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A Checklist of the Lichens of the Beaver Dam Slope, Washington County, Utah, USA

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Abstract: The lichen flora of the extreme northeastern corner of the Mojave Desert was investigated during the spring of 2009. Collections were made from five sites on the Beaver Dam Slope in Washington Co., Utah, including the privately owned Lytle Ranch Preserve. We have identified 41 lichen-forming fungal species in 23 genera, including 30 saxicolous, 7 terricolous, and 4 corticolous taxa; including, 16 species recorded from Utah for the first time and 10 new records for the Mojave Desert. This study provides a baseline for documenting the distribution of common and sensitive lichen communities along a transition zone between the Mojave Desert, Great Basin, and Colorado Plateau.

Key words: Lichens, floristics, Beaver Dam Slope, Mojave Desert.

Introduction: Some components of the Mojave Desert's biodiversity (e.g., vascular plants and vertebrates) have been examined (Bell, et al., 2010; Walde, et al., 2009; McLaughlin, 1986; Meyer, 1986; Thorne, et al., 2009); however, the lichen flora of this region has generally not been surveyed. Hasse's study of the lichens of southern California (1913) included a few reports from the Mojave Desert. More recently, Mojave Desert lichen communities have been characterized at a number of sites, including: the Granite Mountains (California) in the southwestern portion of the Mojave Desert (Doell, et al., 1999; and Knudsen & Werth, 2008); two sites within the Mojave National Preserve, California (Knight, et al., 2002); and a floristic survey from a single site in northwestern, Arizona (Jackson, et al., 2005). Similarly, Rosentreter and Belnap (2001) briefly described some of the more common soil crust lichens reported for the Mojave Desert. Most recently, a master thesis characterizing the lichen flora of the Spring Mountains north of Las Vegas was completed (Proulx, 2011).

Lichen communities throughout the Mojave Desert are dominated by saxicolous and to a lesser extent terricolous species most of which are adapted to extreme environmental conditions. Although biological soil crust communities in the Mojave Desert ecosystem tend to have patchy distributions, with limited development, they do play crucial ecological roles in some parts of the region (Billings, et al., 2003; Johansen, et al., 2001; Thompson, et al., 2005; Ustin, et al., 2009). Relative to saxicolous and terricolous lichen diversity, lichen communities on corticolous and lignicolous substrates are generally limited in terms of species numbers (Jackson, et al., 2005; Knight, et al., 2002).

The Beaver Dam Slope is located in the extreme northeastern portion of the Mojave Desert where the Great Basin meets the Colorado Plateau. This region is topographically and floristically diverse, and is characterized by hot, dry summers and cool winters with generally low but variable amounts of precipitation. The Beaver Dam Slope is characterized by three main desert vegetation



Figure 1: General habitat of the Beaver Dam Slope and Beaver Dam Wash, Washington County, Utah, U.S.A.

zones: cottonwood-ash riparian, catclaw acacia-mistletoe-desert willow terrace, and Joshua tree-cholla-blackbrush-ambrosia upland (Fig. 1). The Beaver Dam Slope also includes critical habitat for numerous state and federally listed sensitive species, including the Mojave Desert tortoise (*Gopherus agassizii*), Arizona toad (*Bufo microscaphus*), Desert Night lizard (*Xantusia vigilis*), Gila monster (*Heloderma suspectum*), and Mojave rattlesnake (*Crotalus scutulatus*), among others.

The objective of this study was to generate a checklist of the lichens of the Beaver Dam Slope, which represents a unique transition zone between the Great Basin, Colorado Plateau, and Mojave Desert bio-regions. Our survey included one site at the Lytle Ranch Preserve situated along the Beaver Dam Wash, administered by the M. L. Bean Life Science Museum (Brigham Young University, Provo, UT, USA) and four additional sites across Beaver Dam Slope – on land managed by the Bureau of Land Management (U.S. Department of the Interior). All four BLM sites were along the Lytle Ranch road between the Lytle Ranch Preserve property and old Highway 91.

Materials and Methods: Lichens were collected from all sites during the spring of 2009. We surveyed approximately 2 hectares at each site for about 2 hours. Relative abundance for each species was determined on the basis of the number of times a species was encountered at a particular site. Species with 10 or more encounters/site were designated as abundant while species with 4-9 encounters were listed as common and species with 3 or fewer encounters were designated as rare. Detailed site descriptions are as follows:

Site No. 1: Utah, Washington County, at the Lytle Ranch Preserve, in feral agricultural land, cottonwood-ash riparian zone, and catclaw acacia-mistletoe-desert willow terrace along Beaver Dam Wash; 17.3 km from old Highway 91. Common vascular plants: *Bromus tectorum*

(cheat grass), *Coleogyne ramosissima* (blackbrush), *Cylindropuntia echinocarpa* (cholla cactus), *Fraxinus velutina* (velvet ash), *Larrea tridentata* (creosote bush), *Malus domestica* (apple), *Pistacia vera* (pistachio), *Populus fremontii* (Fremont cottonwood), *Prunus americana* (Pottawattami plum), *Prunus persica* (peach), and *Yucca brevifolia* (Joshua tree); 37° 08' 36.84" N.; 114° 01' 19.68" W.; elevation 846 m.

Site No. 2: Utah, Washington County, along Lytle Ranch Preserve road in a Joshua tree dominated upland, 13.8 km west of old Highway 91, along Beaver Dam slope. Common vascular plants: *Ambrosia dumosa* (white bur-sage), *B. tectorum*, *C. ramosissima*, *Ephedra nevadensis* (Mormon tea), *L. tridentata*, *C. echinocarpa*, *Prunus fasciculata* (desert almond), *Purshia tridentata* (bitterbrush), *Thamnosma montana* (desert rue), *Y. brevifolia*, and *Yucca utahensis* (Utah yucca); 37° 07' 14.52" N.; 114° 00' 33.84" W.; elevation 930 m.

Site No. 3: Utah, Washington County, along Lytle Ranch Preserve road in a Joshua tree dominated upland, 12.3 km west of old Highway 91, along Beaver Dam slope. Common vascular plants: *A. dumosa*, *B. tectorum*, *C. ramosissima*, *E. nevadensis*, *L. tridentata*, *C. echinocarpa*, and *Y. brevifolia*; 37° 07' 1.08" N.; 113° 59' 36.48" W.; elevation 980 m.

Site No. 4: Utah, Washington County, along Lytle Ranch Preserve road in a Joshua tree dominated upland, 6.8 km west of old Highway 91, along Beaver Dam slope, at a limestone outcrop. Common vascular plants: *B. tectorum*, *C. ramosissima*, *L. tridentata*, *C. echinocarpa*, and *Y. brevifolia*; 37° 05' 34.36" N.; 113° 56' 38.88" W.; elevation 1150m.

Site No. 5: Utah, Washington County, along Lytle Ranch Preserve road in a Joshua tree and Utah juniper dominated upland, 5.36 km west of old Highway 91; along Beaver Dam slope.

Common vascular plants: *B. tectorum*, *C. ramosissima*, *E. nevadensis*, *Ferocactus sp.* (barrel cactus), *F. velutina*, *L. tridentata*, *Juniperus osteosperma* (Utah juniper), *C. echinocarpa*, *P. tridentata*, and *Y. brevifolia*; 37° 05' 14.4" N.; 113° 55' 57.24" W.; elevation 1162 m.

All available substrates and habitats at each site were carefully examined and collected during the field work portion of this study. Voucher specimens were collected and identified using standard lichen keys, taxonomic treatises, and by making comparisons with herbarium material. Chemical spot tests and, where necessary, thin-layer chromatography techniques were used to confirm species identifications. All vouchers collections are deposited in the BYU Herbarium of Nonvascular Cryptogams (BRY (C)).

Results and Discussion: We identified 41 lichen-forming fungus species in 23 genera from the Beaver Dam Slope; including, 16 species new to Utah (St. Clair et al. 1991, Newberry and St. Clair 1991, and St. Clair et al. 1995) and 10 new records for the Mojave Desert (Proulx 2011) (Table 1).

Most of the lichens collected at our study sites were saxicolous (30 of 41 species), terricolous taxa included 7 species. All corticolous lichens collected during this survey (4 species) were found on trees, specifically *Fraxinus velutina* from site No. 1. Overall, the lichen flora reported here is similar to previous reports for the Mojave Desert. For example, Jackson et al. (2005) reported 43 lichen species in 25 genera with 17 species in common with our checklist. Like the Jackson publication, saxicolous taxa also dominated our species list. Similar results have also been reported by Knudsen and La Doux (2005) and Knudsen and La Doux (2006). Additional surveys focusing on rare taxa and unique local habitats in the area will likely add new taxa to our list.

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Table 1. Checklist of the lichen species for the Beaver Dam Slope with substrates, collection sites, relative abundance and BRY number; * represents new records for Utah and + indicates new records for the Mojave Desert.

Species	Substrate	Site 1	Site 2	Site 3	Site 4	Site 5	Herbarium No.
+ <i>Acarospora calcarea</i> K. Knudsen	Rock	-	R	-	-	-	BRY (C)-56074
*+ <i>Acarospora contigua</i> H. Magn.	Rock	-	-	R	-	-	BRY (C)-56088
*+ <i>Acarospora dispersa</i> H. Magn.	Rock	-	-	-	-	R	BRY (C)-56112
*+ <i>Acarospora novomexicana</i> H. Magn.	Rock	-	-	-	C	-	BRY (C)-56104
<i>Acarospora strigata</i> (Nyl.) Jatta	Rock	-	C	C	C	-	BRY (C)-56076
<i>Aspicilia cinerea</i> (L.) Körber	Rock	-	-	-	R	-	BRY (C)-56096
*+ <i>Aspicilia determinata</i> (H. Magn.) N. S. Golubk.	Rock	-	R-C	-	-	R-C	BRY (C)-56077
<i>Buellia dispersa</i> A. Massal.	Rock	-	-	-	R	-	BRY (C)-56097
<i>Caloplaca saxicola</i> (Hoffm.) Nordin	Rock	-	-	R	R	-	BRY (C)-56091
* <i>Candelariella antennaria</i> Räsänen	Bark	R-C	-	-	-	-	BRY (C)-56078
<i>Candelariella aurella</i> (Hoffm.)	Rock	-	R	-	-	-	BRY (C)-56079

Zahlbr.							
<i>Candelariella rosulans</i> (Müll. Arg.) Zahlbr.	Rock	-	-	R-C	-	-	BRY (C)-56092
<i>Circinaria arida</i> Owe-Larss., A. Nordin & Tibell	Rock	-	-	C	-	-	BRY (C)-56090
<i>Collema tenax</i> (Sw.) Ach.	Soil	-	C	-	-	C	BRY (C)-56080
* <i>Dermatocarpon americanum</i> Vainio	Rock	-	-	-	R	R	BRY (C)-56099
*+ <i>Endocarpon pseudosubnitescens</i> Breuss	Soil	-	-	-	-	R	BRY (C)-56116
<i>Endocarpon pusillum</i> Hedwig	Soil over rock	-	-	-	-	R	BRY (C)-56117
<i>Lecanora argopholis</i> (Ach.) Ach.	Rock	-	-	-	R	-	BRY (C)-56100
<i>Lecanora crenulata</i> Hooker	Rock	-	R	-	R	R	BRY (C)-56081
<i>Lecanora muralis</i> (Schreber) Rabenh.	Rock	-	-	-	R-C	R-C	BRY (C)-56102
<i>Lecanora valesiaca</i> (Müll. Arg.) Stizenb.	Rock	-	-	R	R	R	BRY (C)-56093
*+ <i>Lichinella granulosa</i> M. Schultz	Rock	-	-	R	-	-	BRY (C)-56094
* <i>Lichinella nigritella</i> (Lettau) P. P. Moreno & Egea	Rock	-	C	-	-	C	BRY (C)-56087
<i>Lobothallia praeradiosa</i> (Nyl.) Hafellner	Rock	-	-	-	-	R	BRY (C)-56121
<i>Peltula euploca</i> (Ach.) Poelt	Rock	-	-	-	-	R	BRY (C)-56122
<i>Peltula obscurans</i> var. <i>deserticola</i> (Zahlbr.) Wetmore	Rock	-	R-C	-	-	-	BRY (C)-56082
<i>Physcia stellaris</i> (L.) Nyl.	Bark	R-C	-	-	-	-	BRY (C)-56071
* <i>Physciella chloantha</i> (Ach.) Essl.	Bark	C-A	-	-	-	-	BRY (C)-56072
* <i>Placidium lacinulatum</i> (Ach.) Breuss	Soil	-	C	-	-	C	BRY (C)-56083
* <i>Placopyrenium stanfordii</i> (Herre) K. Knudsen	Rock	-	R	-	-	-	BRY (C)-56085
<i>Psora decipiens</i> (Hedwig) Hoffm.	Soil	-	-	-	C	-	BRY (C)-56105
<i>Psora tuckermanii</i> R. A. Anderson ex Timdal	Soil	-	-	-	R-C	-	BRY (C)-56106
<i>Rhizoplaca melanophthalma</i> (DC.) Leuckert & Poelt	Rock	-	-	-	C	C	BRY (C)-56107
<i>Rhizoplaca peltata</i> (Ramond) Leuckert & Poelt	Rock	-	-	-	-	R	BRY (C)-56126
<i>Sarcogyne privigna</i> (Ach.) A. Massal.	Rock	-	R	-	-	-	BRY (C)-56086
* <i>Toninia sedifolia</i> (Scop.) Timdal	Soil over rock	-	-	-	R	R	BRY (C)-56108
<i>Xanthomendoza fallax</i> (Hepp ex Arnold) Søchting, Kärnefelt & S. Kondr.	Bark	C	-	-	-	-	BRY (C)-56073

*+ <i>Xanthoparmelia californica</i> Hale	Rock	-	-	-	R	R	BRY (C)-56109
*+ <i>Xanthoparmelia maricopensis</i> T. H. Nash & Elix	Rock	-	-	-	-	R	BRY (C)-56130
<i>Xanthoparmelia mexicana</i> (Gyelnik) Hale	Rock	-	-	-	R-C	R-C	BRY (C)-56110
*+ <i>Xanthoparmelia subplittii</i> Hale	Rock	-	-	-	R-C	R-C	BRY (C)-56111

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