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Source: *Evansia*, 30(3):105-109. 2013.

Published By: The American Bryological and Lichenological Society, Inc.

DOI: <http://dx.doi.org/10.1639/079.030.0301>

URL: <http://www.bioone.org/doi/full/10.1639/079.030.0301>

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Mosses New to New Mexico

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Abstract. A bryophyte inventory was conducted in the Valles Caldera National Preserve (VCNP), New Mexico, from 2009 to 2011. Specimens representing 113 species of bryophytes were collected. Of those bryophytes, seven of the mosses were new to New Mexico: *Atrichum tenellum* (Röhling) Bruch & Schimper, *Dicranum tauricum* Sapjegin, *Orthotrichum pallens* Bridel, *Sphagnum girgensohnii* Russow, *Tortella fragilis* (Hooker & Wilson) Limpricht, *Tortella tortuosa* (Hedwig) Limpricht var. *fragilifolia* (Juratzska) Limpricht, and *Warnstorfia exannulata* (Hedwig) Loeske.

Key words: bryophyte, moss, inventory, Valles Caldera National Preserve, New Mexico.

INTRODUCTION

The Valles Caldera National Preserve (VCNP) is a beautiful area nestled within the Jemez Mountains of Sandoval County in northern New Mexico (Fig. 1). With the last volcanic eruption, roughly 1.22 million years ago, the Valles Caldera was formed from the older Toledo Caldera. This eruption released ash, hundreds of meters thick, onto the surrounding area. Magma welled to the surface, together with ash and steam, which over time dwindled and eventually a rock plug sealed the volcanic chamber (Treiman 2003). A large 15 mile diameter crater was left behind, surrounded by jagged peaks containing a large body of water. Over time deposited sediments raised the floor of the valleys, creating some of the grandest valley vistas in the state. The upper peaks, remnants of resurgent domes and post-volcanic eruptive centers, are carpeted in thick spruce-fir communities and skirted with ponderosa pine. The largest peak and a sacred mountain site for the Jemez Pueblo Indians is Rodondo Peak at 11,254 feet (3,430 meters). The valleys dip to 7,930 feet (2417 meters; Parmenter 2009).

The majority of human activity for the last 10,000 years was by the Pueblo Indians, who may have used the Valles as hunting grounds, but made no permanent residence. With the first wave of European occupation, Spanish settlers eventually occupied the area and displaced previous Native American movements and habitations. In 1860, Congress gave the Valles to the Baca family as replacement for other properties which had been absorbed by the government. Over time the land changed ownership, but not the name, during the remainder of the 19th and into the 20th century. The last private land holder to own the Valles Caldera was James P. (Pat) Dunigan (Anschuetz 2007). The VCNP was established in 2000 with the purchase of the Baca Ranch, an 88,900 acre parcel, from James Dunigan, as directed through the Valles Caldera Preservation Act (PL106-248; Parmenter 2009).

VCNP is a self-contained watershed of grassy valleys surrounded by forested peaks (DeBuys 2003). There is still a high level of geothermal activity, especially in Alamo Canyon, which contributes to one of the more diverse bryophyte habitats on the VCNP. The first *Sphagnum* of New Mexico was collected in the Alamo fens (Coop 2002). The Alamo springs bubble and collect into a series of acidic ponds and a fen at the southern end of the canyons' downward slope. This acidic

environment seems conducive to a greater diversity of bryophytes, in the otherwise basic volcanic strata of VCNP.

Between the years of 2009 to 2011, an inventory was conducted of bryophytes for the Valles Caldera National Preserve as part of thesis research for New Mexico State University and the Jornada Experimental Range (USDA ARS) (Romig 2012). This was the first comprehensive bryophyte inventory of its kind for New Mexico. With the addition of bryophyte species to the previous (vascular) plant inventory for VCNP, plant biodiversity increased by 21% (Hartman and Nelson 2006). This inventory could also be a base line study for pre and post fire observations from the Las Conchas fires of 2011 which burned a third of the preserve.

The bryophyte inventory resulted in a collection of 556 individual samples of bryophytes identified as 113 different species. These samples are deposited at the New Mexico State University Range Science Herbarium (NMRC). Of those bryophytes, seven of the mosses collected were new to New Mexico: *Atrichum tenellum* (Röhling) Bruch & Schimper, *Dicranum tauricum* Sappjegin, *Orthotrichum pallens* Bridel, *Sphagnum girgensohnii* Russow, *Tortella fragilis* (Hook. & Wilson) Limpricht, *Tortella tortuosa* (Hedwig) Limpricht var. *fragilifolia* (Juratzska) Limpricht, and *Warnstorfia exannulata* (Hedwig) Loeske (Romig 2012).

NEW RECORDS

Atrichum tenellum (Röhling) Bruch & Schimper

Our specimen was first sighted by Ron Wittman, while touring with us for bryophytes in VCNP. Ron quickly pointed to a typical characteristic of *Atrichum* – the slightly “wrinkled” look of the leaves due to the sparse lamellae. And indeed, as Carl Darigo later determined, we had collected New Mexico’s first *Atrichum tenellum*. Of New Mexico’s neighboring states, only Colorado has records of *A. tenellum* (CNABH 2013).

Our *Atrichum tenellum* specimen is a slight, delicate looking plant. It has a dark green color with a hint of brown. When dry, the leaves are slightly crisped and contorted in appearance. The typical Polytrichaceae longitudinal striations of the few lamellae are clearly seen with a dissecting scope. Using a compound microscope, a cross section shows the 4 lamellae striating from the costa. The leaves are evenly spaced along the stem and ovate-lanceolate with an acute apex. The leaves are barely undulate, having plane margins on the lower half and fine teeth lining the upper portion. The costa is subpercurrent. The median leaf cells are subquadrate, thin walled and have slight thickening at the corners.

Specimen examined. - **U.S.A. NEW MEXICO. SANDOVAL CO.:** Valles Caldera National Preserve, along the Preserve’s Northwest border heading north along the road from Valle San Antonio heading north, collected from along the road cut, WGS 1984 Zone 13 N Easting 354912 and Northing 3982613, 8751 ft (2668 m), 26 May 2010, *Kirsten Romig 243* (NMCR). Det by Carl Darigo.

Dicranum tauricum Sappjegin

Dicranum tauricum is an acrocarpous moss, bright green, and is similar to and often found growing next to, *Dicranoweisia cirrata*. It was found growing in dense cushions on the rotting wood of a log. The stems are mostly 1.5 cm long and tomentose below. The distinguishing feature for *D. tauricum* is the broken-off leaf tips, an asexual reproductive function. The lanceolate leaves remain erect-spreading whether wet or dry. The bases are concave and the margins are mostly entire and slightly serrulate at apex. The costa is long and excurrent without stereid bands. The alar cells are reddish in color and inflated. The cells are smooth with the proximal cells rectangular and distal laminal; quadrate, rounded, and short-rectangular. It is dioicous with male plants the same size as the female. Although our specimen does not have sporophytes, *D. tauricum* has straight erect capsules and a 1.5-2.5 cm long seta (Norris and Shevock 2004; Ireland 2010).

Dicranum tauricum is distributed throughout western North America. Of New Mexico’s neighboring states, it has been found in Colorado and Utah (BFNA 2013).

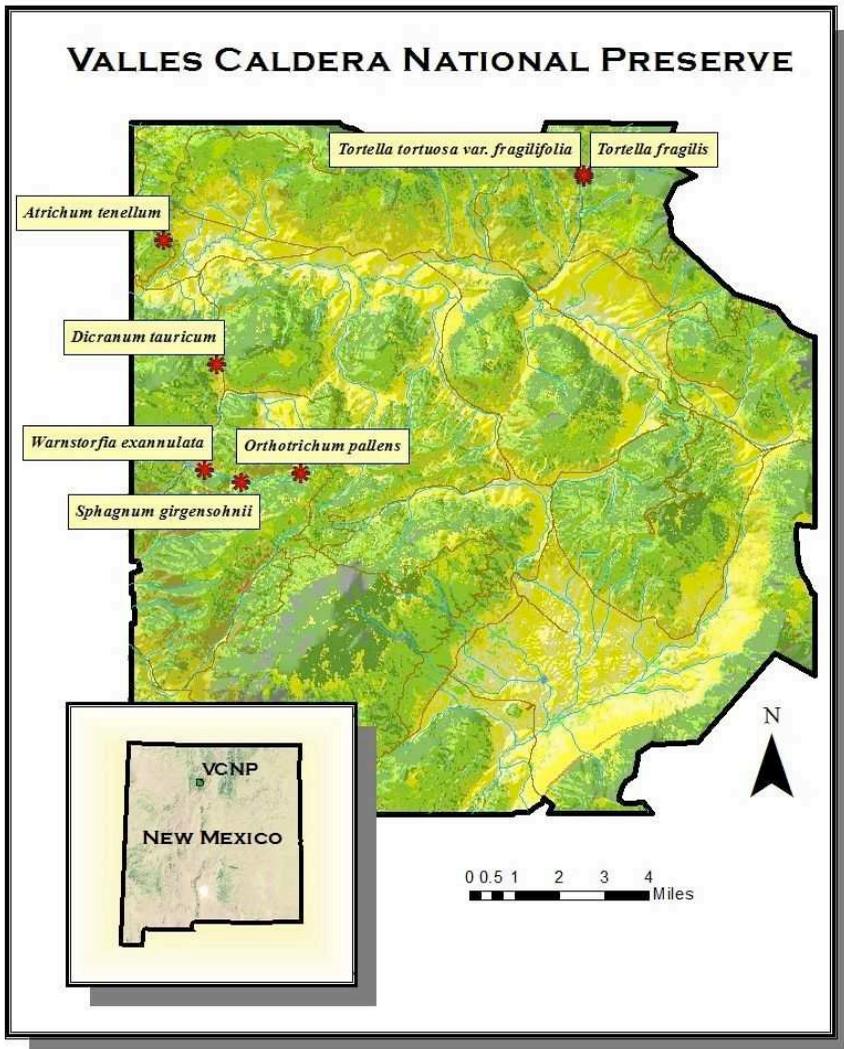


Figure 1: Map of the Valles Caldera National Preserve (VCNP) in New Mexico, with new moss record localities.

Specimen examined. - U.S.A. NEW MEXICO. SANDOVAL CO.: Valles Caldera National Preserve, Cero Secco pass, ½ mile from Valle Secco heading north and collected along the road, WGS 1984 Zone 13 N Easting Northing 3979001, 8937 ft (2724 m), 24 August 2010, *Kirsten Romig* 237 (NMCR). Det by Carl Darigo.

Orthotrichum pallens Bridel

Orthotrichum pallens is a small acrocarpous plant mostly 6 mm tall. It was collected from the lower trunk of a living gambel's oak, in a deciduous tree clearing in the middle of an otherwise coniferous forested slope of Rodondo Peak. The leaves are mostly 3 mm long with entire, recurved margins. It is cladautoicous with a seta approximately 1 mm long and has an emergent 8-ribbed capsule with a naked plicate calyptra. The most distinguishing features are the immersed stomates and a double peristome. Antheridial branches were seen below the seta and the perichaetial leaves.

Of New Mexico's neighboring states, Colorado and Utah have records of *O. pallens* (CNABH and FNA 2013; Flowers 1973).

Specimen examined. - **U.S.A. NEW MEXICO. SANDOVAL CO.:** Valles Caldera National Preserve, Beginning of Alamo Canyon drainage in a NM locust and oak clearing, on the lower trunk of a living *Quercus gambellii*. WGS 84 Zone 13 N Easting 358775 Northing 3975821, 9457 ft (2882 m), 02 July 2009, *Kirsten Romig* 59 (NMCR). Det by Kelly Allred.

Sphagnum girgensohnii Russow

This is the second sphagnum to be collected in New Mexico. The first, *Sphagnum fimbriatum*, was also collected in the same fen on July 18, 2002 by Jonathan Coop (Coop 2002).

Our *Sphagnum girgensohnii* has a pale yellowish-green color, without a reddish tint. It has a medium sized terminal bud and compact capitula. The stem branches have long drooping ends. The stem leaves are widest near the base and roughly tear drop in shape. The leaves narrow towards the apex and are almost entire, unlike *S. fimbriatum*, which is fringed across the entire apex (Amphlett and Payne 2010). The cortical cells of the stem do not have spiral fibrils, are unequal in size, and the larger ones are porose.

Of New Mexico's neighboring states, only Colorado has records of *S. girgensohnii* (CNABH and FNA 2013).

Specimen examined. - **U.S.A. NEW MEXICO. SANDOVAL CO.:** Valles Caldera National Preserve, Alamo Canyon, below the last and largest pond ("Caribbean" Pond) and the southern end of Alamo Canyon, WGS 84 Zone 13 N Easting 357064 Northing 3975612, 8743 ft (2665 m), 21 July 2009, *Kirsten Romig* 147.2 (NMCR). Det by Carl Darigo.

Tortella fragilis (Hooker & Wilson) Limpricht

This is a dark, yellow-green colored plant. The stems are around 2 cm long with no central strand. Visible rhizoids run along the entire length of the stem, but they are not tomentose. The leaves are subulate, with the lower leaves missing their leaf tips, stiff and somewhat spreading when wet, but contorted when dry. The leaf tips are propaguloid. Leaves which are not propaguloid are concave and keeled towards apex. The costa is excurrent and mostly smooth. Reproduction from propagules is common, but the plant is dioicous with perichaetial leaves bristle-like and also with propagule modifications. Our specimen did not have sporophytes, but this plant will have 1.5-2 cm long setas, a 1.8-3mm long capsule with one to two rows of slightly inflated cells. It has an operculum. The peristome teeth are long and spiral 1-3 times (Eckel 2011).

Tortella fragilis can be confused with *Tortella tortuosa* var. *fragilifolia*, but the later has both fragile leaf lamina and fragile leaf apices (Eckel 2011). Of New Mexico's neighboring states, only Colorado has records of *T. fragilis* (CNABH and FNA 2013).

Specimen examined. - **U.S.A. NEW MEXICO. SANDOVAL CO.:** Valles Caldera National Preserve, on a rock along Indios creek at Rito de los Indios, WGS 84 Zone 13 N Easting 367161 Northing 3984268, 9114 ft (2778 m), 01 August 2009, *Kirsten Romig* 192.3 (NMCR). Det by Kelly Allred.

Tortella tortuosa (Hedwig) Limpricht var. *fragilifolia* (Juratzska) Limpricht

Tortella tortuosa var. *fragilifolia* is a yellow green acrocarpous moss. The tomentum along the stem is dense and reddish brown. The stem does not have a central strand. Some leaf apices are completely absent due to their fragility. The tips are not propaguloid, as with *T. fragilis*. The leaves are not strongly crisped, but have one twist when dry. When wet, the margins undulate and the leaf is erect-spreading. Leaves are keeled. It is irregularly bi-stratose juxtacostally, and the lamina tattered. The costa has two thick stereid bands which gradually disappear towards the apex. Unusually, for this genus, the adaxial epidermal layer remains intact (Eckel 2011).

Tortella tortuosa var. *fragilifolia* has not been collected in any of New Mexico's neighboring states (CNABH and FNA 2013).

Specimen examined. - **U.S.A. NEW MEXICO. SANDOVAL CO.:** Valles Caldera National Preserve, Rito de los Indios, WGS 84 Zone 13 N Easting 367148 Northing 3984328, 9125 ft (2781 m), 27 May, 2010, *Kirsten Romig* 261 (NMCR). Det by Carl Darigo.

Warnstorfia exannulata (Hedwig) Loeske

Warnstorfia exannulata is a pleurocarpous moss and has a deep green, slightly yellowish color. Some leaves have a hint of red. The stem has a partial hyalodermis. It has concave, slightly decurrent, falcate lanceolate leaves which gradually narrow to a twisted apex. The distal margins are slightly denticulate. The costa is subpercurrent. The adaxial marginal laminal cells have a rectangular shape. The alar cells are inflated and reach the costa making a distinctive triangular patch at the base of the leaf.

The first *Warnstorfia* known from the Valles Caldera was *Warnstorfia fluitans*, collected by Relf Price, from the same fen where we later found our *W. exannulata* (Price 2011). Of New Mexico's neighboring states, only Colorado has records of *W. exannulata* (CNABH 2013).

Specimen examined. - **U.S.A. NEW MEXICO. SANDOVAL CO.:** Valles Caldera National Preserve, Alamo Canyon, downstream from the largest and last pond in Alamo Canyon ("Caribbean" Pond), WGS 84 Zone 13 N Easting 355994 Northing 3975966, 8601 ft (2622 m), 26 May 2010 *Kirsten Romig* 235 (NMCR). Det by Carl Darigo.

ACKNOWLEDGEMENTS

We would like to thank the late Carl Darigo (MO) and Ron Wittmann (CO) for help with identifications; Relf Price and the staff of the Valles Caldera National Preserve for access; Peg Gronemeyer (NMSU) and Caiti Steele (NMSU) for maps; Rachel Svejcar, Darren James, Nick Olsen, and Byron Yepa for help with field work; and, Richard Worthington for reviewing the manuscript. We are grateful to the Jornada Experimental Range (USDA) and the College of Agricultural Experiment Station for funding this inventory.

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