

## Initial Lichen Inventory of the Trinity Alps Wilderness

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*Lichen inventories on Forest Service lands are few. The Trinity Alps Wilderness is a unique and complex area of multiple vegetations, geologies, and moisture regimes, providing numerous habitats for lichen diversity. Six different locations were inventoried in 2013, resulting in 89 species recorded. An additional 13 species were added from incidental records. Collection locations and significant species are discussed. Additional areas are identified for future inventories.*

### INTRODUCTION

Lichen inventory data for federally-administered lands is scant to nonexistent. While there is a policy document (NPS 2001) and a monitoring program (NPS 2014) in place for the national parks in the United States, it is currently estimated to be only 46% complete. In California there are only three published inventories for national parks (Knudsen & Kokourkova 2012; Hutten et al. 2013; Knudsen et al. 2013). Additional inventories are recommended (McCune *et al.* 2007). For the much larger land area managed by the US Forest Service, no formal lichen inventories have been made, aside from species-specific surveys conducted within the range of the northern spotted owl, as part of the Survey and Manage component of the Northwest Forest Plan. Informal inventory data exist in the form of spatial queries of online lichen herbaria (CNALH, UC Riverside, NY Botanic Garden), but data for these are incidental rather than focused.

The objective of this work was to initiate a focused inventory and collection of macro-

lichens on National Forests in northwest California. Large portions of National Forest lands have been fragmented by logging and related road construction. Wilderness areas, while not exempt from the disturbance of wild-fire, are relatively undisturbed by land management activities and also capture relatively wide elevational gradients and thus diverse vegetative communities, providing an advantageous setting for lichen inventory.

### GEOGRAPHIC SETTING

The Trinity Alps is a 525,627-acre Wilderness located primarily in northern Trinity County in northern California, and except for approximately 4623 acres under the jurisdiction of the Bureau of Land Management, is administered by the Shasta-Trinity, Klamath and Six Rivers National Forests. The Wilderness also crosses the boundaries of Trinity, Siskiyou and Humboldt Counties; the county boundaries coincide with the National Forest boundaries. The wilderness is located in the Salmon and Scott Mountains, subranges of the Klamath Mountains. Elevations range from 2400 feet in the Stuart Fork Canyon to just over 9000 feet at Thomson Peak (Ferlatte 1974). Rainfall varies between 29 and 107 inches of precipitation annually (Gibson et al. 2002); higher elevations typically receive greater precipitation than low.

The following information on the geology of the Trinity Alps Wilderness is excerpted from Davis et. al, 1965:

"The oldest rocks are Pre-Upper Jurassic metamorphics. Igneous rocks are younger, mostly Upper Jurassic-Lower Cretaceous in age. Plutons at Caribou Mountain and in

Canyon Creek are quartz diorite; there are also large ultramafic outcrops, most of which have altered to serpentine. The youngest rocks are Quaternary glacial deposits, alluvium and talus".

Portions of the vascular flora are predominantly Sierran, a unique occurrence for mountains that lie only sixty miles from the Pacific Ocean. The following ecological zones occur (Ferlatte 1974): mixed conifer forest, red fir forest, subalpine forest, alpine fell-field, and montane chaparral.

#### COLLECTION LOCATIONS

Inventory locations were chosen to capture as much of the habitat diversity of the Wilderness as was practical (Figure 1), given the time and funding available. Visits to west side locations around Limestone Ridge, Tish Tang Creek and Mill Creek Lakes had to be cancelled

due to the Corral and Baker fires of 2013. This was unfortunate because the west side (approximately west of the New River) receives more moisture than the rest of the Wilderness, both in precipitation and also in relative humidity (PRISM 2010). The resulting loss of inventory diversity was significant.

Locations 7, 8 and 9 were not a formal part of this Inventory. They represent earlier collections from my personal herbarium, and were made during casual recreational trips into the Alps and surrounding areas, or were collected during field work for Six Rivers National Forest. All collections (Table 1) have been accessioned into the herbarium at the California Academy of Sciences (CAS).

#### 1. East Fork New River Trail. 33 species.

Portions of this trail had burned during the 1999 Megram Fire, but as was typical of the patchy nature of Megram, certain areas remained unburned, despite their proximity to areas of high-intensity burn. East Fork New River Trail follows the north bank of the East Fork, beginning at about 2000' elevation. Except for the river benches the habitat is a relatively uniform moist vegetation type, and consists primarily of early- to late-mature *Pseudotsuga menziesii*/*Notholithocarpus densiflora* forest mixed with *Calocedrus decurrens* and *Pinus ponderosa* in slightly drier areas, and *Acer macrophyllum* where more moisture is available. Small *Quercus garryana* woodlands less than 10 acres in size are scant along the portions of the trail surveyed. On old river benches the vegetation changes to an *Alnus*

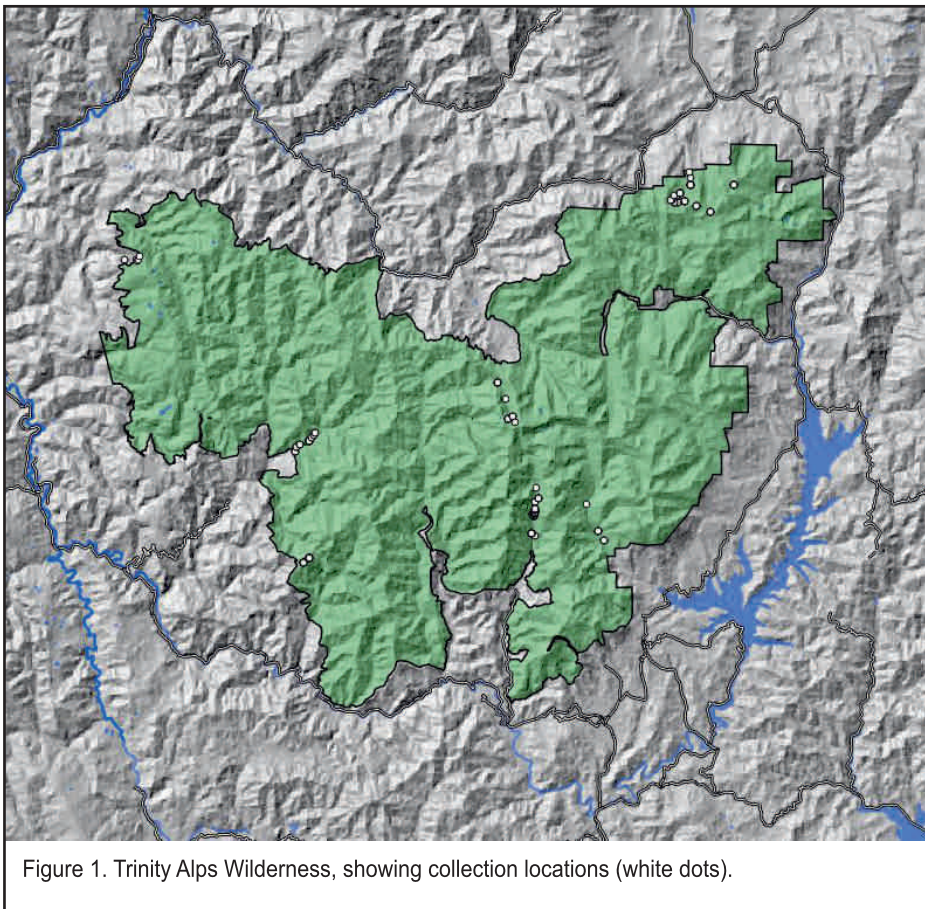


Figure 1. Trinity Alps Wilderness, showing collection locations (white dots).

*rhombofolia/Acer macrophyllum* forest with an understory of *Cornus canadensis* and *Taxus brevifolia*. Light levels can be very low and moisture is available year-round.

Due to the valley bottom slope position (McCune et al.2002) and hardwood species, cyanolichens are well-represented on trees and sometimes on the ground along many parts of the trail. *Collema nigrescens*, *Nephroma helveticum*, *N. resupinatum* and *Pseudocyphellaria anthraspis* are common on maple and yew branches and trunks. The lowest portions of mossy clustered dogwood trunks host smaller cyanolichens: *Leptogium palmatum*, *L. polycarpum*, and *Fuscopannaria pacifica*. Some of the larger cyanolichens are also present in the drier Garry oak stands, including *Lobaria hallii*. Terrestrial lichens are present in unburned portions of the trail, but species diversity is low.

## 2. Green Mountain Trail. 17 species.

Green Mountain Trail begins at 5,050' in a small *Quercus garryana* grassland, and climbs steeply up the southeast ridge of Brushy Mountain, ascending through a mixed early-mature/old-growth forest of *Pseudotsuga menziesii/Abies grandis/Abies magnifica*, until approximately 5,800', where Douglas-fir drops out, and the forest is composed entirely of fir trees. Lichen species conformed to that of a typical mid-elevation mid- to upper-slope fir forest, with *Alectoria sarmentosa*, *Platismatia glauca*, *P. stenophylla*, *Letharia columbiana*, *L. vulpina*, *Esslingeriana idahoensis*, *Bryoria pseudofuscescens*, and *Hypogymnia imshaugii* dominating the boles and/or litterfall. *Parmeliopsis ambigua* grew abundantly on tree butts, and *P. hyperopta* was notably absent. Species diversity is low, and in keeping with its slope position (Berryman & McCune 2006), cyanolichens were expectedly absent from this relatively high-elevation ridgetop trail.

Greater species diversity would have been present, however one of the fires of the Bar Complex (2006) had burned through Brushy Mountain, starting above the Garry oak grove at the start of the trail. Burn evidence was apparent throughout the length of the trail surveyed.

While the pattern of burning is a beautiful example of an old-growth forest's tendency towards ground-hugging fire (it may in fact have been a controlled back-burn), it also demonstrates that ground-based fire is catastrophic to any plant community less than eight feet tall. There was no vascular plant understory and virtually no graminoid presence in any surveyed part of this trail. Lichens that are typically found on soil, soil on rocks, directly on small and large rocks, or on tree bases or the cut banks of trails were completely absent from all parts of the Green Mountain Trail. No specimens were found of the common terrestrial/saxicolous genera *Peltigera*, *Leptogium*, *Cladonia*, *Leptochidium*, *Polychidium*, *Fuscopannaria*, and *Massalongia*.

## 3. Canyon Creek Trail. 58 species.

This popular backpacking trail had the least elevational gradient and the greatest substrate diversity of any inventoried location. Lower portions of the trail are *Pseudotsuga menziesii/Abies concolor/Notholithocarpus densiflora* forest with regular *Quercus kelloggii* and frequent *Quercus chrysolepus*, *Calocedrus decurrens* and *Abies magnifica*, as well as *Acer macrophyllum* where more moisture is available. Small granite boulders are common along the lower trail, increasing in size and frequency approaching the subalpine parts of the trail. Portions of the first 1.5 miles of the trail show evidence of a controlled underburn. Above Canyon Creek Falls, tree size and diversity increased – *Picea breweriana*, *Tsuga mertensiana*, some large (>40"dbh) *Pinus lambertiana* and *P. ponderosa*, *Pinus monticola*, and *Populus trichocarpa* are present in various locations in the meadows paralleling the creek.

Canyon Creek Trail resembles East Fork New River Trail in that both have a vegetation type indicative of a mesic habitat, which in combination with the absence of widespread fire and the high substrate diversity, contributes to a high lichen species diversity. Both chlorolichens and cyanolichens were abundant and diverse. Additionally, the greater presence of rocky substrates in this area resulted in detections of

terrestrial and saxicolous species not found at East Fork, including *Vestergrenopsis sonomensis*, *Cladonia ochrochlora*, *C. verruculosa*, *Leptochidium albociliatum*, *Leptogium teretiusculum*, *Melanelia disjuncta*, seven species of *Peltigera*, and *Xanthoparmelia verruculifera*. Especially notable is the presence of *Peltigera gowardii*, a Sensitive species in Region 5. This is only the second occurrence of this species on the Shasta-Trinity National Forest.

**4. East Boulder Lake – Pacific Crest Trail.** 13 species.

This inventory location had low species diversity for a number of reasons: 1) the northeast corner of the Trinity Alps has a mixed geology of metamorphic and granitic parent materials. The rocks of East Boulder Lake and the Pacific Crest Trail above the lake are peridotite, the chemistry of which is not conducive to macrolichen diversity; 2) based on the absence of lichens from the lowest 5-10' of tree trunks in the area, the area experiences significant persistent snow. In summer-dry climates, lichens photosynthesize and increase biomass significantly during periods of winter sun in the presence of snow (Kappan & Breuer 1991; Schroeter et al. 1997), but only to the depth that sunlight can penetrate the upper layers of snow. Below this depth, there is moisture but insufficient light, resulting in the decay and death of the lichen; 3) the habitat is rocky and alpine to subalpine, and 4) the trail contours along the dry south face of a long east-west ridge. Each factor taken singly (exotic chemistry, persistent snow pack, dry south slope, sub/alpine habitat) will reduce species diversity; taken together they result in overall very low macrolichen species diversity.

**5. Mavis Lake/Fox Lake/Fox Creek cross-country loop.** 19 species.

This portion of the inventory had similarities to the East Boulder Lake/Pacific Crest leg of the trail, in that the habitat was subalpine and rocky, with an apparent persistent snowpack. In particular, the stretch of terrain between Fox Lake and Fox Creek showed significant snow damage in the form of heavy

branch litterfall, absence of understory, and numerous dead and dying standing *Abies* spp. on the gentle slopes east of Fox Creek, all of which contributed to diminished lichen diversity because of the short life of the substrate. However the granitic parent material and the northerly aspect combined to provide substrate, temperature and moisture conditions suitable to lichen metabolism. Notable collections made here were *Leptogium rivale*, found where the cool waters of Fox Creek flowed over slopes of 5-15%, and *Bryoria simplicior*, a species with white soredia, which is an uncommon character in California species of *Bryoria*.

The ridge between Fox Lake and Fox Creek is rocky enough that trees grow poorly here, and the accumulation of litter and duff is minimal. A well-established community of terrestrial lichens grows here, including *Placynthiella icmalea*, a widely distributed and frequently overlooked minute soil crust.

The highest species diversity associated with this particular route was found on flat ground at the confluence of Fox Creek and the unnamed outflow from Mavis Lake. At this site, there were five species that showed up here that had been undetected all day: *Alectoria sarmentosa*, *Bryoria simplicior*, *Melanohalea exasperatula*, *Platismatia glauca* and *Tuckermannopsis chlorophylla*.

**6. Fox Ridge Trail.** 11 species.

The habitat along Fox Ridge was the driest encountered in the course of this inventory. Typical of ridgetop locations, it is more exposed, receives more insolation, and becomes drier as one descends. These changes are reflected in the presence of species indicative of drier environments such as *Pinus ponderosa* and *Arctostaphylos* spp.

Two species found on the ridge are unusual. Additional occurrences of *Bryoria simplicior* were found on *Abies concolor* and *Abies magnifica*. The only detection within the Alps of *Hypocenomyce castaneocinerea* came from Fox Ridge. This common lichen grows almost exclusively on burned wood and charcoal; given the large acreage of burned forest surveyed, it is

unusual that only one detection was made.

**West Side Inventory.** Day trips planned for the west side trailheads at Limestone Ridge, Mill Creek Lakes and Tish Tang Creek were cancelled, as the Corral and Baker fires of 2013 had increased in size and caused closures in these Wilderness areas.

**7. Grizzly Lake and North Fork Trinity Trail.** 16 species.

Collections from Grizzly Lake and North Fork Trinity Trail were made in 2002 incidental to a recreational backpacking trip, and are not as representative of the lichen flora of the area as collections from other sites, the collections having been made sporadically. A detailed inventory of this trail is recommended, especially the portion between China Spring Trail and Grizzly Meadows, as this segment of the trail has dense and moist vegetation. Despite the unstructured nature of this trip, some significant collections were made of species representative of a community that inhabits drier, more easterly habitats (i.e., California Cascade Mountains or Interior Coast Ranges): *Nephroma parile*, *Dermatocarpon intestiniforme*, *Lobothallia melanaspis*, and *Phaeophyscia decolor*. Other notable species from North Fork Trail include *D. meiophyllizum*, *Pseudephebe pubescens* and *Umbilicaria polyphylla*.

**8, 9. Stuart Fork Creek and incidental westside locations.** 10 species.

Like the Grizzly Lake and North Fork Trinity Trail collections, the specimens from Stuart Fork Creek were made in 2002 while backpacking, and were not intended to represent the lichen flora of these areas. They are included here to increase the value of this report, and because some of the species from Stuart Fork Creek were not found in other parts of the Alps. *Melanelia panniformis* is uncommon throughout the Pacific Northwest.

Incidental collections are from the Lower Trinity Ranger District on Six Rivers National Forest, and were made during the course of botanical field work in 2001 related to the Megram Fire. Notable species are *Leptogium subaridum*, which was described in 1994 and is

seldom collected, and *Psoroma hypnorum*, from the headwaters of Mill Creek.

#### SIGNIFICANT SPECIES

The following collections are noteworthy, representing species encountered that are unusual, under-reported or uncommon to rare.

*Bryoria simplicior* (Vainio) Brodo & D. Hawksw. (Carlberg #03519A, 03522, 03534).

It is unusual to find in California any of the species of *Bryoria* that produce white soredia. *Bryoria furcellata*, *B. fuscescens*, *B. glabra*, *B. implexa* and *B. pikei* have all been found sporadically and in small quantities in California, mostly in relatively pristine locations. The USDA National Lichens & Air Quality Database (USDA 2013) shows only one previous detection of *B. simplicior* in California (Marble Mountains).

*“Dendriscoaulon” intricatum* (Nyl.) Henssen.

The taxonomy of this occasional cyanolichen is still unresolved, however the lower elevations of both the Fox Ridge and Canyon Creek Trails, with their mixed hardwood/conifer forests that include *Quercus kelloggii*, seem like suitable habitat. This lichen was not found during the current inventory.

*Dermatocarpon intestiniforme* (Körber) Hasse (Carlberg #00742).

Widespread, uncommon, and distinctive, this specimen is from the north side of the Wilderness, along Grizzly Creek Trail. In reference books that recognize this taxon (Brodo et al. 2002; McCune & Geiser 1997) it keys easily because of the multiple holdfasts for each thallus, however some recent texts (McCune & Geiser 2009) treat it as a synonym of *D. miniatum* var. *complicatum*, which however has a single holdfast.

*Dermatocarpon meiophyllizum* Vainio (Carlberg #00744, 00745, 03499, 03512).

In western North America prior to 2009, this lichen was identified as *D. luridum*, a rare lichen protected under the Survey & Manage component of the Northwest Forest Plan. Research by Glavich & Geiser (2009) determined that

most North American specimens were actually the European taxon *D. meiophyllizum*, distinguished by the Melzer's (+) reaction of the medulla. It was found at two widely separated locations in the Wilderness.

*Hypocenomyce castaneocinerea* (Räsänen) Timdal (Carlberg #03404, 03538).

Given the amount of burned forest visited during this inventory, it is surprising that this lichen was not found numerous times, given the specificity of its substrate (charcoal and burned wood).

*Leptogium polycarpum* P. M. Jørg. & Goward (Carlberg #03334).

Widely distributed and possibly uncommon in California, *L. polycarpum* is easily distinguished from other fertile species of *Leptogium* by the 4-spored asci.

*Leptogium rivale* Tuck. (Carlberg #03506B).

An aquatic cyanolichen that is more likely overlooked and undercollected than rare (Glavich 2009), *L. rivale* is found in clear cold perennial streams, especially on granitic substrates. The thin brown thallus resembles a smudge on the rock surface,

*Leptogium subaridum* Jørgensen & Goward (Carlberg #00518).

Seldom reported in California, and usually absent from the Central and Outer Coast Ranges. Possibly overlooked, and very widely distributed, having been reported from Greece, Italy, Spain, and Morocco (Aragón et al. 2004).

*Massalongia carnosa* (Dickson) Körber (Carlberg #00725, 00729, 03427, 03468).

Published reports of this widespread and common species that grows on moss over rock are few (Tucker 2013), so it perhaps deserves more frequent mention.

*Melanelia panniformis* (Nyl.) Essl. (Carlberg #00726).

Another specimen from the Grizzly Creek Trail, *Melanelia panniformis* is isidiate and saxicolous, and like many lichens has the apparently contradictory distribution pattern of being both uncommon and widespread. Only two recent reports from California (Tucker 2013).

*Nephroma parile* (Ach.) Ach. (Carlberg #00747).

Uncommon in northern California, and absent from the northern Outer Coast Ranges, this lichen is sporadic in mesic areas, and becomes the dominant representative of the genus in drier forests further east.

*Peltigera britannica* (Gyelnik) Holt.-Hartw. & Tønsberg (Carlberg #03327).

From the East Fork New River Trail. More common further west, and may be restricted to the Coast Ranges in northern California.

*Peltigera gowardii* Lendemer & H. O'Brien (Carlberg #03437A, 03437B).

This species has in recent times undergone a somewhat bewildering series of name changes (Miadlikowska & Lutzoni 2000; Lendemer & O'Brien 2011).

Like *Leptogium rivale*, *Peltigera gowardii* prefers clear cold spring-fed creeks. *P. gowardii* has very strict requirements regarding stream temperature, scour and sedimentation (Davis et al. 2000, 2003). This lichen is a Sensitive species in Region 5, and occupies much of its predicted habitat in the central Sierra Nevada (Peterson 2010), but is scarce in the Coast Ranges, with only four occurrences on the Six Rivers (1), Shasta-Trinity (2), and Mendocino (1) National Forests. A new unvouchered detection was made recently on the Klamath National Forest (Rentz 2013), but given the ease with which this lichen can be identified, it seems very likely that the identification is valid.

*Peltigera leucophlebia* (Nyl.) Gyelnik (Carlberg #03439, 03458, 03464).

The most common green *Peltigera* in the Wilderness. Green species of *Peltigera* are a symbiosis of a fungus, a green primary photopartner, and a secondary cyanobacterial photopartner. In the outer Coast Ranges of northern California, *P. britannica* dominates, and apparently in the central Coast Range, the opposite is true. *P. leucophlebia* has also been reported from Plumas County (Bratt 7550; det. McCune).

*Peltigera venosa* (L.) Hoffm. (Carlberg #03408).

Uncommon throughout northern California,

and absent from the southern part of the state.

*Placynthiella icmalea* (Ach.) Coppins & P. James (Carlberg #03501B).

Another overlooked and underreported lichen, *P. icmalea* is nearly indistinguishable from the dirt on which it grows.

*Psoroma hypnorum* (Vahl) Gray (Carlberg #00519).

Uncommon to rare in California, but more common in states to the north and east (Oregon and Colorado). This voucher is actually from just west of the Wilderness, in the Mill Creek drainage on Six Rivers National Forest. The location is near the Corral Fire (2013), and has possibly burned since the 2001 collection.

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Table 1. Species encountered during Trinity Alps Inventory (2013), collection numbers, and locations. Site 1 = East Fork New River Trail; 2 = Green Mountain Trail; 3 = Canyon Creek Trail; 4 = East Boulder Lake – Pacific Crest Trail; 5 = Mavis Lake/Fox Lake/Fox Creek; 6 = Fox Ridge Trail; 7 = Grizzly Lake and North Fork Trinity Trail; 8-9 = Stuart Fork Creek and incidental westside locations; “Y” = present; “NC” means observed but not collected.

Scientific Name	Carlberg Collection number(s)	1	2	3	4	5	6	7	8-9
<i>Ahtiana pallidula</i> (Tuck. ex Riddle) Goward & Thell	#03320	Y							
<i>Ahtiana sphaerosporella</i> (Müll. Arg.) Goward	#00733, 03482, 03494, 03509				Y			Y	
<i>Alectoria imshaugii</i> Brodo & D. Hawksw.	#03355, 03451A		Y	Y					
<i>Alectoria lata</i> (Taylor) Lindsay	#03353		Y						
<i>Alectoria sarmentosa</i> (Ach.) Ach.	#03313, 03462, 03513	Y		Y		Y			
<i>Bryoria cf. pseudofuscescens</i> Brodo & D. Hawksw.	#03413			Y					
<i>Bryoria fremontii</i> (Tuck.) Brodo & D. Hawksw.	#03481, 03490, 03526				Y	Y	Y		
<i>Bryoria pseudofuscescens</i> Brodo & D. Hawksw.	#03351, 03359, 03375, 03378		Y						
<i>Bryoria simplicior</i> (Vainio) Brodo & D. Hawksw.	#03519A, 03522, 03534					Y	Y		
<i>Cladonia carneola</i> (Fr.) Fr.	#03508					Y			
<i>Cladonia chlorophylla</i> (Flörke ex Sommerf.) Sprengel	#03324	Y							
<i>Cladonia fimbriata</i> (L.) Fr.	#03387	s.n.		Y					
<i>Cladonia ochrochlora</i> Flörke	#03441			Y					
<i>Cladonia pyxidata</i> (L.) Hoffm.	#03420	s.n.		Y					
<i>Cladonia transcendens</i> (Vainio) Vainio	#03442	s.n.		Y					
<i>Cladonia verruculosa</i> (Vainio) Ahti	#03465			Y					
<i>Collema nigrescens</i> (Hudson) DC.	#03335A, 03344, 03388, 03444	Y		Y		Y	Y		
<i>Dermatocarpon intestiniforme</i> (Körber) Hasse	#00742							Y	
<i>Dermatocarpon meiophyllizum</i> Vainio	#00744, 00745, 03499, 03512					Y		Y	
<i>Dermatocarpon reticulatum</i> H. Magn.	#03429, 03483A			Y	Y				
<i>Esslingeriana idahoensis</i> (Essl.) Hale & M. J. Lai	#00094, 03322, 03373, 03394	Y	Y	Y		Y			
<i>Evernia prunastri</i> (L.) Ach.	#03349, 03460B	Y		Y					
<i>Fuscopannaria pacifica</i> P. M. Jørg.	#03332, 03338	Y							
<i>Hypocenomyce castaneocinerea</i> (Räsänen) Timdal	#03404, 03538			Y			Y		
<i>Hypogymnia enteromorpha</i> (Ach.) Nyl.	#03323	Y							
<i>Hypogymnia imshaugii</i> Krog	#03318, 03352, 03400, 03475, 03479, 03510, 03529	Y	Y	Y	Y	Y	Y		
<i>Hypogymnia occidentalis</i> L. Pike		s.n.							
<i>Kaernefeltia merrillii</i> (Du Rietz) Thell & Goward	#03477				Y				
<i>Leptochidium albociliatum</i> (Desm.) M. Choisy	#03425			Y					
<i>Leptogium lichenoides</i> (L.) Zahlbr.	#00517, 00746, 03418, 03426, 03463	Y		Y				Y	Y
<i>Leptogium palmatum</i> (Hudson) Mont.	#03346	Y		s.n.			s.n.		
<i>Leptogium polycarpum</i> P. M. Jørg. & Goward	#03334	Y							

Scientific Name	Carlberg Collection number(s)	1	2	3	4	5	6	7	8-9
<i>Leptogium rivale</i> Tuck.	#03506B					Y			
<i>Leptogium subaridum</i> Jørgensen & Goward	#00518								Y
<i>Leptogium teretiisculum</i> (Wallr.) Arnold				s.n.					
<i>Letharia columbiana</i> (Nutt.) J. W. Thomson	#03362, 03474		Y		Y				
<i>Letharia vulpina</i> (L.) Hue	#00734, 03361, 03397, 03473, 03478, 03527	s.n.	Y	Y	Y	Y	Y	Y	
<i>Lobaria hallii</i> (Tuck.) Zahlbr.	#03343, 03457	Y		Y					
<i>Lobaria pulmonaria</i> (L.) Hoffm.	#03337, 03449A	Y		Y			s.n.		
<i>Lobothallia melanaspis</i> (Ach.) Hafellner	#00740							Y	
<i>Massalonia carnosa</i> (Dickson) Körber	#00725, 00729, 03427, 03468	Y		Y		Y			Y
<i>Melanelia disjuncta</i> (Erichsen) Essl.	#03431			Y					
<i>Melanelia panniformis</i> (Nyl.) Essl.	#00726								Y
<i>Melanelia subolivacea</i> (Nyl.) Essl.	#00529								Y
<i>Melanohalea exasperatula</i> (Nyl.) O. Blanco et al.	#03518					Y			
<i>Melanohalea multispora</i> (A. Schneider) O. Blanco et al.	#03434			Y					
<i>Melanohalea sublegantula</i> (Essl.) O. Blanco et al.	#03398, 03511, 03524, 03533			Y		Y	Y		
<i>Melanohalea subolivacea</i> (Nyl.) O. Blanco et al.	#03369, 03383			Y					
<i>Nephroma helveticum</i> Ach.	#03316, 03328, 03385	Y		Y					
<i>Nephroma parile</i> (Ach.) Ach.	#00747							Y	
<i>Nephroma resupinatum</i> (L.) Ach.	#00721, 03319, 03330, 03433, 03443	Y		Y					Y
<i>Nodobryoria abbreviata</i> (Müll. Arg.) Common & Brodo	#03358, 03432, 03476, 03480, 03525		Y	Y	Y		Y		
<i>Normandina pulchella</i> (Borrer) Nyl.	#03333, 03389, 03456	Y		Y					
<i>Parmelia hygrophila</i> Goward & Ahti	#03356, 03374, 03382, 03393		Y	Y					
<i>Parmelia saxatilis</i> (L.) Ach.	#00730, 03428, 03435			Y				Y	
<i>Parmelia sulcata</i> Taylor	#03314, 03377	Y	Y	s.n.					
<i>Parmeliopsis ambigua</i> (Ach.) Arnold	#03367, 03405, 03488, 03496, 03515		Y	Y		Y	s.n.		
<i>Parmeliopsis hyperopta</i> (Ach.) Arnold	#03341, 03498, 03516	Y		s.n.		Y			
<i>Peltigera britannica</i> (Gyelnik) Holt.-Hartw. & Tønsberg	#03327	Y							
<i>Peltigera collina</i> (Ach.) Schrader	#00724, 03326, 03407	Y		s.n.					Y
<i>Peltigera gowardii</i> Lendemer & H. O'Brien	#03437B, 03438			Y					
<i>Peltigera leucophlebia</i> (Nyl.) Gyelnik	#03439, 03458, 03464			Y					
<i>Peltigera membranacea</i> (Ach.) Nyl	#03331, 03459	Y		Y					
<i>Peltigera ponojensis</i> Gyelnik	#03417, 03466, 03469			Y					
<i>Peltigera praetextata</i> (Flörke ex Sommerf.) Zopf	#00748, 03419, 03440, 03460A			Y				Y	
<i>Peltigera venosa</i> (L.) Hoffm.	#03408			Y					
<i>Phaeophyscia decolor</i> (Kashiw.) Essl.	#00743							Y	

Scientific Name	Carlberg Collection number(s)	1	2	3	4	5	6	7	8-9
<i>Physcia dubia</i> (Hoffm.) Lettau	#03470, 03504A				Y	Y			
<i>Physcia subtilis</i> Degel.	#00722								Y
<i>Physconia americana</i> Essl.	#00095A, 03342, 03386, 03446	Y		Y					
<i>Physconia enteroxantha</i> (Nyl.) Poelt	#00723								Y
<i>Physconia perisidiosa</i> (Erichsen) Moberg	#03390			Y					
<i>Placidium lachneum</i> (Ach.) Breuss	#03502B, 03503					Y			
<i>Placidium squamulosum</i> (Ach.) Breuss	#03483B, 03484				Y				
<i>Placopsis lambii</i> Hertel & V. Wirth	#03437A			Y					
<i>Placynthiella icmalea</i> (Ach.) Coppins & P. James	#03501B					Y			
<i>Platismatia glauca</i> (L.) Lindsay	#03317, 03364, 03517, 03531	Y	Y	s.n.	s.n.	Y	Y		
<i>Platismatia herrei</i> (Imshaug) Culb. & C. Culb.	#03340	Y							
<i>Platismatia stenophylla</i> (Tuck.) Culb. & C. Culb.	#03360, 03380, 03461		Y	Y					
<i>Polychidium muscicola</i> (Sw.) Gray	#00821, 03325, 03416, 03430	Y		Y					Y
<i>Pseudephebe miniscula</i> (Nyl. ex Arnold) Brodo & D. Hawksw.	#00732, 03487					Y		Y	
<i>Pseudephebe pubescens</i> (L.) M. Choisy	#00731							Y	
<i>Pseudocyphellaria anomala</i> Brodo & Ahti	#03415			Y					
<i>Pseudocyphellaria anthraspis</i> (Ach.) H. Magn.	#03329, 03384, 03448	Y		Y					
<i>Psoroma hypnorum</i> (Vahl) Gray	#00519								Y
<i>Sphaerophorus tuckermannii</i> Räsänen	#03411			Y					
<i>Tuckermannopsis chlorophylla</i> (Willd.) Hale	#00093, 03412, 03514, 03530	Y		Y	Y	Y			
<i>Tuckermannopsis orbata</i> (Nyl.) M. J. Lai	#03321, 03376	Y	Y						
<i>Tuckermannopsis platyphylla</i> (Tuck.) Hale	#03363, 03489, 03528		Y			Y	Y		
<i>Umbilicaria hyperborea</i> (Ach.) Hoffm.	#00735, 03472				Y			Y	
<i>Umbilicaria phaea</i> Tuck.	#03421, 03485			Y	Y				
<i>Umbilicaria polaris</i> (Savicz) Zahlbr.	#00738, 03471				Y			Y	
<i>Umbilicaria polyphylla</i> (L.) Baumg.	#00736							Y	
<i>Umbilicaria polyrhiza</i> (L.) Fr.	#03436			Y					
<i>Umbilicaria vellea</i> (L.) Hoffm.	#00737							Y	
<i>Usnea cornuta</i> Körber	#03381			Y					
<i>Usnea diplotypus</i> Vainio	#03350, 03391, 03414, 03532	Y		Y			Y		
<i>Usnea pacificana</i> P. Halonen	#03339, 03357	Y	Y						
<i>Usnea subfloridana</i> Stirton	#03409			Y					
<i>Vestergrenopsis sonomensis</i> (Tuck.) T. Strib. & Muggia	#03424			Y					
<i>Vulpicida canadensis</i> (Räsänen) J.-E. Mattsson & M. J. Lai	#03315	Y							
<i>Xanthoparmelia verruculifera</i> (Nyl.) O. Blanco et al.	# 03423			Y					