LICHENS OF GRAND TETON NATIONAL PARK

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✦ INTRODUCTON

Lichens are an important group when considering the biodiversity of a region. While not usually considered economically important, they are conspicuous parts of the flora of alpine rock and soil, contributing to rock weathering and providing habitat for small invertebrates. In the forest zones, large hanging fruticose species are food for deer and elk and are indicators of high air quality. Soil lichens at all elevations are important stabilizers, helping to prevent wind and water erosion. Since lichens have a very slow growth rate, a diverse lichen flora indicates stable undisturbed environments. The major objective of this project was to characterize the lichen flora of Grand Teton National Park, providing a species list as part of the ongoing lichen studies in the northern Rocky Mountains and as a contribution to the database for all national parks. Lichen specimens were also collected for element analysis to provide a baseline for air quality assessment.

✦ LOCATIONS AND METHODS

Between 20 July and 1 October 1995, we (Rebecca Schanz, Deana Maloney, and Sharon Eversman) collected lichen specimens from all substrates, rock, soil, wood and bark, from 24 areas in Grand Teton National Park (Table 1); each collecting area had many collecting sites, generally proceeding from lower to higher elevations, traversing through many vegetation communities. Collections were made from each community, e.g., sagebrush-grassland, lodgepole pine, Douglas fir, spruce-subalpine fir, alpine, and riparian. Identification is continuing using standard morphological and chemical techniques (Bird, unpublished keys; McCune and Goward, 1995; Wetmore, 1967) and current nomenclature (Esslinger and Egan, 1995). It is expected that by the end of summer, 1996, all the specimens will be identified and packets will be prepared for the Montana State University Herbarium (MONT) and for the National Park Service, Grand Teton National Park.

Table 1. Areas from which lichens were collected July - September, 1996, arranged in approximate order from north to south in Grand Teton National Park and adjacent Teton National Forest. Each area generally has more than one collecting site, e.g., lower slopes, higher slopes, Douglas fir forest type, alpine, etc.

Teton Range

1. Wilcox Point to Webb Canyon, SE base of Owl Peak
   2045-2075m; 43°58'N, 110°42-45°W
   Wet spruce-fir to lodgepole pine and meadows
   Calcareous rock on Owl Peak
2. Waterfalls Canyon
   2000-2424m; 43°55'N, 110°44'W
   Spruce bog , aspen, Douglas fir, cottonwood; fire in 1974 Granitic rock
3. Paintbrush Canyon to Holly Lake to Paintbrush Divide
   2109-2909m; 43°47'30"N, 110°48'W Forested to alpine
4. Cascade Creek Canyon to Schoolroom Glacier
   2056-3030m; 43°43-46°N, 110°46-50'30"W
   Forested to alpine
5. Lupine Meadows to Surprise Lake
   2061-2909m; 43°43'N, 110°44-47'W
   Lodgepole pine, Douglas fir, subalpine fir; granitic rock

Table 1 (continued)

6. Phelps Lake from trailhead
   2030-2212m; 43°39'N, 110°37-39'W
   Aspen, Douglas fir, spruce, subalpine fir
   Granitic outcrop at NW end of Phelps Lake

7. Granite Canyon
   1940-3152m; 43°36-47'N; 110° 49-53'W
   Lodgepole pine, spruce, Douglas fir, subalpine fir, alpine
   Calcareous on top; granitic lower

8. Rendezvous Peak (tram, Teton National Forest)
   1955-3160m; 43°36'N, 110°51-53'W
   Lodgepole pine, spruce, Douglas fir, subalpine fir, alpine
   Calcareous on top; granitic lower

Jackson Hole and Gros Ventre Range

9. Steamboat Mountain, Rockefeller Parkway
   2224-2318m; 44°03'N, 110°42'W
   Spruce, Douglas fir, willow, lodgepole pine, whitebark pine

10. Moose Island
   2055-2061m; 43°56'N, 110°38W
   Lodgepole pine, subalpine fir, Douglas fir
   Sandy soils

11. Pilgrim Creek, floodplain and moraine SSE of Pilgrim Mountain
   2091-2121m; 43°56'N, 110°35'W
   Cottonwoods, lodgepole pine
   Gravelly floodplain

12. Grand View Point
   2109-2218m; 43° 54'N, 110°33'30"W
   Douglas fir to rhyolite cliffs

13. Elk Island, east half
   2048-2076m; 43°52'N, 110°41'W
   Grassy, lodgepole pine, Douglas fir, young subalpine fir

14. Hermitage Point
   2053-2060m; 43°51-54'N; 110°37-38'W
   Artemisia, lodgepole pine, Idaho fescue

15. Emma Matilda Lake, trail from Christian Pond around lake
   2061-2182m; 43° 53-54'N, 110°30-34'W
   Lodgepole pine, Douglas fir, spruce along lake; aspen on north side
   Rock granitic or rhyolite

16. Signal Mountain
   2302-2348m; 43°51'N, 110°35W
   Sagebrush, Douglas fir, aspen
   Rhyolite

17. Cow Lake - Cattlemen's Bridge area
   2030-2077m; 43°50-51'N, 100°34'W
   Lodgepole pine, subalpine fir; big sagebrush
   Sagebrush-grassland; rhyolite cliff

18. Snake River, west side
   2030m; 43°48'N, 110°33'W
   Spruce bog, cottonwood
   Sandy soil; used by elk and bison

19. Potholes
   2061-2085m; 43°48'N, 110°47'W
   Sagebrush-grassland.
   Gravelly loose disturbed soil

20. Timbered Island
   2036-2060m; 43°43'N, 110°43'W
   Sagebrush grassland surrounding Douglas fir, lodgepole pine, spruce Moraine

21. Moose Visitor Center
   1952-1964m; 43°39'N, 110°43'W
   Cottonwood and spruce near Snake River
   Sandy soil

22. Ditch Creek
   2036-2048m; 43°40'N, 110°38'W
   Sagebrush-grassland
   Alluvial porous soil

23. Blacktail Butte
   1976-2061m; 43°38'N, 110°42'W
   Douglas fir, some aspen
   Limestone

24. Kelly Warm Springs to Kelly Peak
   2024-2109m; 43°38'N, 110°36'W
   Willow, sagebrush-grassland to aspen, subalpine fir, lodgepole pine

✦ RESULTS AND DISCUSSION

To date, 120 species have been identified from seven areas: the trail from Christian Pond around Emma Matilda Lake, Phelps Lake, Granite Canyon, Rendezvous Peak, Paintbrush Canyon, Grand View Point, and Signal Mountain. Table 2 lists the species by substrate (rock, soil, wood and bark, other) and growth form (crustose, squamulose, foliose, and fruticose). Of the 120 species identified, 44 species (36%) are crustose ; 12 (10%) are squamulose; 53 (45%) are foliose, including umbilicate; and 11 (10%) are fruticose. Sixty-four lichen species (53%) grow on rock, 25 species (21%) are on soil, 25 (21%) are on wood and bark, and six (4%) are on moss on soil or rock.

TABLE 2: Lichen species identified from Grand Teton National Park

Rock substrate
Crustose growth form
Acarospora fuscata (Nyl.) Arnold

Table 2 (continued)

Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold
Bellemerea alpina (Sommerf.) Clauz. & Roux
Bellemerea cinereorufescens (Ach.) Clauzade & Roux
Caloplaca atroalba (Tuck.) Zahlbr.
Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth.
Caloplaca fraudans (Th. Fr.) Oliv.
Caloplaca holocarpa (Hoffm.) Wade
Caloplaca jungermanniae (Vahl) Th.Fr.
Candelariella aurella (Hoffm.) Zahlbr.
Dimelaena oreina (Ach.) Norman
Farnoldia jurana (Schaerer) Hertel
Lecanora argopholis (Ach.) Ach.
Lecanora cenisia Ach.
Lecanora dispersa (Pers.) Sommerf.
Lecanora muralis (Schreber) Rabenh.
Lecanora novomexicana (B. De Lesd.) Zahlbr.
Lecanora polytropa (Hoffm.) Rabenh.
Lecidea atrobrunnea (Ramond. in Lam. & DC.) Schaerer
Lecidea auriculata Th.Fr.
Lecidella stigmatea (Ach.) Hertel & Leuck.
Rhizocarpon disporum (Naeg. ex Hepp) Mull.
Rhizocarpon geographicum (L.) DC.
Rhizocarpon grande (Floerke ex Flotow) Arnold
Rhizocarpon riparium Rasanan
Rhizocarpon sphaerosporum Rasanen
Sporastatia testudinea (Ach.) Massal.
Staurothele fissa (Taylor) Zwackh
Verrucaria glaucovirens Grummann

Squamulose
Dermatocarpon lorenzianum Anders.
Psora globifera (Ach.) Mass.
Psora himalayana (Church.Bab.) Timdal

Foliose
Caloplaca saxicola (Hoffm.) Nordin
Dermatocarpon luridum (With.) J.R. Laundon
Dermatocarpon miniatum (L.) Mann
Dermatocarpon moulinsii (Mont.) Zahlbr.
Dermatocarpon reticulatum Magnusson
Lecanora garovaglii (Koerber) Zahlbr.
Lecanora nigromarginata H. Magn.
Leptogium saturninum (Dickson) Nyl.
Melanelia sorediata (Ach.) Goward & Ahti
Melanelia stygia (L.) Essl.
Phaeophyscia decolor (Kashiw.) Essl.
Phaeophyscia sciastra (Ach.) Moberg
Physcia caesia (Hoffm.) Fuernr.
Physcia dubia (Hoffm.) Lettau
Physcia phaea (Tuck) J. W. Thomson
Rhizoplaca chrysoleuca (Sm.) Zopf
Rhizoplaca melanophthalma (DC.) Leuck. & Poelt
Umbilicaria hyperborea (Ach.) Hoffm.
Umbilicaria kraschenninikovii (Sav.) Zahlbr.
Umbilicaria vellea (L.) Ach.
Umbilicaria virginis Schaerer
Xanthoparmelia coloradoensis (Gyelnik) Hale
Xanthoparmelia cumberlandia
Xanthoparmelia lineola
Xanthoparmelia taractica
Xanthoparmelia mexicana, plittii
Xanthoparmelia subdecipiens
Xanthoria elegans (Link) Th.Fr.
Xanthoria sorediata (Vain) Poelt

Fruticose
Nodobryoria subdivergens (E. Dahl) Common & Brodo
Xanthoria candelaria (L.) Th.Fr.

Soil substrate
Crustose growth form
Diploschistes muscorum (Scop.) R. Sant.

Squamulose
Arthonia glebosa Tuck.
Catapyrenium cinereum (Pers.) Koerber
Catapyrenium daedalum (Krempelh.) B. Stein
Catapyrenium norvegicum Breuss
Psora decipiens (Hedwig) Hoffm
Psora montana Timdal
Psora tuckermanii R. Anderson *ex* Timdal
Psoroma hypnorum (Vahl) Gray
Toninia sedifolia (Scop.) Timdal

Foliose growth form
Arctoparmelia centrifuga (L.) Hale
Nephroma parile (Ach.) Ach.
Peltigera canina (L.) Willd.
Peltigera didactyla (With.) J. R. Laundon
Peltigera rufescens (Weis.) Humb.
Peltigera venosa (L.) Hoffm.
Solorina bispora Nyl.
Solorina crocea (L.) Ach.
Xanthoparmelia wyomingica

Fruticose
Cladonia cariosa (Ach.) Spreng.
Cladonia coniocraea (Floerke) Spreng.
Cladonia pocillum (Ach.) O. Rich
Cladonia pyxidata (L.) Hoffm.
Coelocaulon aculeatum (Schreber) Link
Coelocaulon muricatum (Ach.) Laundon

Bark and wood substrates
Crustose growth form
Buellia erubescens Arnold
Buellia punctata (Hoffm.) Mass.
Cyphelium tigillare (Ach.) Ach.
Lecanora hagenii (Ach.) Ach.
Lecanora pulicaris (Pers.) Ach.
Lecanora varia (Hoffm.) Ach.
Lecidella euphorea (Floerke) Hertel
Rinodina archaea (Ach.) Arnold
Trapeliopsis granulosa (Hoffm.) Lumbsch

Foliose growth form
Hypogymnia austerodes (Nyl.) Rasanen
Melanelia elegantula (Zahlbr.) Essl.
Melanelia exasperatula (Nyl.) Essl.
Melanelia subelegantula (Essl.) Essl.
Melanelia subolivacea (Nyl. in Hesse) Essl.
Parmelia sulcata Tayl.
Parmeliopsis ambigua (Wulfen. in Jacq.) Nyl.
Phaeophyscia nigricans (Floerke) Moberg
Physcia adscendens (Fr.) Oliv.
Physcia aipolia (Ehrh. ex Humb.) Fuernr.
Placynthiella uliginosa (Schrader) Coppins & P. James
Xanthoria fallax (Hepp. in Arnold) Arnold
Xanthoria polycarpa (Hoffm.) Rieber

Table 2 (continued)

Fruticose growth form	
Bryoria fuscescens (Gyeln.) Brodo & D. Hawksw.	
Letharia vulpina (L.) Hue	
Usnea lapponica Vainio	
Moss on soil, rock, or tree bases	
Crustose	
Chrysothrix chlorina (Ach.) Laundon	
Cladonia fimbriata (L.) Fr.	
Lepraria cacuminum (Massal.) Lohtander	
Rinodina turfacea (Wahl.) Korb.	
Foliose	
Lempholemma polyanthes (Bernh.) Malme	
Other lichens	
Crustose	
Rimularia insularis (Nyl.) Rambold & Hertel	

All of the lichen species on wood and bark in the Grand Teton National Park are characteristic of boreal forests. These arboreal lichens show many characteristics in common with distribution in Yellowstone National Park: few fruticose species and the same curious lack of species of the genus *Hypogymnia* found in conifer forests north of Yellowstone Park in Montana. The only species of *Hypogymnia* so far identified is *H. austerodes*; other *Hypogymnia* species expected were *H. physodes* and *H. imshaugii*. The species growing on rock and mossy rock vary with elevation, but they are also generally species typical of those substrates; two rarely encountered species have been identified, *Dermatocarpon lorenzianum*, a squamulose species on rock and *Lempholemma polyanthes*, a cyanobacteria-containing lichen on shaded moss on rock.

Lichens on soil at lower elevations and in the forest zones are similar to those collected from other nearby areas in Yellowstone Park and Montana. Alpine areas were much different than expected. Above an elevation of about 2900m, I expected to find fruticose species such as *Dactylina madreporiformis*, *Cetraria nivalis*, and *C. islandica*, typical of alpine meadows on the Beartooth Plateau and parts of Yellowstone Park (Eversman, 1990, 1995). However, these species were not found at any of the high elevations sites examined. I suspect that there are two major reasons why the alpine communities of the Teton Range are very different from those of the Beartooth Plateau and peaks like Electric Peak and Mount Washburn in Yellowstone Park. Both reasons are related to steep slopes, which cause much more unstable soil and rock substrates in the Teton Range. Lichens cannot become well-established where the substrate is not stable. Where slopes are more gentle, snow frequently collects until late in the summer, causing a growing season that is too short for lichens to become established. Lichen growth is relatively slow and more than 200 snow-free days per year are needed for substantial lichen development (Benedict, 1990; Eversman, 1995; Walker et al., 1993). It is possible that propagules for these typical alpine species may not have reached the Teton Range, but that seems improbable since the expected species are distributed throughout the Rocky Mountains in appropriate habitats (Egan, 1971; DeBolt and McCune, 1993; McCune and Goward, 1995).

I suspect that most of the species in Grand Teton National Park have been identified, but I am looking forward to continuing the identifications to describe the lichen flora in greater detail. A final report will be submitted when the identifications and element analyses are completed.

✦ LITERATURE CITED

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