

Colorado Bryological Hot Spots

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During our preparation of a revision of the guide to the bryophytes of Colorado (Weber 1973), current intensive field work has revealed a much more diverse flora than we had imagined fifty years ago. The revision is badly needed because at the present time there is no single volume that covers all of our bryophytes. So little has been published about them that we want to describe for amateur bryologists a few of the richest areas. We begin this series with the Boulder Mountain Park, a reserve of the City of Boulder, situated at 40 degrees North Latitude.

The Park is a photographer's dream and its trails and vistas attract thousands of visitors, joggers, and dog walkers. It protects raptorial birds by prohibiting climbing during the nesting season, and has guides and schedules many field trips and interpretive programs. Collecting of plants and animals is forbidden except by permit. Rock climbing is extremely popular; there are hundreds of routes, and as a result parts of the area have been badly trampled. The Park receives more visitors in a season than does Rocky Mountain National Park! Nevertheless, The citizens of the City of Boulder have exercised great foresight in preserving their Park and open spaces, and continue to acquire lands which still contain relatively unspoiled portions of the ecosystem.

The Continental Divide reaches its easternmost limit in North America in Boulder County; the gradient from the plains (5,000 feet) to the high peaks (13-14,000 feet) is very steep and short. It is dissected by canyons with mossy north exposures, and the alpine tundra is within a half-hour drive. The Boulder Mountain Park represents the eastern anchor of this altitudinal segment.

A jagged group of steep rock walls of arkosic conglomerate (Fountain Formation) of Pennsylvanian age forms a striking backdrop on the west edge of Boulder. Behind these "Flatirons" Green, Bear, and South Boulder Peaks rise to 8,500 feet altitude, formed of the granite bedrock characteristic of the Rocky Mountain Front Range. The Dakota Ridge, at the east base of the Flatirons is a cuesta of vertical outcrops that parallel the Rocky Mountains from here to Montana. The Boulder Mountain Park includes outwash fans with residual tall grass prairie, a varied series of rock formations including shales and sandstones, and the Flatirons lie against Precambrian granites. The vegetation varies from grassland to riparian canyon-bottoms with *Acer*

glabrum and *Corylus cornuta*, *Prunus-Crataegus-Rhus trilobata*-*Cercocarpus* thickets, *Pinus ponderosa* and *Pseudotsuga* forests, and numerous steep north-facing canyon sides favorable for bryophyte development.

A few miles east of the city, along Boulder Creek, a spectacular exposure of south-facing sandstone cliffs, the "White Rocks", is also a reserve although not a part of Boulder Mountain Park and harbors a limited but interesting desert-steppe bryophyte flora, including *Grimmia plagiopodia*, on its curious surface "turtleback" formations, a small colony of the rare fern, *Asplenium adiantum-nigrum*, and a few hepatics including at one time our only station in Colorado for *Phaeoceros laevis*, in the Laramie Sandstone.

For plant geography, the most interesting feature of the Boulder Mountain Park is a meteorological phenomenon—a frequently occurring cloud veil that hangs along the Flatirons and provides a local humid atmosphere. Here, on a day when this occurs, one may walk up into the gulches and be drenched although no rain may fall. The vascular flora is especially rich here (see Hogan 1993, Weber & Wittmann 2001), and recently our attention to this feature was dramatically fueled by the discovery of several disjunct moss species. The known populations of these mosses are very small, but they cannot be said to be rare, because much of the region, steep and difficult of access, has not been explored.

Professional botanists frequently learn that it takes a rank novice to make crucial discoveries, partly because the professional claims to know which areas are most fruitful, and the novice does not. This year we recruited Gary Mazurek, whose main interest is in Tardigrades. We met quite accidentally getting off the local city bus. Gary overheard me speaking to the bus driver about our work, introduced himself and said that he would like to learn some mosses because they are habitats for Tardigrades. I immediately drew Gary into our small circle and showed that I could identify his mosses, and if he learned to recognize them, he could make a real contribution to tardigrade geography in the Rocky Mountains, where very little has been published. While Tardigrade specialists usually have to seek out experts for identification of the lichen and moss habitats long after the collections are made, Gary will be able to sample the same moss species from different sites and establish some important ecological-geographical data.

Gary lives within walking distance of the Flatirons. The next day he went up to the Mesa Trail which runs along them from north to south, and brought back a garbage bagful of paper sacks of mosses. I identified them for him, and he returned to the area, bringing back another batch, mostly the same common species. This time he wanted to show me a moss that was quite new to him. It

was *Rhytidiadelphus triquetrus*, new to Colorado and disjunct from Montana, California, and Arkansas.

The following day we joined him to see the extent of the population, and found an area ten feet square, where *Rhytidialdelphus* was intermixed with *Pleurozium schreberi*, another disjunct known previously in Colorado from a small area in Rocky Mountain National Park.! Each subsequent visit has netted novelties, the latest being *Neckera complanata* and *Entodon cladorrhizans*! I plead guilty for not, in fifty-five years of botanizing in Colorado, thoroughly explored the Flatirons area. However, the horse is never content to graze in his own pasture.

Another bryological hot spot is the notch or saddle between Green Mountain and Flagstaff Mountain (a popular picnic area and overlook). The south-facing slope is a combination of fixed granite outcrops and great boulders. On the steep slope there is seasonal seepage over the rocks. The only common moss on this site is *Bryum alpinum*, which forms beautiful golden-brown or golden-green polsters easily visible from the car window. The north-facing slope is at the north end of Gregory Canyon, where a trail begins at Baseline Road in Boulder and is easily followed up to the summit of Green Mountain. It is difficult to reach the seeping cliffs, for the trail diverges from the main drainage and access is made either by scrambling down the talus or by beating ones way through very dense stands of *Salix irrorata*, which in the past half century have become almost impenetrable.

The seeping north-facing ledge has a remarkable assemblage of bryophytes and chasmophytic vascular plants, notably the Front Range endemic, *Selaginella weatherbiana*. Here we find, besides the usual common components, *Anacolia menziesii*, *Bartramia ithyphylla*, *Brachythecium acuminatum*, *B. velutinum*, *Bryum gemmiparum*, *Campyliadelphus chrysophyllus*, *Didymodon tectorum* (see Zander 2001), and *Homalothecium nevadense*.

Several trails lead to the summit of Green Mountain. Long Canyon is particularly interesting because it supports the only population of paper birch (*Betula papyrifera*) in Colorado. The colony is greatly affected by introgressive hybridization with the dark-barked *B. fontinalis* (see Froiland 1952), and only a few trees have the typical white, peeling bark; most of the intermediates are in a cluster at the upper end of the canyon, and have bark resembling *Betula lutea*. In a side canyon there is a small population of the rare orchid, *Malaxis monophyllos* and *Botrypus virginianus*. The cool north-facing canyons support many Pleistocene relictual vascular plants of the midwestern woodlands, including *Sanicula marilandica*, *Aralia nudicaulis*, *Carex sprengelii*, *Bromopsis pubescens*, and *Cylactis pubescens* (Weber 1965).

BRYOPHYTES OF BOULDER MOUNTAIN PARK MOSSES

- Abietinella abietina*, COLO 49085
Amblystegium riparium 111357
Amblystegium serpens 111356
Amphidium lapponicum 49082
Anacolia menziesii 111351
Atrichum undulatum 112032
Aulacomnium androgynum 110671
Bartramia ithyphylla 111352
Brachythecium acuminatum 112049
Brachythecium collinum 17596
Brachythecium erythrorrhizon 110673
Brachythecium fendleri 11008
Brachythecium rivulare 111497
Brachythecium velutinum 111354
Bryoerythrophyllum recurvirostrum
 111359
Bryum alpinum 111364
Bryum amblyodon 111353
Bryum argenteum 49094
Bryum caespitium 112139
Bryum flaccidum 112029
Bryum gemmiparum 111393
Campyliadelphus chrysophyllus 112134
Campylophyllum sommerfeltii 35450
Ceratodon purpureus 112052
Coscinodon calyptratus 113385
Dicranoweisia crispula 18237
Dicranum montanum 111481
Dicranum rhabdocarpum 18392
Dicranum tauricum 14918
Didymodon tectorum 10580
Didymodon vinealis 49101
Encalypta vulgaris 49099
Entodon cladorrhizans 112178
Fabronia ciliaris 19010
Fontinalis neomexicana 112024
Funaria hygrometrica 106963
Grimmia anomala 112124
Grimmia elatior 49075
Grimmia longirostris
 (specimens on loan)
Grimmia "montana group" 49084
Grimmia pulvinata 12183
Hedwigia ciliata 23044
Homalothecium nevadense 49072
Hygroamblystegium tenax 111358
Hypnum cupressiforme 111362
Hypnum revolutum 49087
Hypnum vaucheri 49091
Leptobryum pyriforme 20925
Leptodictyum riparium 111357
Leptopterigynandrum austroalpinum
 112205
Lescuraea incurvata 11496
Mnium arizonicum 2000
Mnium blyttii 110678
Neckera complanata 112176
Neckera pennata 112177
Orthotrichum alpestre 9657
Orthotrichum anomalum 30133
Orthotrichum hallii 112051
Orthotrichum laevigatum 49092
Orthotrichum rupestre 49078
Paraleucobryum longifolium 112205
Philonotis fontana 112133
Plagiomnium cuspidatum 16934
Plagiomnium medium 11010
Plagiothecium laetum 112123
Pleurozium schreberi 112026
Pohlia cruda 111495
Pohlia nutans 106964
Pohlia wahlenbergii 49076
Polytrichum juniperinum 14649
Polytrichum piliferum 14679
Pseudoleskea nervosa 49098
Pseudoleskeella nervosa 112031
Pseudoleskeella sibirica 112135
Pseudoleskeella tectorum 24571
Pterigynandrum filiforme 112050
Pylaisiella polyantha 112048
Rhynchostegium pulchellum 111361
Rhytidiadelphus triquetrus 112026
Sanionia uncinata 110682
Schistidium confertum 19615
Schistidium pulchrum 110683
Syntrichia intermedia 112179
Syntrichia norvegica 112138
Syntrichia ruralis 27014
Syntrichia sinensis 112027
Timmia austriaca 26826
Timmia megapolitana 3624
Tortella tortuosa 112137

Tortula mucronifolia 112028
Weissia controversa 49100

HEPATICA

Athalamia hyalina 25756
Cephaloziella divaricata 110674
Cephaloziella rubella 49097

Lophozia barbata 110677
Lophozia hatcheri 11007
Marchantia polymorpha 26960
Porella cordaeana 111363
Preissia quadrata 24508
Radula complanata 24793

Total 98 species

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Correction

An improved miniprep method of DNA extraction for bryophytes

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The mailing address for Kelsi Scott was missing from the paper.

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