

*LICHENOGRAPHIA THOMSONIANA: NORTH AMERICAN LICHENOLOGY
IN HONOR OF JOHN W. THOMSON.*

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LICHENS OF GRAND TETON NATIONAL PARK, WYOMING

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ABSTRACT: Two hundred twenty-one lichen species in 72 genera were identified from collections made in 1995 in Grand Teton National Park. Previous reports included four species not encountered in 1995. Nearly half the species (49%) were saxicolous, mostly on granitic substrates; 24% of the species were corticolous or lignicolous, 9% were terricolous, and the remaining species were on other substrates (decaying wood, plant debris, moss, litter, other lichens). Crustose species were 43% of the total number; 33% were foliose, 16% were fruticose, and 8% were squamulose. The lichen species and their distribution reflect the cold continental climate of the park, vegetation patterns, fire history, and perhaps human use of the valley part of the park.

Lichens are valuable indicators of air quality (Stolte, et al., 1993; Gries, 1996) and, since they grow slowly, of ecological stability and integrity (Hale, 1974, 1983; Ladyman & Muldavin, 1996; Wetmore & Bennett, 1996). An inventory of species present is considered mandatory for establishing baseline information for monitoring of atmospheric and terrestrial quality (Nash, et al. 1993). A few key areas of ecological interest in the northern Rocky Mountains near Grand Teton National Park have been investigated: Glacier National Park (Debolt & McCune 1993), the Swan Valley in northwestern Montana (McCune, 1982), Yellowstone National Park, (Eversman, 1990), alpine meadows of the Beartooth Plateau (Eversman, 1995), and the Anaconda-Pintler Wilderness Area, Montana (St. Clair & Newberry, 1993). The National Park Service has catalogs of known lichen species from 93 national park units, but had recorded only 18 species from Grand Teton National Park (Wetmore & Bennett, 1996).

The major objective of lichen study in Grand Teton National Park was to determine species present as a first step in identifying those that are sensitive to air pollution and other stresses. A secondary objective, not included in this paper, was the tissue analysis of species of *Bryoria*, *Usnea* and *Letharia* for element content.

Previously published collections of lichens in Grand Teton National Park include those of Imshaug (1957) who identified ten species from three sites 3000-3422 m on the east face of the Teton Range and Oswald (1966) who reported 13 species from glacial moraines on the valley floor. Mahaney (1975) measured lichen growth relative to glaciation at 3100 m; he observed that within 75-150 m of a glacier, on rock that had been free of ice for about 100 years, *Lecanora novomexicana* and *Lecidea atrobrunnea* reached maximum diameters of 8 mm. On rock free of ice for about 1000 years, the

surfaces had 20-25% lichen cover; four species (*Aspicilia* sp., *Lecanora novomexicana*, *Lecidea atrobrunnea*, and *Rhizocarpon geographicum*) formed thalli 132 mm, 126 mm, 143 mm, and 52 mm respectively. Spence (1981) listed ten lichen species (eight saxicolous, one terricolous, one muscicolous) near glaciers at 2865-3120 m; he observed that lichens were absent on moraines with slopes of 20-50°, and that *Stereocaulon alpinum* along with *Xanthoria elegans* on moss preceded growth of any saxicolous lichen. Sites snow-free about 100 years had mosses but no lichens.

Park Description. Grand Teton National Park is in northwest Wyoming joined to adjacent Yellowstone National Park to the north by the John D. Rockefeller Parkway; its western boundary, the top of the Teton Range, borders Idaho. The elevation rises sharply from 2030 m in Jackson Hole to over 4150 m on Grand Teton Peak. The east slopes of the Teton Range were designated a national park in 1929; it was enlarged in 1950 to include more of Jackson Hole in which are located former and currently operating dude and cattle ranches. The park extends about 55 km north to south, and 34 km east to west, with irregular boundaries. The climate is continental. Annual precipitation in the northern part of the valley (Jackson Lake Dam) is about 62 cm, mostly as snow; the southern part (Jackson, Wyoming) receives about 41 cm (NOAA, 1995). Average annual temperature is about 3°C. In some years, snow remains on the ground all summer at higher elevations.

Glacial features such as moraines, hanging valleys, cirques, alpine lakes, ice fields and small glaciers are conspicuous in the park. The steep east-facing slopes of the Teton Range are dissected by ice- and water-cut canyons. The core rock types are granite, gneiss and schist with overlying calcareous layers visible mostly on the west side of the Teton Range and at the northern and southern tips of the range. The northern part has volcanic rocks of the same nature as on the adjacent Yellowstone Plateau.

Plant Communities. The valley floor, a gravelly outwash plain, is dominated by sagebrush (*Artemisia tridentata* Nutt, *A. cana* Pursh) and grasses; some areas are highly disturbed by grazing by cattle, horses, elk, and bison. Blue spruce (*Picea pungens* Engelm.) is abundant with cottonwoods (*Populus balsamifera* L., *P. angustifolia* James) along the Snake River. The dominant species on moraines is lodgepole pine (*Pinus contorta* Dougl. ex Loud) (Oswald, 1966); successional species are subalpine fir (*Abies lasiocarpa* [Hook.] Nutt.) and occasional Engelmann spruce (*Picea engelmannii* Parry ex Engelm.) on wetter sites and Douglas fir (*Pseudotsuga menziesii* [Mirb.] Franco) on drier sites. Oswald (1966) observed that all stands on moraines were less than 200 years old; older individual Douglas fir trees had fire scars. None of his sites have burned since 1966, although fires have occurred in other locations. In adjacent Yellowstone National Park, the time between successive fires on a site is 150 to 400 years (DeSpain 1990); the assumption is made that the fire cycle is similar in Grand Teton National Park. On the mountain slopes, a rather straightforward elevational series of trees is Douglas fir, usually with lodgepole pine on the lower slopes, above which Engelmann spruce-subalpine fir forests extend to timberline, where whitebark pine (*Pinus albicaulis* Engelm.) is also present. Uppermost tree stands are usually krummholz islands. Peaks above timberline are generally steep and unstable; meadows with tall grasses and herbs are in more level sites. Aspen (*Populus tremuloides* Michx.) forms extensive stands on moraines and on the lower Teton Range slopes; conifers are in the understory of many aspen groves. The communities reflect a combination of climatic, edaphic, and biologic processes, and contain three major species, lodgepole pine, Douglas fir, and aspen, that are well adapted

to fire (Whitlock, 1993).

Methods. From early July to October 1995, more than 2000 lichen specimens were collected from all substrates from 37 sites in Grand Teton National Park considered to represent all vegetation communities present, following guidelines by Smith, et al. (1993). Collections were made from sagebrush-grassland, lodgepole pine, Douglas fir, Engelmann spruce-subalpine fir, alpine, and riparian blue spruce-cottonwood communities. The highest peaks in the Tetons (Grand Teton, Mount Moran, Mount Teewinot) were not included in this study because their ascent requires technical climbing skills. For identification I used standard morphological and chemical techniques (Bird, unpublished keys; Brodo & Hawksworth, 1977; Culberson, 1972; Goffinet & Hastings, 1994; Goward, et al., 1994; Laundon, 1989, 1992; McCune, unpublished key; McCune and Goward, 1995; Ryan & Nash, 1991, 1993; Thomson, 1967, 1979, 1984; Timdal, 1986; Wetmore, 1967, 1994, 1996.), and current nomenclature (Dorn, 1984; Esslinger & Egan, 1995).

Collection Locations. Areas from which lichens were collected July through September, 1995, are arranged in approximate order from north to south in the Teton Range, then north to south in Jackson Hole (Figure 1). Sites 1c, 7b, 8a, and 23 are calcareous; other sites are granitic (granites, schist, gneiss).

Teton Range. 2052- 4173m. **1a.** Wilcox Point, west side of Jackson Lake. 2060m. 43°59'N, 110°43'W. Moist spruce-fir. **1b.** Moose Creek. 2100m. 43°58'N, 110°44'W. Lodgepole pine and willow. **1c.** Webb Canyon, SE base of Owl Peak. 2200m. 43°58'N, 110°45'W. Calcareous rock. **2.** Waterfalls Canyon. 2000-2424m; 43°55'N, 110°44'W. Granitic rock, gneiss, schist. Aspen, spruce, Douglas fir. Fire in 1974 in part of canyon. **3a.** Paintbrush Canyon. 2425m; 43°48'N, 110°47'W. Granitic rock. Aspen, Engelmann spruce, Douglas fir. **3b.** Holly Lake. 2812 m. 43°48'N, 110°48'W. **3c.** Paintbrush Divide. 2880 m. 43°47'N, 110°49'W. Exposed granitic rock. **4a.** Cascade Creek Canyon, west side of Jenny Lake. 2056-2400 m. 43°45'N, 110°48'W. Granitic rock. Aspen, Douglas fir, spruce. **4b.** Below Schoolroom Glacier. 2600-3030 m. 43°44'N, 110°51'W. Exposed granitic rock outcrops and talus; lodgepole pine, spruce. **5a.** Lupine Meadows. 2061-2400m. 43°45'N, 110°44'30". Lodgepole pine, Douglas fir. Granite boulders. **5b.** Surprise Lake. 2520 m. 43°44'N, 110°47'30". Exposed granitic rock. **5c.** Amphitheater Lake. 2545 m. 43°44'N, 110°48'W. Exposed granitic rock. **6a.** Phelps Lake trailhead. 2030-2212 m. 43°39'N, 110°48'W. Lodgepole pine, Douglas fir. **6b.** Phelps Lake, northwest end. 2090m. 43°39'N, 110°49'W. Quartz-rich granitic outcrop. **6c.** Phelps Lake, WSW side. 2060 m. 43°38'N, 110°49'W. Moist spruce stand at mouth of Open Canyon. **7a.** Granite Canyon mouth. 1940-2100 m. 43°37'N, 110°50'W. Aspen, Douglas fir; granitic boulders. **7b.** Top of Granite Canyon. 3000-3152 m. 43°37'N, 110°51'W. Calcareous outcrops and soils. **8a.** Rendezvous Peak (top of tram, Teton National Forest), upper slopes. 3030 m. 43°36'N, 110°52'30"W. Alpine and krummholz subalpine fir and spruce. Calcareous dolomite outcrops and loose rock. **8b.** Lower slopes of Rendezvous Peak. 2800 m. 43°36'N, 110°53'W. Granitic rock. Douglas fir, lodgepole pine.

Jackson Hole and Gros Ventre Range. **9.** Rockefeller Parkway/Park Boundary, east of Steamboat Mountain. 2224-2318 m. 44°03'N, 110°41'W. From spruce and willow to Douglas fir, lodgepole pine. **10.** Moose Island, Jackson Lake. 2055 -2061 m. 43°56'N, 110°38'W. Sandy soil, granitic rock. Lodgepole pine, Douglas fir, subalpine fir. **11.** Pilgrim Creek, floodplain and moraine SSE of Pilgrim Mountain. 2100-2121 m. 43°56'N,

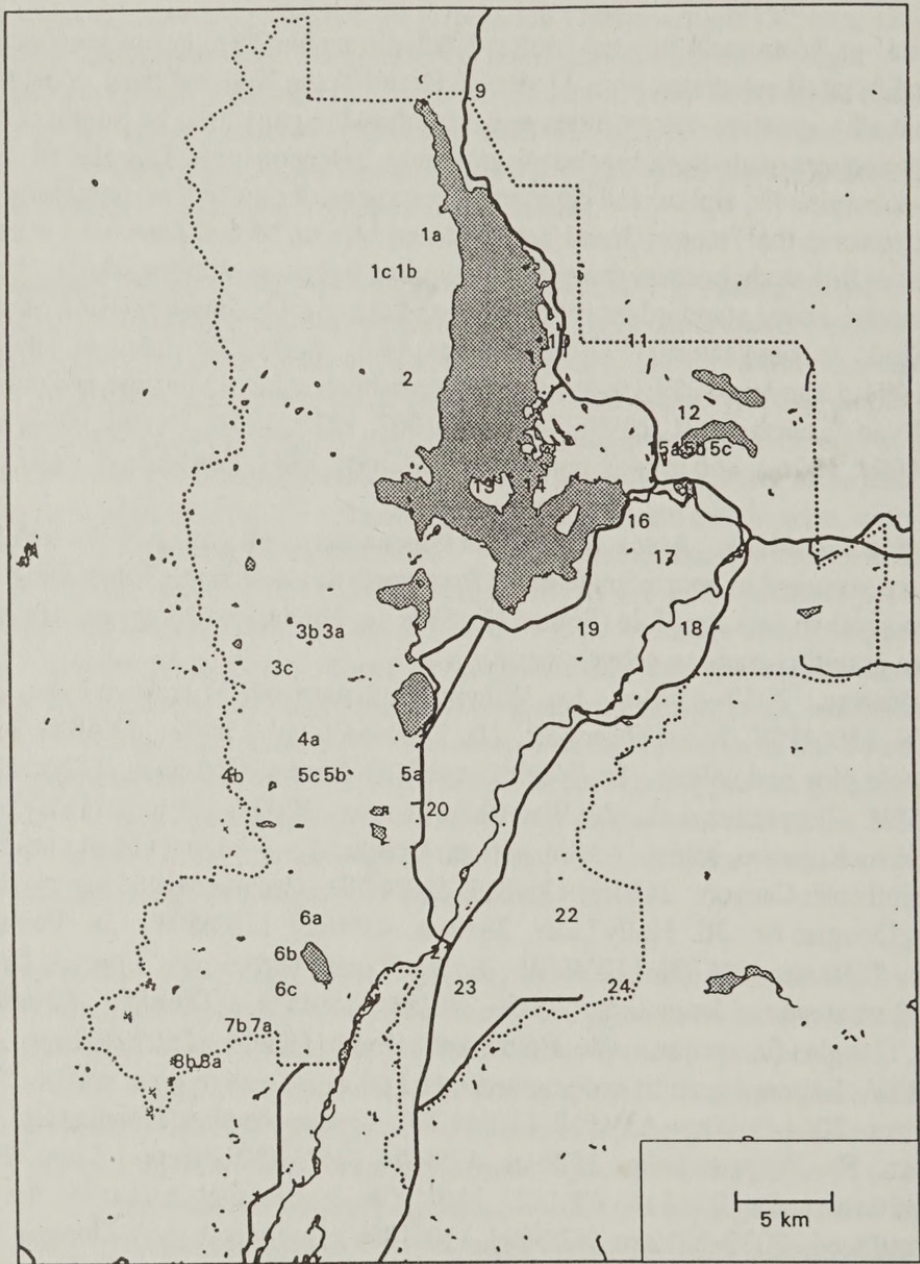


Figure 1. Grand Teton National Park and the collecting sites. Boundaries of the park are represented by the dotted line. The mottled areas are lakes, with Jackson Lake the largest. Sites 1a-8b are in the Teton Range. The heavy lines represent major roads. The Snake River runs east from Jackson Lake, then northeast to southwest through the valley floor.

110°35'W. Gravelly floodplain with cottonwoods. Lodgepole pine on moraine. **12.** Grand View Point. 2109-2218m; 43° 54'N, 110°33'30"W. Douglas fir with rhyolite cliffs. **13.** Elk Island, east half, Jackson Lake. 2048-2076m. 43°52'N, 110°41'W. Lodgepole pine, Douglas fir, young subalpine fir, grass. **14.** Hermitage Point, east shore of Jackson Lake. 2053-2060 m; 43°51-54'N; 110°37-38'W. Lodgepole pine, Idaho fescue, sagebrush. **15a.** Emma Matilda Lake, near Christian Pond. 2100 m. 43°52'30"N, 110°34'W. Lodgepole pine, sagebrush. **15b.** Douglas fir, spruce on south side of lake. 2061-2100 m. 43°53'N, 110°33'W. **15c.** Overlook, south side of lake. 2100m. 43°52'30"N, 110°33'W. Granitic outcrop. **16.** Signal Mountain, south and east slopes. 2302-2348 m. 43°51'N, 110°35'W. Granitic. Douglas fir, aspen; sagebrush on lower slopes. **17.** Cow Lake - Cattlemen's Bridge area. 2050 m. 43°50-51'N, 100°34'W. Rhyolite cliff. Lodgepole pine, subalpine fir; big sagebrush. **18.** Snake River, west side. 2030m. 43°48'N, 110°33'W. Sandy soil; used by elk and bison. Spruce, cottonwood. **19.** Potholes. 2070 m; 43°48'N, 110°47'W. Loose gravelly disturbed soil. Sagebrush-grassland; invading lodgepole pine. **20.** Timbered Island, moraine. 2050m. 43°43'N, 110°43'W. Lodgepole pine, Douglas fir, spruce. **21.** Snake River Bend. 1955 m. 43°39'N, 110°43'W. Sandy soil. Blue spruce, cottonwood. **22.** Ditch Creek. 2040m; 43°40'N, 110°38'W. Gravelly alluvial soil. Sagebrush-grassland. **23.** Blacktail Butte. 2300 m; 43°38'N, 110°42'W. Calcareous. Douglas fir, aspen. **24.** Kelly Warm Springs, Kelly Peak. 2024-2109m; 43°38'N, 110°36'W. Willow, sagebrush-grassland to aspen, subalpine fir, lodgepole pine.

Results and Discussion

Two hundred sixteen species were identified from over 2000 collected specimens. Ninety-six species (43%), were crustose; 72 species (33%) were foliose, 35 (16%) were fruticose, and 17 (8%) were squamulose. One "pin lichen" (*Chaenotheca furfuracea*) was collected. Nearly half of the species (108) were from rock substrates, mostly granitic; 44 species (19%) were corticolous, 20 (9%) were terricolous; 8 (4%) were lignicolous, and the remaining 41 species (19%) were on decaying wood, plant debris, litter and other lichens. *Catillaria chalybeia*, *Chaenotheca furfuracea*, *Peltigera ponojensis*, *P. retifoveata*, and *Solorina bispora* had not been previously identified from this immediate area

Rock Communities. Several species grew on granitic rock surfaces throughout the park: the most common and abundant of these were *Aspicilia caesiocinerea*, *Bellemerea cinereorufescens*, *Caloplaca fraudans*, *C. holocarpa* and *Candelariella aurella* that were also on bark, *Rhizocarpon geographicum*, *R. riparium*, *Xanthoria fallax*, and *X. soorediata*. The occurrence of *Pseudephebe pubescens* and species of *Umbilicaria* was less than expected on the granitic boulders and outcrops in comparison to similar substrates on the Beartooth Plateau and Yellowstone Park. The highest windswept ridges visited were calcareous, which is perhaps one explanation. It might also be a function of not sampling some of the highest granitic peaks, or of deep-lying snow that bury the boulders and soil most of the year; the growing season may not be long enough to allow lichen establishment of foliose species (Benedict, 1991; Walker, et al., 1993). Expected *Brodoa oroarctica* and *Pseudephebe pubescens*, reported previously from Grand Teton National Park (Imshaug, 1957), were not collected.

At the top of Rendezvous Peak and Granite Canyon, calcareous sites, and near Schoolroom Glacier, the rock is in smaller pieces and does not appear stable. Lichen cover was relatively sparse, perhaps reflecting the instability, or perhaps indicating

conditions either too dry or too snow-covered for much lichen growth. The major species on calcareous rock above 3000 m were *Xanthoria elegans* and *Staurothele drummondii*; *Collema fuscovirens* and *C. polycarpon* occurred only on calcareous rock in relatively moist sites.

Soil Communities. The major lichens observed on the soil in Jackson Hole, the valley floor, were *Cladonia cervicornis*, *Peltigera malacea* and *P. rufescens*. Expected well-developed soil crust communities with several species of *Psora*, *Collema*, *Catapyrenium*, and perhaps *Buellia elegans*, similar to those in Montana (Eversman & Schanz 1997), Idaho (Kaltenecker & Wicklow-Howard, 1994) and Utah (Anderson & Rushforth 1976) were not found. This is perhaps due to one or more of these factors: inadequate sampling, very porous gravelly soils (Oswald, 1966) that do not hold adequate moisture, or historically heavy use by grazing animals (bison, elk, cattle and horses).

Alpine species of *Cetraria*, *Vulpicida*, *Thamnolia*, and *Dactylina* identified from sites in Yellowstone National Park (Eversman, 1990), the Beartooth Plateau (Eversman 1996), Glacier National Park (Debolt & McCune 1993) and Colorado and New Mexico (Egan 1971) likewise were not found in the alpine sites visited. The upper slopes of the Teton Range are steep and jagged, with very little development of broad meadow surfaces such as those in Yellowstone Park and the Beartooth Plateau. Instability of rock and soil on the steep slopes apparently does not allow for an adequate soil surface for development of fruticose lichen communities. Where more level surfaces do occur in the Teton Range, they tend to be wet alpine meadows with dense grass-sedge communities that probably out-compete lichens. The species found only on calcareous alpine soils were *Collema tenax*, *Solorina bispora*, and *Toninia sedifolia*. Imshaug (1957) reported *Cladonia coccifera* from an alpine granitic site.

Wood and Bark Communities. All of the species on wood and bark are characteristic of boreal forests in this region. The arboreal lichens show characteristics in common with distribution in Yellowstone National Park (Eversman, 1990): few fruticose species and the same curious paucity of species of the genus *Hypogymnia* found abundantly in conifer forests in Montana north of Yellowstone Park. Only five species of *Hypogymnia* from five sites were collected, and they are not hearty specimens. They were all from moist Douglas fir or spruce sites, suggesting that low relative humidity in most forest communities of Grand Teton National Park inhibits growth of *Hypogymnia* and fruticose species. Lichens grow mostly on tree bases and branches rather than on the trunks. Subalpine fir with its smooth bark tends to have more lichen growth than Douglas fir, spruce, or lodgepole pine.

In addition to the 42 species collected from bark in 1995, Oswald (1966) also reported *Candelaria concolor* and *Usnea glabrata* from conifer bark on comparatively low-elevation moraines.

Lichens reported from Grand Teton National Park. Nomenclature follows Esslinger and Egan (1995); substrates and site locations are included. Sites 1c, 7b, 8a and 23 are calcareous; all the others are granitic.

Acarospora fuscata. Rock. 4b, 6b, 12, 16

A. glaucocarpa. Rock. 1b, 6a, 8a, 23

A. heppii. Calcareous rock. 1c

A. smaragdula. Rock. 2, 7b, 8a, 16, 17, 19

- Amandinea (Buellia) punctata*. Bark, wood. 5b, 8a, 13, 15b, 18
Arthonia glebosa. Soil. 3a
Aspicilia calcarea. Rock. 1c, 19
A. candida. Rock. 7a, 8a, 15a, 16
A. caesiocinerea. Rock. 1c, 2, 3a, 3b, 3c, 4a, 4b, 6a, 6b, 7a, 7c, 8a, 8b, 13, 16, 17, 19, 20, 22
A. cinerea. Rock. 2, 5b, 6b, 6c, 7a, 8b, 9, 11, 16, 19, 20, 24
A. supertegens. Rock. 6a
Bellemerea alpina. Rock. 5b, 6a, 7a, 8a.
Bellemerea cinereorufescens. Rock. 1c, 2, 3a, 4a, 6a, 6b, 7a, 9, 14, 16, 20
Brodoa oroarctica (Imshaug, 1957)
Bryoria fremontii. Conifer bark. 1a, 2, 5a, 7a, 7b, 9, 10, 11, 13, 14, 15a, 15b, 23
B. fuscescens. Conifer bark. 1a, 1c, 2, 5b, 6a, 6b, 6c, 7a, 7b, 10, 11, 13, 14, 15a, 15b, 16, 18, 20, 22
B. glabra. Conifer bark. 7a
B. lanestris. Conifer bark. 1c, 10, 12, 13
Buellia erubescens. Wood. 6c, 6b, 7a, 11, 12, 15a, 15b, 18, 23
Caloplaca atroalba. Rock. 15a, 23
C. citrina. Bark, rock. 1a, 7a, 13
C. epithallina. Crustose lichens. 4a, 6a, 6c, 7a
C. flavovirescens. Rock. 4b, 6b, 15c
C. fraudans. Rock. 1c, 2, 6a, 6b, 8a, 11, 12, 13, 14, 16, 19, 22
C. holocarpa. Rock, bark. 4a, 6a, 8a, 10, 12, 13, 15b, 15c, 19, 22, 23
C. jungermanniae. Rock. 8b, 12, 13, 15a, 15c
C. pinicola. Wood. 7b
C. saxicola. Rock. 8a, 15b, 16, 24
C. sideritis. Rock. 2, 6a
C. tirolensis. Plant debris. 9, 15c
C. vitellinula. Rock. 6a, 7a, 7b, 12
Candelaria concolor (Oswald, 1966)
Candelariella aurella. Rock, bark. 1b, 1c, 5b, 6a, 7a, 7b, 7c, 8a, 11, 12, 13, 20
C. canadensis. Moss on soil. 2
C. vitellina. Bark, on *Aspicilia*. 6a, 6b, 7a, 7b, 12, 13, 15b, 20
C. xanthostigma. Litter, moss. 6a, 7b, 12, 15b, 23
Catapyrenium cinereum. Soil. 7b, 8a, 15a
C. norvegicum. Rock. 8a
C. squamulosum. Rock. 6a, 7b, 8a
Catillaria chalybeia. Rock. 14
Chaenotheca furfuracea. "Pin lichen", mossy wood. 4a
Chrysothrix chlorina. Mossy soil and rock. 2, 6a, 7a, 11, 16, 18, 23
Cladonia cariosa. Soil, litter. 5c, 6a, 7a, 9, 10, 13, 14, 15a, 24b
C. carneola. Fruticose, wood. 5a, 10, 13, 14, 16, 18
C. cenotea. Decaying logs, litter on soil. 2, 9, 14, 20
C. cervicornis subsp. *cervicornis*. Soil, litter. 1a, 1c, 4a, 9, 10, 11, 13, 14
C. cervicornis subsp. *verticillata*. Soil, litter. 5a, 10, 13, 15a, 18
C. chlorophaea. Soil, litter. 1a, 1c, 2, 3a, 4a, 5a, 6a, 6b, 7a, 9, 11, 13, 15c, 18, 19, 20
C. coccifera. (Imshaug, 1957)
C. coniocraea. Mossy, decaying wood. 1a, 2, 3a, 6a, 9, 11, 12, 13, 15b, 15c, 18, 19

- C. decorticata*. Soil. 1a, 6c, 14
C. deformis. Decaying logs, litter on soil. 2, 5b, 15b
C. ecmocyna subsp. *ecmocyna*. Soil. 13
C. fimbriata. Decaying logs, litter. 1a, 2, 3b, 4a, 5a, 5b, 6a, 6b, 7a, 7b, 9, 10, 11, 13, 14, 15a, 15b, 15c, 16, 17, 18, 19, 20, 22, 23
C. gracilis. Litter on soil. 15a.
C. norvegicum. Mossy soil. 4a, 10
C. ochrochlora. Decaying logs, litter. 1a, 5
C. pocillum. Mossy soil, litter. 1b, 3, 5c, 7b, 7c, 9, 13, 15c, 22, 23
C. pyxidata. Soil, litter. 2, 3, 4a, 4b, 5b, 6a, 7a, 7b, 10, 13, 15a, 15c, 18, 20, 24
C. rei. Soil, litter. 1a, 2, 5b, 7b, 9, 10, 15c, 20
C. subulata. Litter on soil. 2, 5a, 9
C. sulphurina. Decaying logs. 2, 5a, 6a, 6c, 7a, 9, 10, 11, 12, 13, 14, 18, 19, 20, 24
C. transcendens. Decaying logs, litter. 2, 5a
C. verruculosa. Soil. 2, 19
Coelocaulon aculeatum. Soil. 3, 4b
Collema fuscovirens. Rock, soil. 1c, 6b
C. polycarpon. Calcareous rock. 1c, 23
C. tenax. Soil. 7b
Cyphelium tigillare. Wood. 3c, 5b
Dermatocarpon luridum. Rock. 4a, 7a
D. miniatum. Rock. 2, 4b, 6b, 7a, 12, 15c, 16
D. moulinsii. Rock. 4a, 4b, 6b, 7a
D. reticulatum. Rock. 2, 3b, 4a, 6a, 6b, 6c, 7a, 8a, 16
D. rivulorum. Rock. 4b, 15c
Dimelaena oreina. Rock. 6a, 6c
Diploschistes muscorum. Moss. 4b
D. scruposus. Rock. 4a
Endocarpon pulvinatum. Rock. 1c, 7b
Farnoldia (Lecidea) jurana. Rock. 3b
Fuscopannaria leucophaea. Moss. 6c
F. praetermissa. Moss. 6b
Hypocoenomyce scalaris. Wood. 13
Hypogymnia austerodes. Bark. 1a, 6c
H. farinacea. Conifer bark. 6a
H. imshaugii. Conifer bark. 6a
H. physodes. Conifer bark. 7b
H. tubulosa. Conifer bark. 18
Lecania nylanderiana. Calcareous rock. 1c
Lecanora albescens. Rock. 20
L. allophana. Bark. 1a, 6a, 7b, 13
L. argopholis. Rock. 3a, 3c, 4a, 6a, 6b, 12, 15a
L. cenisia. Rock. 5a, 6b, 7a, 11, 15c
L. crenulata. Rock. 1b, 7a
L. dispersa. Rock. 12
L. epibryon. Plant debris. 23
L. garovaglii. Rock. 4b, 6a, 6b, 6c, 11, 12, 16, 24
L. hagenii. Bark. 1a, 6a, 7a, 10, 12, 13, 15a, 16, 24

- L. marginata*. Rock. 2, 7a, 8a, 9, 19, 23
L. muralis. Rock. 6a, 6b, 7a, 15c, 14, 16
L. nigromarginata. Rock. 16, 17
L. novomexicana. Rock. 4a, 4b, 6a, 6b, 7a, 8, 12, 20
L. polytropa. Rock. 1b, 2, 3a, 3c, 4a, 5b, 6a, 6b, 9, 12
L. pulicaris. Bark. 5b, 6c, 7a
L. rugosella. Bark. 16
L. rupicola. Rock. 2, 3a, 7a, 12, 16
L. subrugosa. Bark. 7a, 7b, 11
L. varia. Bark. 3b, 6a, 6b, 7a, 7b, 8a, 15a, 20
Lecidea atrobrunnea. Rock. 2, 3a, 3b, 3c, 4a, 4b, 6a, 6b, 7a, 7b, 9, 12, 20, 22
L. auriculata. Rock. 3a, 3b, 7b, 19
L. elabens. Wood. 1a, 7a, 7b, 12
L. plana. Rock. 2, 6a
Lecidella euphorea. Wood, bark. 1a, 2, 5c, 6a, 6b, 6c, 7a, 7b, 8a, 12, 13, 18, 24
L. stigmatia. Crustose, rock. 6a, 8a, 14, 19
Lempholemma polyanthes. Rock. 6b
Lepraria cacuminum. Mossy rock, soil. 3a, 3b, 3c, 4a, 5c, 6a, 6b, 7b, 11, 15a, 15c
Leptogium cyanescens. Rock. 1c, 6b
L. saturninum. Rock. 1c, 4b, 6a, 6b, 6c, 7a, 7b
Letharia columbiana. Conifer bark. 4a, 9, 11, 13
L. vulpina. Conifer bark. 1a, 1b, 1c, 2, 3a, 4a, 5a, 5b, 6b, 6c, 7a, 7b, 9, 10, 11, 12, 13, 14, 15b, 15c, 16, 18, 20, 23
Lobothallia alphoplaca. Rock. 6a, 6b, 7a, 15a
Melanelia disjuncta. Rock. 6a
M. elegantula. Bark. 3c, 7a, 7b, 8a, 11, 12, 13, 15a, 18, 21, 23, 24
M. exasperatula. Bark. 1a, 3, 5b, 6a, 6b, 7a, 7b, 8b, 11, 12, 13, 15a, 15b, 16, 18, 20, 23
M. infumata. Rock. 7a, 8b, 12, 16, 23
M. soorediata. Rock. 6a, 6b, 6c
M. stygia. Rock. 3c, 7a, 4b, 16
M. subelegantula. Bark. 5a, 6a, 6b, 7a, 12
M. subolivacea. Bark. 6a, 6b, 7a, 7b, 13, 15b, 16, 23
Nephroma parile. Mossy soil, litter. 3c, 5b, 5c, 6c, 6b, 7a
Pannaria pezizoides. Soil. 4a
Parmelia sulcata. Bark. 4a, 6a, 7a, 15b
Parmeliopsis ambigua. Conifer bark at base of trees. 1a, 1c, 3b, 4a, 5a, 6c, 7a, 7b, 11, 12, 13, 14, 15a, 15b, 15c, 16, 17, 18, 19, 20, 23
P. hyperopta. Wood. 1a, 15a
Peltigera aphthosa. Moist soil, litter. 1a, 4a, 5a, 5b
P. canina. Soil, litter. 2, 4a, 5a, 7b, 9, 15a, 16, 20, 23
P. didactyla. Soil, moss. 2, 5a, 5b, 6a, 9, 13, 20, 24
P. kristinsonii. Soil, moss. 2, 7a
P. malacea. Soil, moss. 1a, 5b, 6b, 7a, 10, 13, 14, 19, 23
P. membranacea. Soil, litter. 1a, 1c, 15b
P. neckeri. Soil, litter. 14
P. polydactylon. Soil, litter. 1a, 1c
P. ponojensis. Soil, litter. 9, 20
P. praetextata. Soil, litter. 6b, 20

- P. retifoveata*. Soil, litter. 1a, 13, 15, 17, 19, 21
P. rufescens. Soil, litter. 1a, 1b, 1c, 2, 3a, 3c, 4a, 5c, 6b, 7a, 7b, 8a, 9, 10, 11, 12, 13, 15a, 17, 18, 19, 20, 21, 22, 23, 24
P. venosa. Soil, litter. 3a, 4a, 5a, 6a
Phaeophyscia decolor. Rock, mossy rock. 4a, 5a, 6a, 6b, 6c, 7a, 8b
P. nigricans. Rock. 6c
P. sciastra. Mossy rock. 5a, 6a, 16, 23
Physcia adscendens. Bark. 6a, 6b, 6c, 7a, 7b, 10, 15a, 15b, 17, 24
P. aipolia. Bark. 6b, 6c
P. biziana. Rock. 6a, 6b, 23
P. caesia. Rock. 2, 4a, 6a, 6b, 6c, 16
P. callosa. Rock. 4a
P. dimidiata. Mossy rock. 16, 23
P. dubia. Bark, mossy rock. 5b, 6a, 6b, 7a, 8b, 12, 113, 14, 5a, 15b, 15c, 16, 23
P. phaea. Mossy rock. 3, 4a, 6a, 6b, 6c, 16
P. stellaris. Bark. 6b
Physconia muscigena. Mossy rock. 6b, 7c, 23
Placynthiella uliginosa. Mossy rock. 14
Pleopsidium (Acarospora) chlorophanum. Rock. 5b, 7a, 8a, 16
Polychidium muscicola. Moss on rock. 7a
Polysporina (Sarcogyne) simplex. Rock. 4b
Porpidia crustulata. Rock. 3a, 5a, 9
P. macrocarpa. Rock. 5b, 7b, 12, 22
Protoblastenia rupestris. Calcareous rock. 1c
Protoparmelia badia. Rock. 19, 24
Pseudephebe minuscula. (Imshaug, 1966)
P. pubescens. Rock. 6a
Psora decipiens. Soil. 4b, 7b, 22
P. globifera. Rock. 2, 6a, 14, 15c, 16, 17
P. himalayana. Rock. 4a, 15c, 16
P. montana. Rock. 7a, 8a, 15a
P. nipponica. Rock crevices. 16
P. tuckermanii. Rock, soil. 7a, 21, 23
Psoroma hypnorum. Mossy soil. 3a, 3c, 9, 16
Pyrrhospora (Lecidea) elabens. Wood. 1a, 3, 7b, 11, 18
Rhizocarpon disporum. Rock. 3a, 4a, 4b, 5a, 6a, 6b, 7a, 16
R. geminatum. Rock. 3b, 5b, 6a, 6b, 6c, 16
R. geographicum. Rock. 2, 3c, 4a, 4b, 6a, 6c, 7a, 8b, 13, 15c, 20
R. grande. Rock. 6c
R. riparium. Rock. 1 c, 2, 3a, 3b, 4b, 5b, 6a, 6b, 9, 12, 15c, 16
Rhizoplaca chrysoleuca. Rock. 4a, 5a, 6a, 6b, 6c, 7a, 16
R. melanophthalma. Rock. 4b, 6a, 6b, 6c, 8b, 12, 15b, 16, 19
Rimularia insularis. On *Lecanora rupicola*. 2, 3a, 7a, 12, 16
Rinodina annulata. Bark. 23
R. archaea. Wood, bark of deciduous trees. 6a, 7b, 15a
R. bischoffii. Rock. 7b, 9
R. calcigena. Usually calcareous rock. 1c, 7a, 8a
R. exigua. Bark of alder. 6a, 19

- R. milvina*. Rock. 2
R. pyrina. Bark. 1a, 1b, 15a, 20
Solorina bispora. Alpine calcareous soil. 8a
S. crocea. Soil. 5b
Sporastatia testudinea. Rock. 3c
Staurothele drummondii. Rock. 1c, 2, 6b, 7b, 8a, 12, 16, 23
S. fissa. Rock. 2, 4a, 5b, 7b, 8a, 23
Stereocaulon alpinum. Soil. 2
Toninia sedifolia. Alpine calcareous soil. 8a
Trapeliopsis granulosa. Wood, organic soil. 3c, 6a, 15a, 15b
Tuckermannopsis chlorophylla. Conifer branch. 6a
U. hyperborea. Rock. 3c, 4a, 4b, 5c, 6a, 6b, 7a
U. kraschennikovii. Rock. 6b, 8b, 11, 16
U. torrefacta. Rock. 6a
U. vellea. Rock. 4a, 5b
U. virginis. Rock. 3, 4b, 8b
Usnea lapponica. Bark. 1a, 1c, 2, 5, 6a, 6c, 7a, 7b, 10, 12, 13, 15a, 16, 22
U. substerilis. Bark. 1c, 2, 4a, 5a, 6b, 7a, 7b, 8a, 11, 13, 14, 15a, 15b, 15c, 18, 20, 21, 23
Verrucaria caerulea. Rock. 5b
Verrucaria compacta. Rock. 16
V. fuscella. Rock. 1c, 6b, 8a, 16
V. nigrescens. Rock. 1c
V. glaucovirens. Rock. 1b, 6a, 6b, 6c, 8a, 24
Vulpicida pinastri. Base of conifer trees. 4a, 6a, 6b, 18
Xanthoparmelia coloradoensis. Rocky soil. 15a
Xanthoparmelia cumberlandia. Rock. 3, 4b, 6a, 6b, 16
X. lineola. Rock. 4b, 6a, 6b, 6c, 7a
X. plittii. Rock. 6b, 16
X. subdecepiens. Rock. 2, 6a, 6c, 7a, 11
X. wyomingica. Soil. 4b
Xanthoria elegans. Foliose, rock. 2, 4b, 5b, 6a, 6b, 7b, 8a, 8b, 12, 16, 23
X. fallax. Bark, moist rock. 6b, 6c, 7a, 7b, 7c, 10, 11, 13, 15a, 15b, 15c, 16, 18, 21, 22, 23, 24
X. polycarpa. Bark. 1a, 6a, 7b, 10, 13, 15a, 15b, 23, 24
X. sorediata. Rock. 2, 4a, 4b, 5b, 6a, 6b, 6c, 7a, 8a, 15a, 19

The cold dry continental climate, the steep slopes of the peaks and the fire history of Grand Teton National Park affect the vegetation patterns, including lichens. It was expected that fewer species of lichens would grow in this park compared with areas with Pacific influence (DeBolt & McCune, 1993; McCune 1982); however, Grand Teton National Park, as well as Yellowstone National Park immediately north, remain undercollected. Further excursions into the alpine would add significantly to the knowledge of the lichen flora of this region.

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