

**Mosses of Semiarid Steppes
Bitterroot Valley, Ravalli County, Montana**

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Mosses of the semiarid steppes on the east side of the Bitterroot Valley, Ravalli County and other western Montana grasslands have been largely unstudied; however, research of similar Palouse Prairie grasslands in British Columbia indicates that rare mosses are present in these diminishing habitats. McIntosh (1989) found several mosses with disjunctions between western North America and arid regions of Eurasia in semiarid steppe habitats of British Columbia. Eckel et al (1997) reported *Pseudocrossidium obtusulum*, a new species for Montana, from the semiarid steppes of the Bitterroot Valley, Montana.

Prior to settlement, the east side of the Valley was mostly covered with Palouse Prairie communities dominated by bluebunch wheatgrass and big sagebrush. Lying in the rain shadows of the Bitterroot Mountains to the west, severely limits the amount of annual precipitation to 9 or 10 inches. Much of the native vegetation on the east side of the Bitterroot Valley has been substantially altered or destroyed by agricultural practices, introduction of non-native grasses and forbs, and residential subdivisions.

About half of the 100-acre area investigated for this study is composed of relatively pristine Palouse Prairie vegetation, and half has been plowed or is hay field or pasture. Approximately 40 acres, the Willoughby Bluffs Natural Area, is protected by a Nature Conservancy easement. The dissected topography and soils of the study area include several outcrops of volcanic ash, composed of compacted microscopic glass shards. Cryptogamic crusts composed of bryophytes, lichens, fungi and cyanobacteria cover much of the soil between bunchgrasses. A perennial stream with a riparian zone of black cottonwoods and shrubs drains the project area. Scattered ponderosa pines are present on moister microsites.

We have identified the following mosses from the Ravalli County study area. Nomenclature generally follows Anderson et al (1990) and Zander (1993). Species that appear to be new for Montana are denoted with an asterisk. Noteworthy collections are deposited at the University of Montana Herbarium (MONTU), Missoula, Montana, or the Clinton Herbarium (BUF), Buffalo, New York. J.A. Hoy made all collections.

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- Amblystegium serpens* var. *juratzkanum* (Schimp.) Rau & Herv. (#161). Shaded, dead tree trunk.
- Amblystegium serpens* var. *serpens* Schimp. in B.S.G. (#271). Shaded, moist soil.
- Barbula unguiculata* Hedw. (#312A, BUFO). Volcanic ash deposit.
- Brachythecium albicans* (Hedw.) Schimp. in B.S.G. (#255A). Partially shaded soil.
- Brachythecium velutinum* (Hedw.) Schimp. in B.S.G. (#269). Shaded soil.
- Bryum argenteum* Hedw. (#258C). Soil in full sun.
- **Bryum dichotomum* Hedw. (#306B, BUFO). Soil on a vertical south-facing bank of an irrigation canal just above the water line, with *Pseudocrossidium obtusulum*. Seville Flowers also collected this moss (#6661 and #10105, COLO) near Mission Fall, Lake County, Montana.
- Bryum caespitium* Hedw. (#280). Partially shaded soil.
- Bryum capillare* Hedw. (#303). Partially shaded soil.
- Ceratodon purpureus* (Hedw.) Brid. (#197). Partially shaded soil.
- Coscinodon calyptratus* (Hook.) C. Jens. (#337, BUFO and MONTU). Rock in full sun.
- Desmatodon heimii* (Hedw.) Mitt. (#261, BUFO). Vertical volcanic ash outcrops in shady areas. Known from two collection in Cascade County, Montana (Williams 1902).
- Didymodon acutus* (Brid.) Saito (#326A, BUFO). Soil in dryland sagebrush habitat.
- Didymodon brachyphyllus* (Sull. in Whipple & Ives) Zand. (#153, BUFO). Shady areas of vertical volcanic ash outcrop, nearly always with *Tortula muralis*. Reported from Glacier National Park, Montana (Hermann 1969).
- Didymodon rigidulus* var. *gracilis* (Schleich. ex Hook. and Grev.) Zand. (#326A, BUFO). Soil in dryland sagebrush habitat.
- Didymodon vinealis* (Brid.) Zand. (#275B, BUFO). Soil and volcanic ash.
- Encalypta rhaptocarpa* Schwaegr. (#275A). Partially shaded rock.
- Encalypta vulgaris* Hedw. (#515). Shaded, moist soil.
- Eurhynchium pulchellum* (Hedw.) Jenn. (#275D). Partially shaded soil.
- Fissidens bryoides* Hedw. (#519, MONTU). Shady moist soil.
- Funaria hygrometrica* Hedw. (#306A). Partially shaded, seasonally moist soil.
- Grimmia anodon* B.S.G. (#307, BUFO). Soil in full sun.
- Grimmia plagiopodia* Hedw. (#309, BUFO). Volcanic ash outcrop in full sun.
- Grimmia pulvinata* (Hedw.) Sm. (#150, BUFO). Rock in full sun.
- Grimmia tenerrima* Ren. & Card. (#307, BUFO). Rock in full sun.
- Hypnum revolutum* (Mott.) Lindb. (#521). Shaded rock.
- Leptobryum pyriforme* (Hedw.) Wils. (#516). Moist, shaded soil.
- Orthotrichum affine* Brid. (#307D). Partially shaded dead wood.
- Orthotrichum laevigatum* Zett. (#307D). Dry rock in full sun.

- Orthotrichum pumilum* Sw. (#512, MONTU). Trunks and branches of cottonwoods.
- Orthotrichum speciosum* var. *speciosum* Nees ex Sturm (#371). Rocks and wood.
- Phascum cuspidatum* Hedw. (#258A, BUFO and MONTU). Soil, fruits profusely in spring.
- Physcomitrium hookeri* Hampe. (#319, BUFO and MONTU). Bare soil in valley bottoms.
- Pohlia nutans* (Hedw.) Lindb. (#255D). Soil and duff.
- Polytrichum juniperinum* Hedw. (#253E). Soil under sagebrush.
- Polytrichum piliferum* Hedw. (#254E). Soil under sagebrush.
- Pseudocrossidium obtusulum* (Brid. ex Schrad.) Zand. (#306D, BUFO). Soil on the south facing vertical side of an irrigation canal. McIntosh (1989) reported *P. revolutum* (Brid. in Schrad.) as new for Washington and "was one of the most frequently encountered taxa in the steppe, both in British Columbia and in Washington". According to Eckel et al. (1997), *P. revolutum*, has been excluded from the North American flora and is actually *P. obtusulum*.
- Pterigynandrum filiforme* Hedw. (#520). Shaded moist rock and wood.
- Pterygoneurum ovatum* (Hedw.) Dix. (#193, BUFO). Soil in full sun.
- **Pterygoneurum subsessile* (Brid.) Jur. (#312C, BUFO). Cryptogamic crust in sagebrush habitat. J. Hoy collected this moss at several other sites in Ravalli County and in Madison, Silverbow, and Stillwater counties, Montana.
- Rhytidiadelphus triquetrus* (Hedw.) Warnst. Partially shades soil under sagebrush.
- Saonia uncinata* (Hedw.) Loeske (#160B). Soil over rock in shaded areas.
- Schistidium apocarpum* (Hedw.) B. and S. in B.S.G. (#373). Partially shaded rock.
- **Tortula bartramii* Steere in Grout (#311, BUFO and MONTU). Volcanic ash outcrops. Previously reported from Idaho, Colorado, Arizona, New Mexico, and California (Lawton 1971).
- **Tortula muralis* Hedw. (#151, BUFO and MONTU). Volcanic ash outcrops. A significant range extension from previous stations in British Columbia, California and Southeastern United States. This moss usually grows on walls and stones that contain lime. Its habitat in the Bitterroot Valley is vertical volcanic ash outcrops, similar to a wall but not calcareous.
- Tortula norvegica* (Web.) Wahlenb. ex Lindb. (#280C, BUFO). Volcanic ash soil in shady gullies. Previously reported from Glacier National Park, Montana (Hermann 1969).
- Tortula papillosissima* (Coppey) Broth. in Engl. and Prantl. (#321A, BUFO). Soil in sagebrush habitat on the hottest and driest sites.
- Tortula ruralis* (Hedw.) Gaertn. (#299B). Soil and duff.

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