnatum, 2008
Oncophorus virens, 2012
Ptilidium ciliare, 2012
Ptilidium pulcherrimum, 2008, 2011
Riccardia latifrons, 2012
Rosulabryum flaccidum, 2008
Rosulabryum laevifilum, 2008
Schistidium confertum, 2008
Schistidium papillosum, 2008

2. Compilation of Species Data:

Using the Black Hills ecoregion as defined by J. Hall, , H.J. Marriott, and J.K. Perot. in Ecoregional Conservation in the Black Hills (The Nature Conservancy, Midwest Conservation Science Center, Midwestern Resource Office, Minneapolis, MN. 2002), I searched for collection records that would answer the question, **"What bryophyte species are found in the Black Hills?"**

My research involving roughly 22 herbaria and private collections, 57 collectors, and multiple journal publications yielded 3787 records (spanning years from 1891 to 2012). In total, these records represent a total of 351 bryophyte species and variants in 59 families:

~ 283 species and 23 variants of mosses from 39 families
~ 44 species of liverworts and one variety from 20 families

~ The 4 most collected moss species are:

1. *Syntrichia ruralis*
2. *Hypnum revolutum*
3. *Eurhynchiastrum pulchellum*
4. *Dicranum scoparium*

~ The least collected moss species:

Roughly one-third of the moss species and varieties are represented by only one collection.

~ The most collected liverworts (if you can call any of them common) are:

1. *Jubula Complanata*, surprisingly edging out:
2. *Marchantia polymorpha*

~ The least collected liverwort species:

Roughly one-third of the liverwort species are represented by only one collection.

The **Black Hills Bryophytes Collections Database** is complete and can be found on the enclosed DVD. Included with the database of 3787 records of bryophyte collections from the Black Hills, you will find:

- A list of Black Hills Bryophyte Species which includes all synonyms used in the database records, global status rankings and partial distributions from NatureServe.org, and numbers of collections and records for each species.
- Collectors and Herbaria reports
- A report of my collections from 2012
- A handy dropdown list containing species lists for many Black Hills locations.

The enclosed DVD also contains the document 'Black Hills Bryophytes File Description' which defines all columns of the database and includes a table of popular collection sites with longitude/latitude coordinates. There are also some helpful maps included in this document. Another document on the DVD has a simple species list and a folder on the DVD contains many files which are helpful to anyone wanting to use coordinates in the database for GIS mapping.

Species names recorded in the original records have been maintained in the database and an additional column makes note of the currently accepted name for each taxon. None of the original records have been re-verified and I make no claim of the accuracy of the records, but merely pass them on.

This material has also been given to Chelsea Monks, head botanist with the Black Hills National Forest who will share it with the district botanists via their file sharing system. Receipt of this information is very timely given the successful workshop that Peter Nelson and I provided for the botanists in December 2012.

Stories of Struggle and Success: Not all herbaria have online databases. Attempts to gain information through other resources were met with some

successes and some failures. I put out a plea for collection information on 'Bryonet', an international list-serve for bryologists. From that, I received a number of responses including one from Katherine Slade, the curator at the National Museum of Wales who provided information on the one collection from the Black Hills held in their herbarium. The collection was of '*Sphagnum teres*', one of Steven Churchill's that was split up into many vouchers (records of this collection popped up in many herbarium records) and in this case used in a world-wide exchange. It is a significant collection because it has only been found at one location in the Black Hills, south of Rochford.

Another notable contact made through Bryonet was one with Malcolm Sargent, who had collected in the Black Hills in 1983 as part of a 'foray' of the American Bryological and Lichenological Society when the who's who of Bryology and Lichenology convened for several days in August to visit 7 sites. Dr. Sargent did not have complete information on his collections, but over the course of many communications, he was able to provide me with what I feel to be a significant contribution to the total project since his information lent the addition of many taxa to the species list.

Not every contact lead directly to collection records, but I am grateful for those who took time to let me know if they had collections or not, or knew of where I could find records of Black Hills bryophyte collections. In a couple of cases, there exists the possibility of some records, but the only way to investigate is to actually go to that institution to peruse their vouchers, and that is out of the scope of the current project. I will take opportunities that arise in the future to update this database in t his way.

There are some resources that I have been unsuccessful in tapping into. Dr. Esslinger, Professor Emeritas at NDSU has not responded to my queries. I'm sure that if I was able to go to Fargo to look at collections there, I would not only have information from people at NDSU, but also of the collections made by SDSU's Dr. Berry that were sent to NDSU (this from communications with Dr. Gary Larson, SDSU).

Although unable to get information about possible other collections at the Bell Museum Plant Collections at the University of Minnesota (personal correspondence with Dr. Anita Cholewa), I was able to obtain extensive data from collections held there via correspondence with some important collectors, Eric Grimm and Jan Janssens.

I called The Rocky Mountain Herbarium and spoke with Dr. Ron Hartman. He said they had bryophyte collections, but he did not think any were from the Black Hills. He thought that most were the collections of Yelena Kosovich-Anderson and Martin Lenz, both whom I have known to make collections in the Big Horns. Yelena Kosovich –Anderson made determinations on the 2011

collections made by Jill Larson Welborn with me, but I already had those records.

In compiling the data and researching the currently accepted name - this I felt was necessary in order get a real picture of the number of species occurring in the Black Hills - I treated the Bryophyte Flora of North America, Vol. 27 as the authority. Although Vols. 28 and 29 are not out in hardcopy yet, most of Vol. 28 is available online and some of Vol. 29 is as well. Where the information that I wanted was not available, I turned to The Plant List and Natureserve, both online resources. To give an example of the effects of this, in the family Amblystegiaceae, because of reorganization of the taxa, approximately 50 species turns out to be about 30 species. Synonyms listed are those found in Black Hills records only. I chose not to list all synonyms for any given taxon as in some cases, there could be even 20 or more synonyms, but only a couple that have been used in Black Hills collections. For purposes of this database, this keeps it cleaner and the full synonym information is available from other sources to anyone wanting it.

Assessment of Work Needed:

In addition to ferreting out herbaria collections that are not on online databases, there is much to be done in the way of surveys. There are many areas of the Black Hills where surveys have never been conducted. The area where I've conducted the 2012 surveys (southeastern Lawrence County) was one such area until 2008. It is interesting to note that *Ptilildium pulcherimum* was recorded in this general area at 3 separate locations during surveys with Jill Larson (2011), Grace Kostel (2008). In 2012, I observed this species again, but did not collect it. Although there are no other records of *Ptilildium pulcherimum* in this database of 3787 records, I saw it in December 2012 above the trail at Horsethief Lake. This case is one simple illustration of the need to conduct more surveys, for without them, we have no complete picture of diversity, distribution, and habitat. Supporting this idea is the fact that about one-third of the species recorded are represented by only one collection. Meaningful conservation measures cannot be developed without full knowledge.

Acknowledgements:

A request made via 'Bryonet', a service of the International Association of Bryologists (IAB) administered by Janice Glime through Michigan Technological University yielded much appreciated responses from: Dr. Richard E. Andrus (Binghampton University), Dr. Malcolm Sargent (University of Illinois), Katherine Slade, (National Museum of Wales), Brian Heitz (Duke University), Dr. Jon Shaw

(Duke University), and Dr. Claudio Delgadillo Moya (Universidad Nacional Autónoma de México).

Personal correspondence (by email or phone) with the following individuals was so helpful: Dr. Eric Grimm (Illinois State Museum), Dr. Jan Janssens (Minnesota DNR Volunteer, State Bryologist), Dr. Linda Fuselier (Minnesota State University Moorhead), Dr. Ron Hartman (Rocky Mountain Herbarium), Dr. Gary E. Larson (South Dakota State University), Dr. Shawn DeKeyser (North Dakota State University).

Finally, the Black Hills Bryophytes Database would not have been possible without direct assistance, encouragement, and support of several individuals:

- Ralph Kopp doggedly chipped away at the mechanics of the database and the resulting reports and maps.
- James Walton identified the bulk of my own collections for the project.
- Peter Nelson, in addition to making some of the determinations for my collections, worked to teach me how to make identifications in the lab and verified my work.
- Rylan Sprague, Northern Hills District Botanist, USFS, provided a GPS and mapping support for my collections.

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Black Hills Bryophytes Species List

Phylum	Family	CurrentAcceptedName	Global Rank	# of Records	# of Collections	Records w/o Collection #
Bryophyta	Amblystegiaceae			11	11	0
Bryophyta	Amblystegiaceae	Amblystegium serpens	G5T5	23	20	3
Bryophyta	Amblystegiaceae	Campyliadelphus chrysophyllus	G5	23	15	3
Bryophyta	Amblystegiaceae	Campylium radicale	G3G5	1	1	0
Bryophyta	Amblystegiaceae	Campylophyllum hispidulum	G4G5	15	6	4
Bryophyta	Amblystegiaceae	Conardia compacta	G3G5	11	11	0
Bryophyta	Amblystegiaceae	Cratoneuron commutatum	G4G5	3	2	1
Bryophyta	Amblystegiaceae	Cratoneuron filicinum	G5	36	27	3
Bryophyta	Amblystegiaceae	Drepanocladus aduncus	G5	30	23	2
Bryophyta	Amblystegiaceae	Drepanocladus aduncus var. aduncus	G5T5	1	1	0
Bryophyta	Amblystegiaceae	Drepanocladus longifolius	GNR	2	1	0
Bryophyta	Amblystegiaceae	Drepanocladus polycarpus		3	3	0
Bryophyta	Amblystegiaceae	Drepanocladus sendtneri		1	0	1
Bryophyta	Amblystegiaceae	Hygroamblystegium tenax var. spinifolium	G5TNR	1	1	0
Bryophyta	Amblystegiaceae	Hygroamblystegium varium	GNRT NR	32	20	8
Bryophyta	Amblystegiaceae	Hygroamblystegium varium ssp. varium	GNRT NR	1	0	1
Bryophyta	Amblystegiaceae	Hygroamblystegium varium subsp. noterophilum	G4	11	7	3
Bryophyta	Amblystegiaceae	Hygrohypnum bestii	G4	5	4	1
Bryophyta	Amblystegiaceae	Hygrohypnum luridum	G5	3	2	1
Bryophyta	Amblystegiaceae	Leptodictyum riparium	G5	14	7	2
Bryophyta	Amblystegiaceae	Limprichtia revolvens	G4G5	1	1	0
Bryophyta	Amblystegiaceae	Palustriella falcata		1	1	0
Bryophyta	Amblystegiaceae	Platydictya confervoides	G4G5	1	1	0
Bryophyta	Amblystegiaceae	Platydictya jungermannioides	G5	3	2	1
Bryophyta	Amblystegiaceae	Sanionia uncinata	G5	15	9	4
Bryophyta	Amblystegiaceae	Straminergon stramineum	G5	8	8	0
Bryophyta	Anomodontaceae	Anomodon attenuatus	G5	51	22	10
Bryophyta	Anomodontaceae	Anomodon rostratus	G5	24	14	5
Bryophyta	Aulacomniaceae	Aulacomnium androgynum	G5	18	8	5
Bryophyta	Aulacomniaceae	Aulacomnium palustre	G5	43	27	9
Bryophyta	Bartramiaceae	Bartramia pomiformis	G5	11	3	3
Bryophyta	Bartramiaceae	Bartramia pomiformis var. pomiformis		1	1	0
Bryophyta	Bartramiaceae	Bartramia potosica	GNR	3	2	0

Bryophyta	Bartramiaceae	Bartramia subulata		1	0	1
Bryophyta	Bartramiaceae	Philonotis fontana	G5	3	2	1
Bryophyta	Bartramiaceae	Philonotis fontana var. fontana	G5T5	2	2	0
Bryophyta	Bartramiaceae	Philonotis fontana var. pumila	G5T4T5	1	1	0
Bryophyta	Brachytheciaceae			8	8	0
Bryophyta	Brachytheciaceae	Brachythecium acuminatum	G5	4	3	1
Bryophyta	Brachytheciaceae	Brachythecium albicans	G5	8	7	1
Bryophyta	Brachytheciaceae	Brachythecium calcareum	G3G4	2	1	0
Bryophyta	Brachytheciaceae	Brachythecium collinum	G5?	15	6	4
Bryophyta	Brachytheciaceae	Brachythecium erythrorrhizon	G5	3	2	1
Bryophyta	Brachytheciaceae	Brachythecium glareosum		4	1	3
Bryophyta	Brachytheciaceae	Brachythecium laetum	G5	4	2	1
Bryophyta	Brachytheciaceae	Brachythecium oedipodium	G4G5	2	2	0
Bryophyta	Brachytheciaceae	Brachythecium oxycladon	G5	8	2	6
Bryophyta	Brachytheciaceae	Brachythecium reflexum	G5	1	1	0
Bryophyta	Brachytheciaceae	Brachythecium rivulare	G5	40	30	5
Bryophyta	Brachytheciaceae	Brachythecium rivulare var. cataractarum		1	0	1
Bryophyta	Brachytheciaceae	Brachythecium rutabulum	G5	4	2	1
Bryophyta	Brachytheciaceae	Brachythecium salebrosum	G5	28	23	4
Bryophyta	Brachytheciaceae	Brachythecium salebrosum var. salebrosum	G5TNR	3	3	0
Bryophyta	Brachytheciaceae	Brachythecium velutinum	G5	12	9	2
Bryophyta	Brachytheciaceae	Brachythecium velutinum var. velutinum	G5TNR	1	0	1
Bryophyta	Brachytheciaceae	Eurhynchiastrum pulchellum	G5	69	45	10
Bryophyta	Brachytheciaceae	Eurhynchiastrum pulchellum var. pulchellum	G5TNR	18	13	0
Bryophyta	Brachytheciaceae	Homalothecium aeneum		1	0	1
Bryophyta	Brachytheciaceae	Homalothecium fulgescens	G4	2	1	1
Bryophyta	Brachytheciaceae	Homalothecium lutescens		1	1	0
Bryophyta	Brachytheciaceae	Homalothecium nevadense	G4	4	1	0
Bryophyta	Brachytheciaceae	Homalothecium pinnatifidum	G4	2	0	2
Bryophyta	Brachytheciaceae	Rhynchostegium serrulatum	G5	1	1	0
Bryophyta	Brachytheciaceae	Scleropodium cespitans	G4	1	1	0
Bryophyta	Brachytheciaceae	Tomentypnum nitens	G5	3	2	1
Bryophyta	Bryaceae			4	3	1
Bryophyta	Bryaceae	Bryum alpinum	G4G5	2	2	0
Bryophyta	Bryaceae	Bryum argenteum	G5	11	8	3
Bryophyta	Bryaceae	Bryum capillare var. capillare	G5T5	1	1	0
Bryophyta	Bryaceae	Bryum dichotomum	G3G5	2	1	1
Bryophyta	Bryaceae	Bryum uliginosum	G3G5	1	1	0

Bryophyta	Bryaceae	Gemmabryum caespiticium	G5	24	14	8
Bryophyta	Bryaceae	Leptobryum pyriforme	G5	18	9	5
Bryophyta	Bryaceae	Ptychostomum creberrimum	G5T5	24	20	1
Bryophyta	Bryaceae	Ptychostomum lonchocaulon	G5?	1	0	1
Bryophyta	Bryaceae	Ptychostomum pallens	G4G5	1	0	1
Bryophyta	Bryaceae	Ptychostomum pendulum	G4G5	8	6	1
Bryophyta	Bryaceae	Ptychostomum pseudotriquetrum	G5	25	22	3
Bryophyta	Bryaceae	Ptychostomum weigelii	G4G5	11	4	3
Bryophyta	Bryaceae	Rhodobryum ontariense	G5	3	1	2
Bryophyta	Bryaceae	Rosulabryum capillare	G5	20	13	3
Bryophyta	Bryaceae	Rosulabryum flaccidum	G5	1	0	1
Bryophyta	Bryaceae	Rosulabryum laevifilum		1	0	1
Bryophyta	Calliergonaceae	Campylium stellatum	G5T5	1	1	0
Bryophyta	Calliergonaceae	Warnstorfia fluitans	G5	10	8	2
Bryophyta	Calliergonaceae	Warnstorfia pseudostraminea	G3G4	1	1	0
Bryophyta	Climaciaceae	Climacium americanum		1	0	1
Bryophyta	Climaciaceae	Climacium dendroides	G5	64	42	9
Bryophyta	Dicranaceae			5	5	0
Bryophyta	Dicranaceae	Cynodontium alpestre	G3G5	6	6	0
Bryophyta	Dicranaceae	Cynodontium strumiferum		1	0	1
Bryophyta	Dicranaceae	Cynodontium strumulosum		1	0	1
Bryophyta	Dicranaceae	Cynodontium tenellum	G3G5Q	6	2	1
Bryophyta	Dicranaceae	Dichodontium pellucidum	G4G5	1	1	0
Bryophyta	Dicranaceae	Dicranella cerviculata	G5?	1	0	1
Bryophyta	Dicranaceae	Dicranella schreberiana	G5	2	2	0
Bryophyta	Dicranaceae	Dicranoweisia cirrata	G4	1	1	0
Bryophyta	Dicranaceae	Dicranoweisia crispula	G4G5	11	10	1
Bryophyta	Dicranaceae	Dicranum bonjeanii	G4G5	3	2	1
Bryophyta	Dicranaceae	Dicranum brevifolium	GU	3	1	1
Bryophyta	Dicranaceae	Dicranum elongatum	G5	1	1	0
Bryophyta	Dicranaceae	Dicranum flagellare	G5	35	17	6
Bryophyta	Dicranaceae	Dicranum fuscescens	G5	4	3	1
Bryophyta	Dicranaceae	Dicranum majus	G4G5	1	1	0
Bryophyta	Dicranaceae	Dicranum montanum	G5	2	1	1
Bryophyta	Dicranaceae	Dicranum muehlenbeckii	G3G5	17	11	3
Bryophyta	Dicranaceae	Dicranum ontariense	G4G5	8	1	2
Bryophyta	Dicranaceae	Dicranum polysetum	G5	25	8	5
Bryophyta	Dicranaceae	Dicranum scoparium	G5	78	38	8
Bryophyta	Dicranaceae	Dicranum tauricum	G4	33	17	5
Bryophyta	Dicranaceae	Dicranum undulatum	G5	1	1	0
Bryophyta	Dicranaceae	Oncophorus virens	G5	1	1	0

Bryophyta	Dicranaceae	Oncophorus wahlenbergii	G5	28	18	4
Bryophyta	Dicranaceae	Paraleucobryum enerve	G5?	2	0	2
Bryophyta	Dicranaceae	Paraleucobryum longifolium	G5	38	18	5
Bryophyta	Dicranaceae	Rhabdoweisia crispata	G5	2	2	0
Bryophyta	Ditrichaceae			1	0	1
Bryophyta	Ditrichaceae	Ceratodon purpureus	G5	46	36	5
Bryophyta	Ditrichaceae	Ceratodon purpureus var. purpureus	G5T5	8	8	0
Bryophyta	Ditrichaceae	Distichium capillaceum	G5	46	23	5
Bryophyta	Ditrichaceae	Distichium inclinatum	G4G5	1	1	0
Bryophyta	Ditrichaceae	Ditrichum capillare		1	1	0
Bryophyta	Ditrichaceae	Saelania glaucescens	G4G5	5	3	1
Bryophyta	Encalyptaceae			1	1	0
Bryophyta	Encalyptaceae	Encalypta ciliata	G5	26	17	2
Bryophyta	Encalyptaceae	Encalypta procera	G4G5	27	12	6
Bryophyta	Encalyptaceae	Encalypta rhaptocarpa	G4G5	8	3	3
Bryophyta	Encalyptaceae	Encalypta vulgaris	G5	21	10	2
Bryophyta	Entodontaceae			1	1	0
Bryophyta	Fabroniaceae	Fabronia ciliaris		1	0	1
Bryophyta	Fissidentaceae	Fissidens bryoides	G5	4	1	2
Bryophyta	Fontinalaceae	Fontinalis antipyretica	G5	15	6	4
Bryophyta	Fontinalaceae	Fontinalis hypnoides	G4G5	7	2	2
Bryophyta	Funariaceae	Funaria hygrometrica	GNR	18	9	4
Bryophyta	Funariaceae	Funaria hygrometrica var. convoluta		1	0	1
Bryophyta	Grimmiaceae			5	5	0
Bryophyta	Grimmiaceae	Coscinodon calyptratus	G3G5	25	14	2
Bryophyta	Grimmiaceae	Grimmia affinis	G4G5	5	3	2
Bryophyta	Grimmiaceae	Grimmia anodon	G4G5	7	5	2
Bryophyta	Grimmiaceae	Grimmia donniana	G4G5	2	2	0
Bryophyta	Grimmiaceae	Grimmia elatior	G3G5	3	2	0
Bryophyta	Grimmiaceae	Grimmia incurva		1	0	1
Bryophyta	Grimmiaceae	Grimmia laevigata	G5	4	1	1
Bryophyta	Grimmiaceae	Grimmia longirostris		16	15	1
Bryophyta	Grimmiaceae	Grimmia ovalis	G5?	4	4	0
Bryophyta	Grimmiaceae	Grimmia ovalis var. affinis		1	1	0
Bryophyta	Grimmiaceae	Grimmia pilifera	G4G5	3	1	1
Bryophyta	Grimmiaceae	Grimmia plagiopodia	G4G5	23	17	3
Bryophyta	Grimmiaceae	Grimmia pulvinata	G4G5	2	1	1
Bryophyta	Grimmiaceae	Grimmia sessitana	G3G5	1	1	0
Bryophyta	Grimmiaceae	Grimmia teretinervis	G3G5	2	1	0
Bryophyta	Grimmiaceae	Grimmia trichophylla	G5?	2	1	1

Bryophyta	Grimmiaceae	Jaffueliobryum raui	G4?	8	5	1
Bryophyta	Grimmiaceae	Jaffueliobryum wrightii	G4G5	4	3	1
Bryophyta	Grimmiaceae	Racomitrium canescens	G5	1	1	0
Bryophyta	Grimmiaceae	Schistidium agassizii	G3G5	4	3	1
Bryophyta	Grimmiaceae	Schistidium apocarpum	GNR	9	8	1
Bryophyta	Grimmiaceae	Schistidium confertum		1	0	1
Bryophyta	Grimmiaceae	Schistidium crassipilum	GNRQ	1	1	0
Bryophyta	Grimmiaceae	Schistidium papillosum	GNR	1	0	1
Bryophyta	Grimmiaceae	Schistidium rivulare	G4G5	3	3	0
Bryophyta	Grimmiaceae	Schistidium robustum	GNR	2	2	0
Bryophyta	Hedwigiaceae	Hedwigia ciliata	G5	69	38	11
Bryophyta	Helodiaceae	Helodium blandowii	G5	2	2	0
Bryophyta	Hylocomiaceae	Hylocomium splendens	G5	45	23	8
Bryophyta	Hylocomiaceae	Pleurozium schreberi	G5	43	24	7
Bryophyta	Hylocomiaceae	Rhytidiadelphus triquetrus	G5	10	2	3
Bryophyta	Hypnaceae			6	3	3
Bryophyta	Hypnaceae	Campylophyllum sommerfeltii	GNR	2	2	0
Bryophyta	Hypnaceae	Herzogiella turfacea	G4G5	5	2	2
Bryophyta	Hypnaceae	Homomallium adnatum	G3G5	1	0	1
Bryophyta	Hypnaceae	Homomallium mexicanum	G3G5	3	1	1
Bryophyta	Hypnaceae	Hypnum andoi	G3G5	2	2	0
Bryophyta	Hypnaceae	Hypnum cupressiforme	G5	34	20	6
Bryophyta	Hypnaceae	Hypnum cupressiforme var. cupressiforme	G5T5	11	11	0
Bryophyta	Hypnaceae	Hypnum cupressiforme var. filiforme	G5TNR	4	4	0
Bryophyta	Hypnaceae	Hypnum cupressiforme var. lacunosum	G5T4T5	5	3	0
Bryophyta	Hypnaceae	Hypnum imponens	G5	1	1	0
Bryophyta	Hypnaceae	Hypnum lindbergii	G5	15	9	5
Bryophyta	Hypnaceae	Hypnum pallescens	G5	27	12	6
Bryophyta	Hypnaceae	Hypnum revolutum	G5	104	49	12
Bryophyta	Hypnaceae	Hypnum revolutum var. revolutum	G5TNR	4	4	0
Bryophyta	Hypnaceae	Hypnum vaucheri	G3G5	29	18	4
Bryophyta	Hypnaceae	Platygyrium repens	G5	15	6	3
Bryophyta	Hypnaceae	Ptilium crista-castrensis	G5	21	8	6
Bryophyta	Hypnaceae	Pylaisia intricata		1	0	1
Bryophyta	Hypnaceae	Pylaisia polyantha	G5	55	36	8
Bryophyta	Leskeaceae			2	2	0
Bryophyta	Leskeaceae	Leskeella nervosa	G5	19	15	1
Bryophyta	Leskeaceae	Pseudoleskea radicosa	G5	4	1	1
Bryophyta	Leskeaceae	Pseudoleskeella tectorum	G5	47	29	6

Bryophyta	Mielichhoferiaceae	Pohlia cruda	G5	35	24	4
Bryophyta	Mielichhoferiaceae	Pohlia longicolla	G4G5	3	1	1
Bryophyta	Mielichhoferiaceae	Pohlia longicollis	G4G5	1	1	0
Bryophyta	Mielichhoferiaceae	Pohlia nutans	G5	47	33	6
Bryophyta	Mielichhoferiaceae	Pohlia proligera	G4G5	4	1	2
Bryophyta	Mielichhoferiaceae	Pohlia wahlenbergii	G5	10	8	2
Bryophyta	Mniaceae			4	3	1
Bryophyta	Mniaceae	Mnium ambiguum	G5	5	3	1
Bryophyta	Mniaceae	Mnium lycopodioides		3	2	0
Bryophyta	Mniaceae	Mnium marginatum	G5	21	14	2
Bryophyta	Mniaceae	Mnium orthorrhynchum	G4G5	3	1	1
Bryophyta	Mniaceae	Mnium spinulosum	G5	12	4	3
Bryophyta	Mniaceae	Mnium thomsonii	G5	12	8	1
Bryophyta	Mniaceae	Plagiomnium affine		2	1	1
Bryophyta	Mniaceae	Plagiomnium ciliare	G5	4	2	2
Bryophyta	Mniaceae	Plagiomnium cuspidatum	G5	61	33	10
Bryophyta	Mniaceae	Plagiomnium ellipticum	G5	34	25	2
Bryophyta	Mniaceae	Plagiomnium medium	G5	7	2	2
Bryophyta	Mniaceae	Rhizomnium pseudopunctatum	G5	2	0	2
Bryophyta	Mniaceae	Rhizomnium punctatum	G5	1	1	0
Bryophyta	Myriniaceae	Schwetschkeopsis fabronia	G5	1	1	0
Bryophyta	Neckeraceae	Neckera menziesii	G4G5	27	14	3
Bryophyta	Neckeraceae	Neckera pennata	G5	27	9	4
Bryophyta	Neckeraceae	Neckera pennata var. oligocarpa		1	1	0
Bryophyta	Orthotrichaceae			3	3	0
Bryophyta	Orthotrichaceae	Orthodicranm affine		1	0	1
Bryophyta	Orthotrichaceae	Orthodicranum jamesianum		1	0	1
Bryophyta	Orthotrichaceae	Orthotrichum affine	G3G5	5	4	0
Bryophyta	Orthotrichaceae	Orthotrichum alpestre	G4G5	8	6	2
Bryophyta	Orthotrichaceae	Orthotrichum anomalum	G4G5	31	21	5
Bryophyta	Orthotrichaceae	Orthotrichum cupulatum	G4G5	2	2	0
Bryophyta	Orthotrichaceae	Orthotrichum diaphanum	G5	2	1	0
Bryophyta	Orthotrichaceae	Orthotrichum hallii	G4	7	4	1
Bryophyta	Orthotrichaceae	Orthotrichum laevigatum	GU	10	5	1
Bryophyta	Orthotrichaceae	Orthotrichum obtusifolium	G5	13	8	3
Bryophyta	Orthotrichaceae	Orthotrichum pellucidum	G3G5	12	7	2
Bryophyta	Orthotrichaceae	Orthotrichum pumilum	G5	6	6	0
Bryophyta	Orthotrichaceae	Orthotrichum rupestre	G4G5	53	32	7
Bryophyta	Orthotrichaceae	Orthotrichum speciosum	G5	6	6	0
Bryophyta	Orthotrichaceae	Orthotrichum strangulatum	G4	7	4	1
Bryophyta	Orthotrichaceae	Ulota hutchinsiae	G5	13	4	2

Bryophyta	Orthotrichaceae	Ulota hutchinsiae var. hutchinsiae	G5T5	1	1	0
Bryophyta	Plagiotheciaceae	Plagiothecium cavifolium	G5	2	2	0
Bryophyta	Plagiotheciaceae	Plagiothecium denticulatum	G5	1	1	0
Bryophyta	Polytrichaceae	Atrichum altecristatum	G4G5Q	4	4	0
Bryophyta	Polytrichaceae	Atrichum selwynii	G4	40	16	7
Bryophyta	Polytrichaceae	Atrichum undulatum	G5	1	0	1
Bryophyta	Polytrichaceae	Atrichum undulatum var. selwynii	G4	1	1	0
Bryophyta	Polytrichaceae	Polytrichastrum alpinum	G4G5	17	6	3
Bryophyta	Polytrichaceae	Polytrichastrum longisetum	G5	1	1	0
Bryophyta	Polytrichaceae	Polytrichum commune	G5	6	4	2
Bryophyta	Polytrichaceae	Polytrichum jensenii		4	2	2
Bryophyta	Polytrichaceae	Polytrichum juniperinum	G5	49	34	5
Bryophyta	Polytrichaceae	Polytrichum piliferum	G5	47	33	4
Bryophyta	Polytrichaceae	Polytrichum strictum	G4	13	12	1
Bryophyta	Pottiaceae			1	0	1
Bryophyta	Pottiaceae	Barbula convoluta	G5	3	1	2
Bryophyta	Pottiaceae	Barbula unguiculata	G5	4	3	0
Bryophyta	Pottiaceae	Bryoerythrophyllum recurvirostre	G5	12	7	4
Bryophyta	Pottiaceae	Bryoerythrophyllum recurvirostrum	G5	21	15	2
Bryophyta	Pottiaceae	Crumia latifolia	G3	4	1	2
Bryophyta	Pottiaceae	Didymodon fallax	G5	4	2	1
Bryophyta	Pottiaceae	Didymodon recurvirostris	G5	4	4	0
Bryophyta	Pottiaceae	Didymodon rigidicaulis	G5T5?	1	0	1
Bryophyta	Pottiaceae	Didymodon rigidulus	G5	5	3	2
Bryophyta	Pottiaceae	Didymodon rigidulus var. gracilis	G5T5?	9	7	1
Bryophyta	Pottiaceae	Didymodon tophaceus	G5	9	4	1
Bryophyta	Pottiaceae	Gymnostomum aeruginosum	G5	7	6	1
Bryophyta	Pottiaceae	Gymnostomum calcareum	G5?	2	0	2
Bryophyta	Pottiaceae	Hymenostylium recurvirostrum	G5	17	8	3
Bryophyta	Pottiaceae	Pterygoneurum ovatum	G5	2	2	0
Bryophyta	Pottiaceae	Syntrichia laevipila	G5	8	3	2
Bryophyta	Pottiaceae	Syntrichia montana	GNR	1	1	0
Bryophyta	Pottiaceae	Syntrichia papillosa	G5	6	1	2
Bryophyta	Pottiaceae	Syntrichia ruralis	G5	89	58	11
Bryophyta	Pottiaceae	Tortella alpicola	G4G5	1	1	0
Bryophyta	Pottiaceae	Tortella fragilis	G5	1	1	0
Bryophyta	Pottiaceae	Tortella tortuosa	G5	36	14	8
Bryophyta	Pottiaceae	Tortella tortuosa var. tortuosa		1	1	0
Bryophyta	Pottiaceae	Tortula atrovirens	G5?	1	1	0

Bryophyta	Pottiaceae	Tortula hoppeana	G4G5	2	2	0
Bryophyta	Pottiaceae	Tortula mucronifolia	G5	21	14	4
Bryophyta	Pottiaceae	Tortula norvegica	G5	5	2	1
Bryophyta	Pottiaceae	Tortula obtusifolia	G5	18	10	5
Bryophyta	Pottiaceae	Tortula plinthobia	G4G5	1	1	0
Bryophyta	Pottiaceae	Weissia condensa	G5?	1	1	0
Bryophyta	Pottiaceae	Weissia controversa	G5	5	3	1
Bryophyta	Pterigynandraceae	Myurella sp.		1	1	0
Bryophyta	Pterigynandraceae	Pterigynandrum filiforme	G4G5	43	24	5
Bryophyta	Rhytidiaceae	Rhytidium rugosum	G5	59	27	7
Bryophyta	Seligeriaceae	Seligeria campylopoda	G3G5	1	0	1
Bryophyta	Sematophyllaceae	Brotherella sp.		1	1	0
Bryophyta	Sphagnaceae	Sphagnum angustifolium	G5	1	1	0
Bryophyta	Sphagnaceae	Sphagnum capillifolium	G5	3	2	1
Bryophyta	Sphagnaceae	Sphagnum fallax	G5	1	1	0
Bryophyta	Sphagnaceae	Sphagnum fimbriatum	G5	17	15	2
Bryophyta	Sphagnaceae	Sphagnum fuscum	G5	2	1	1
Bryophyta	Sphagnaceae	Sphagnum russowii	G5	27	26	1
Bryophyta	Sphagnaceae	Sphagnum squarrosum	G5	20	10	4
Bryophyta	Sphagnaceae	Sphagnum tenerum	G5	1	1	0
Bryophyta	Sphagnaceae	Sphagnum teres	G5	15	12	2
Bryophyta	Sphagnaceae	Sphagnum viride	?	1	1	0
Bryophyta	Sphagnaceae	Sphagnum warnstorfii	G5	23	7	6
Bryophyta	Tetraphidaceae	Tetraphis pellucida	G5	23	11	4
Bryophyta	Thuidiaceae			1	0	1
Bryophyta	Thuidiaceae	Abietinella abietina	G4G5	56	33	13
Bryophyta	Thuidiaceae	Heterocladium dimorphum	G4G5	18	7	3
Bryophyta	Thuidiaceae	Thuidium delicatulum	G5	25	12	3
Bryophyta	Thuidiaceae	Thuidium delicatulum var. radicans	G5	9	6	2
Bryophyta	Thuidiaceae	Thuidium recognitum	G5	3	2	1
Bryophyta	Timmiaceae			1	1	0
Bryophyta	Timmiaceae	Timmia austriaca	G4G5	59	28	12
Bryophyta	Timmiaceae	Timmia megapolitana	G5	6	5	0
Bryophyta	Timmiaceae	Timmia megapolitana subsp. Bavarica		1	0	1
Bryophyta	Timmiaceae	Timmia megapolitana var. megapolitana	G5T4?	2	2	0
	Family # = 39	**Species #306**		**3596**	**2155**	**597**
Hepaticae	Anastrophyllaceae	Anastrophyllum minutum	G5	1	0	1
Hepaticae	Anastrophyllaceae	Barbilophozia lycopodioides	G5	2	2	0

Hepaticae	Aneuraceae	Riccardia latifrons	G4G5	1	1	0
Hepaticae	Arnelliaceae	Arnellia fennica	G5	1	1	0
Hepaticae	Aytoniaceae	Asterella saccata	G4G5	1	1	0
Hepaticae	Aytoniaceae	Asterella tenella	G5	1	1	0
Hepaticae	Cephaloziaceae	Cephalozia connivens	G5	1	1	0
Hepaticae	Cephaloziaceae	Cephalozia pleniceps	G5	5	3	2
Hepaticae	Cephaloziellaceae	Cephaloziella divaricata	G5	1	1	0
Hepaticae	Cephaloziellaceae	Cephaloziella rubella	G5	1	0	1
Hepaticae	Cleveaceae			1	1	0
Hepaticae	Cleveaceae	Athalamia hyalina	G5	1	0	1
Hepaticae	Conocephalaceae	Conocephalum conicum	G5	7	5	2
Hepaticae	Conocephalaceae	Conocephalum salebrosum	G5	2	2	0
Hepaticae	Jubulaceae	Frullania inflata	G5	6	6	0
Hepaticae	Jubulaceae	Frullania riparia	G4G5	2	1	1
Hepaticae	Jubulaceae	Jubula complanata	G4	16	14	2
Hepaticae	Jungermanniaceae			1	1	0
Hepaticae	Jungermanniaceae	Jungermannia sp.		1	1	0
Hepaticae	Jungermanniaceae	Lophozia ascendens	G4	2	1	1
Hepaticae	Jungermanniaceae	Lophozia longidens	G5	1	0	1
Hepaticae	Jungermanniaceae	Lophozia ventricosa	G5	1	0	1
Hepaticae	Jungermanniaceae	Mylia anomala	G5	3	2	1
Hepaticae	Jungermanniaceae	Tritomaria exsecta	G5	1	0	1
Hepaticae	Jungermanniaceae	Tritomaria scitula	G4	1	0	1
Hepaticae	Lepidoziaceae	Lepidozia reptans	G5	3	2	1
Hepaticae	Lophocoleaceae	Chiloscyphus minor	G5	4	3	1
Hepaticae	Lophocoleaceae	Chiloscyphus pallescens	G5	2	2	0
Hepaticae	Lophocoleaceae	Chiloscyphus polyanthos	G5	2	1	1
Hepaticae	Lophocoleaceae	Chiloscyphus polyanthos var.rivularis		1	0	1
Hepaticae	Lophocoleaceae	Chiloscyphus profundus	G5	3	3	0
Hepaticae	Marchantiaceae	Dumortiera hirsuta	G5	1	1	0
Hepaticae	Marchantiaceae	Marchantia polymorpha	G5	13	11	1
Hepaticae	Marchantiaceae	Preissia quadrata	G5	3	3	0
Hepaticae	Metzgeriaceae	Metzgeria pinguis		1	0	1
Hepaticae	Plagiochilaceae	Plagiochila asplenioides	G5	2	1	1
Hepaticae	Plagiochilaceae	Plagiochila porelloides	G5	4	4	0
Hepaticae	Porellaceae	Porella platyphylla	G5	9	8	0
Hepaticae	Pseudolepicoleaceae	Blepharostoma trichophyllum	G5	1	0	1
Hepaticae	Ptilidiaceae	Ptilidium ciliare	G5	1	1	0
Hepaticae	Ptilidiaceae	Ptilidium pulcherrimum	G5	3	2	1
Hepaticae	Ricciaceae	Riccia frostii	G5	2	0	2

Hepaticae	Ricciaceae	Ricciella crystallina	G4G5	1	1	0
Hepaticae	Ricciaceae	Ricciella fluitans	G5	1	1	0
Hepaticae	Scapaniaceae	Scapania apiculata		1	0	1
	Family # = 20	**Species # = 45**		**119**	**89**	**28**
Grand Total	**Family # = 59**	**Species # = 351**		**3715**	**2244**	**625**