

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

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## THE LICHEN FLORA OF STONY PASS, AN ALPINE TUNDRA SITE IN SOUTHWESTERN COLORADO

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### ABSTRACT

Sixty-eight species in 41 genera are reported for Stony Pass, a high elevation alpine tundra site in the San Juan Mountains of southwestern Colorado. *Candelariella reflexa*, *Collema ceraniscum*, and *Dermatocarpon lorenzianum* are reported as new species records for the state of Colorado. The lichen flora at Stony Pass is dominated by species from the Arctic floristic element. The overall percentage of Arctic Element species at Stony Pass (78%) is most similar to the alpine lichen floras at Lake Peak (84%) and Sierra Blanca Peak (76%) in north-central and south central New Mexico respectively. However, Stony Pass shares more total species in common with Mt. Audubon in north central Colorado (40/68). This pattern suggests that the contribution of the Temperate Element to alpine tundra sites differs significantly from site to site; while the Arctic Element, in general, tends to be more homogenous from site to site.

Keywords: lichens, alpine tundra, San Juan Mountains, Colorado

### INTRODUCTION

**Previous work-** In the past, the lichens of southwestern Colorado have not been extensively researched. However, in recent years lichenological work in the region has been conducted in connection with the establishment of a lichen air quality biomonitoring program and baseline in the San Juan-Rio Grande National Forest (St. Clair et al. 1996). Other areas of Colorado, including several sites along the Front Range, have been studied. Early reports on Colorado lichens include, Willey (1874), J. Müller (1895), and Fink (1935). Weber and Shushan (1955) described several important components of Colorado alpine tundra lichen communities including several species in the following genera, *Cetraria*, *Cornicularia*, *Dactylina*, and *Thamnolia*. In 1957 Imshaug collected alpine macrolichens throughout western North America, reporting forty-nine species for Colorado. In the mid 1960s, Weber (1965) published a review of the Colorado representatives of the lichen family Pannariaceae; while Anderson (1964) completed an extensive inventory of the lichen genus *Lecidea* in Rocky Mountain National Park. In 1969 Egan described the lichen flora of Mount Audubon, a prominent Front Range Peak in the Colorado Rockies; and in 1971 he



studied three additional alpine tundra sites in New Mexico: La Cal Basin, Lake Peak, and Sierra Blanca Peak. In 1973 Gough examined distribution patterns of corticolous cryptogams (lichens and bryophytes) on selected conifer substrates at several locations in St. Vrain Creek Valley in the Front Range; and in 1978 Flock examined the effects of snow cover and soil moisture on the distribution of lichens and bryophytes on an alpine tundra ridge in the Indian Peaks area of the Colorado Rockies. With data collected from the same general area Komárková (1979) published an extensive phytosociological survey which included some information about lichen community structure. In 1980, Fields studied distribution patterns of lichens found on the sub alpine forest floor in Rocky Mountain National Park; and Peard (1983) examined the distribution of non-crustose lichens on the trunks of Rocky Mountain Juniper in Boulder County, Colorado. In 1969 Shushan and Anderson published the first catalog of Colorado lichens, this list included 521 taxa in 88 genera; this list was updated in 1992 by Weber and Wittmann. In spite of all the lichenological research in the state of Colorado, very little work has been done in the southwestern quadrant of the state. This study provides the first detailed information about alpine tundra lichens in southwestern Colorado.

**Study site-** Stony Pass is a high mountain Pass in the San Juan Mountains of southwestern Colorado (Figure 1). Between 1875 and 1882 Stony Pass was the only major supply route into the mining community of Silverton. The pass was replaced as a supply route in 1882 when the Denver-Rio Grande Railroad from Durango was completed. The pass is located in San Juan County, in the San Juan-Rio Grande National Forest. Elevation at the pass is approximately 3840 m. The pass is above timberline and has a typical alpine tundra type vascular plant community, including *Acomastylis rossii*, *Bistorta bistortoides*, *Castilleja occidentalis*, *Phacelia sericea*, *Potentilla pulcherrima*, *Rydbergia grandiflora*, *Salix arctica*, *Salix reticulata*, *Selaginella densa*, and *Trifolium attenuatum*. Stony Pass consists of a complex of shallow, well drained soils (cobbly loam) with rocky outcrops on mountain slopes and ridges. Rock formations in the area are volcanic dominated by rhyolite and tuff. Average annual precipitation is 85-115 cm; average annual air temperature is -3 to 1°C; and the average frost-free period is less than 40 days.

## MATERIALS AND METHODS

**Collection, identification, and deposition of specimens-** An area of approximately 25 hectares in and around the pass proper was systematically searched for lichens. Specimens were collected from soil, rock, moss, and detritus.

Specimens were identified using standard lichen keys, taxonomic treatises and by making comparisons with herbarium material. Standard chemical spot tests, and where necessary, thin-layered chromatography techniques were used to finalize species identifications. All specimens are deposited in the Herbarium of Nonvascular Cryptogams at Brigham Young University (BRY) in Provo, Utah.

**Organization of species list-** Each species is followed by relative abundance and substrate information, as well as collection and herbarium numbers (Larry St. Clair's collection numbers were used for this paper). Our scale of relative abundance is rare < common < abundant. Assignment of relative abundance categories is based on the following criteria: rare = 1-2 encounters, common = 3-9 encounters, and abundant >10



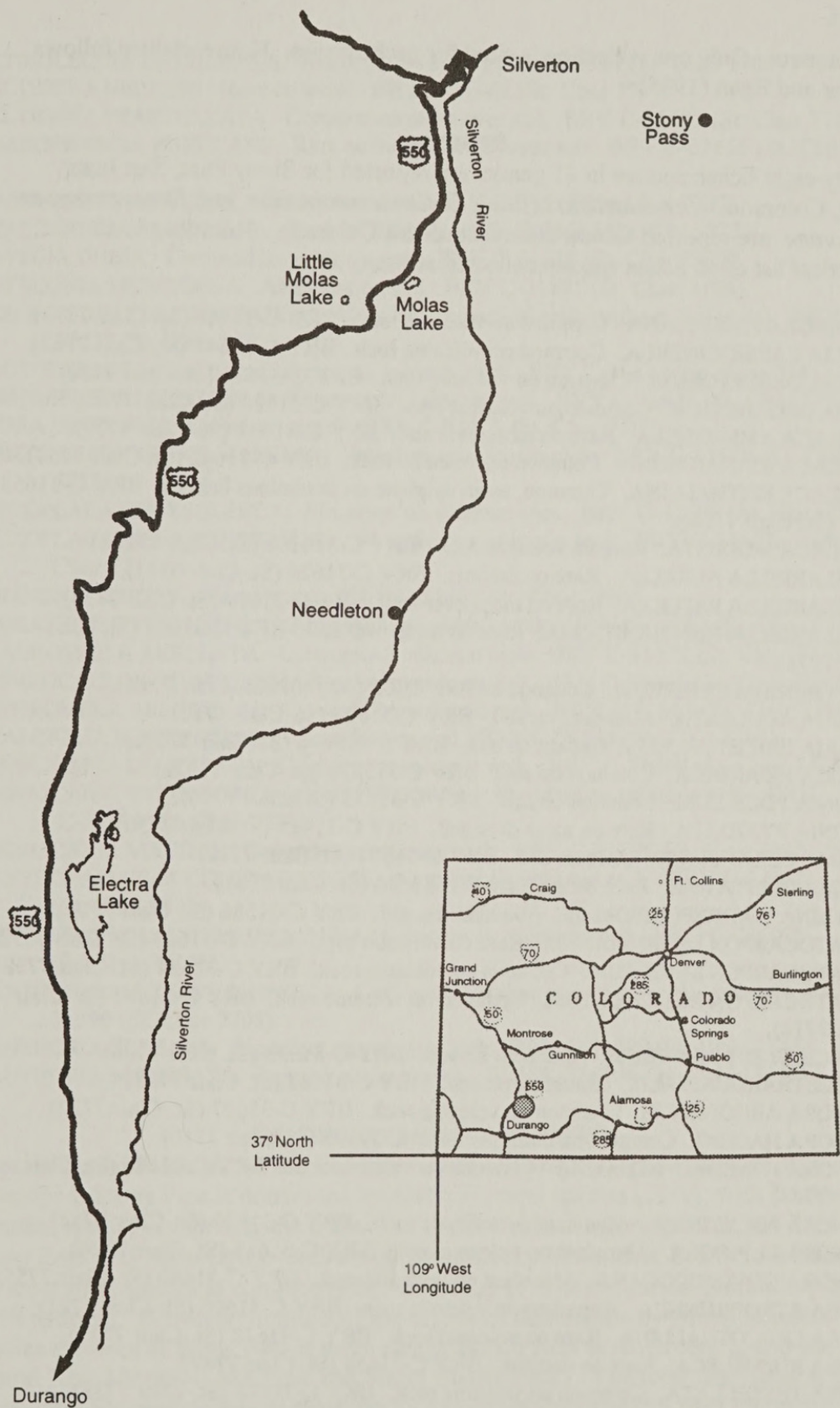


Fig. 1. Map showing location of Stony Pass in southwestern Colorado.



10 encounters. Only one collection is cited for each species. Nomenclature follows Esslinger and Egan (1995).

### RESULTS

Sixty-eight lichen species in 41 genera are reported for Stony Pass, San Juan County, Colorado. *Candelariella reflexa*, *Collema ceraniscum*, and *Dermatocarpon lorenzianum* are reported as new state records for Colorado. Following is an alphabetical list of all lichen species collected at Stony Pass.

- ACAROSPORA AMERICANA. Common on volcanic rock. BRY C-31658 (St. Clair 7773).  
 ASPICILIA CAESIOCINEREA. Common on volcanic rock. BRY C-31647 (St. Clair 7762).  
 ASPICILIA DESERTORUM. Common on volcanic rock. BRY C-31635 (St. Clair 7750).  
 BRODOA OROARCTICA. Common on volcanic rock. BRY C-31625 (St. Clair 7740).  
 CALOPLACA AMMIOSPILA. Rare on moss over soil. BRY C-31664 (St. Clair 7779).  
 CALOPLACA CINNABARINA. Common on volcanic rock. BRY C-31642 (St. Clair 7757).  
 CALOPLACA EPITHALLINA. Common, as an epiphyte on saxicolous lichens. BRY C-31653 (St. Clair 7768).  
 CALOPLACA MODESTA. Rare on volcanic rock. BRY C-31610b (St. Clair 7725b).  
 CANDELARIELLA AURELLA. Rare on detritus. BRY C-31626 (St. Clair 7741).  
 CANDELARIELLA REFLEXA. Rare on moss over soil. BRY C-31619 (St. Clair 7734).  
 CANDELARIELLA XANTHOSTIGMA. Rare on moss over soil. BRY C-31663 (St. Clair 7778).  
 CATAPYRENIUM CINEREUM. Common on soil. BRY C-31609 (St. Clair 7724).  
 CETRARIA ACULEATA. Abundant on soil. BRY C-31597 (St. Clair 7712).  
 CETRARIA ERICETORUM. Abundant on soil. BRY C-31587a (St. Clair 7702a).  
 CETRARIA ISLANDICA. Common on soil. BRY C-31587b (St. Clair 7702b).  
 CLADONIA POCILLUM. Common on soil. BRY C-31655 (St. Clair 7770).  
 CLADONIA PYXIDATA. Rare on moss over soil. BRY C-31615 (St. Clair 7730).  
 COLLEMA CERANISCUM. Rare on soil. BRY C-31604 (St. Clair 7719).  
 COLLEMA CRISTATUM. Rare on soil. BRY C-31646 (St. Clair 7761).  
 DACTYLINA MADREPORIFORMIS. Abundant on soil. BRY C-31586 (St. Clair 7701).  
 DERMATOCARPON LORENZIANUM. Rare on volcanic rock. BRY C-31617 (St. Clair 7732).  
 DERMATOCARPON MINIATUM. Common on volcanic rock. BRY C-31624 (St. Clair 7739).  
 DERMATOCARPON RETICULATUM. Common on volcanic rock. BRY C-31603 (St. Clair 7718).  
 DIPLOSCHISTES MUSCORUM. Abundant on soil. BRY C-31593 (St. Clair 7708).  
 FLAVOCETRARIA NIVALIS. Abundant on soil. BRY C-31588 (St. Clair 7703).  
 LECANORA ARGOPHOLIS. Common on volcanic rock. BRY C-31607 (St. Clair 7722).  
 LECANORA HAGENI. Common on detritus. BRY C-31595 (St. Clair 7710).  
 LECANORA PHAEDROPHTHALMA. Common on volcanic rock. BRY C-31628 (St. Clair 7743).  
 LECANORA POLYTROPA. Abundant on volcanic rock. BRY C-31639 (St. Clair 7754).  
 LECANORA RUPICOLA. Abundant on volcanic rock. BRY C-31611 (St. Clair 7726).  
 LECANORA NOVOMEXICANA. Abundant on volcanic rock. BRY C-31640 (St. Clair 7755).  
 LECIDEA ATROBRUNNEA. Abundant on volcanic rock. BRY C-31606 (St. Clair 7721).  
 LECIDEA LEUCOTHALLINA. Rare on volcanic rock. BRY C-31618 (St. Clair 7733).  
 LECIDEA RUFOFUSCA. Rare on detritus. BRY C-31634 (St. Clair 7749).  
 LECIDEA TESSELLATA. Common on volcanic rock. BRY C-31623 (St. Clair 7738).  
 LECIDELLA STIGMATEA. Common on volcanic rock. BRY C-31613 (St. Clair 7728).  
 LECIDOMA DEMISSUM. Rare on soil. BRY C-31666 (St. Clair 7781).  
 LOBOTHALLIA ALPHOPLACA. Common on volcanic rock. BRY C-31648 (St. Clair 7763).  
 MEGASPORA VERRUCOSA. Rare on detritus. BRY C-31645 (St. Clair 7760).



- OCHROLECHIA UPSALIENSIS. Abundant on soil. BRY C-31594 (St. Clair 7709).  
 PELTIGERA NECKERI. Rare on moss. BRY C-31662 (St. Clair 7777).  
 PELTIGERA PRAETEXTATA. Common on moss over soil. BRY C-31667 (St. Clair 7782).  
 PHAEOPHYSCIA NIGRICANS. Rare on moss/detritus over soil. BRY C-31656 (St. Clair 7771).  
 PHAEORRHIZA NIMBOSA. Common on soil. BRY C-31592 (St. Clair 7707).  
 PHAEORRHIZA SAREPTANA. Rare on detritus. BRY C-31657 (St. Clair 7772).  
 PHYSCIA DUBIA. Common on volcanic rock. BRY C-31612 (St. Clair 7727).  
 PHYSCONIA MUSCIGENA. Abundant on soil. BRY C-31591 (St. Clair 7706).  
 PLEOPSIDIUM CHLOROPHANUM. Abundant on vertical rock surfaces (volcanic). BRY C-31622 (St. Clair 7737).  
 PROTOPARMELIA BADIA. Common on volcanic rock. BRY C-31616 (St. Clair 7731).  
 PSEUDEPHEBE MINUSCULA. Common on volcanic rock. BRY C-31649 (St. Clair 7764).  
 PSORA DECIPIENS. Common on soil. BRY C-31665 (St. Clair 7780).  
 RHIZOCARPON GEOGRAPHICUM. Abundant on volcanic rock. BRY C-31608 (St. Clair 7723).  
 RHIZOPLACA CHRYSOLEUCA. Abundant on volcanic rock. BRY C-31600 (St. Clair 7715).  
 RHIZOPLACA MELANOPHTHALMA. Abundant on volcanic rock. BRY C-31602a (St. Clair 7717a).  
 SOLORINA BISPORIA. Rare on soil. BRY C-31669 (St. Clair 7784).  
 SPORASTATIA TESTUDINEA. Abundant on volcanic rock. BRY C-31652 (St. Clair 7767).  
 STAUROTHELE AREOLATA. Common on volcanic rock. BRY C-31632 (St. Clair 7747).  
 STEREOCAULON RIVULORUM. Rare on moss over soil. BRY C-31605 (St. Clair 7720).  
 TEPHROMELA ARMENIACA. Common on volcanic rock. BRY C-31651 (St. Clair 7766).  
 THAMNOLIA SUBULIFORMIS. Abundant on soil. BRY C-31585 (St. Clair 7700).  
 UMBILICARIA DECUSSATA. Common on volcanic rock. BRY C-31660 (St. Clair 7775).  
 UMBILICARIA HYPERBOREA var. HYPERBOREA. Abundant on volcanic rock. BRY C-31599 (St. Clair 7714).  
 UMBILICARIA VIRGINIS. Common on volcanic rock. BRY C-31598 (St. Clair 7713).  
 XANTHOPARMELIA COLORADOENSIS. Abundant on volcanic rock. BRY C-31630 (St. Clair 7745).  
 XANTHOPARMELIA CUMBERLANDIA. Common on volcanic rock. BRY C-31602b (St. Clair 7717b).  
 XANTHOPARMELIA WYOMINGICA. Common on soil or over small rocks and soil. BRY C-31590 (St. Clair 7705).  
 XANTHORIA ELEGANS. Abundant on volcanic rock. BRY C-31629 (St. Clair 7744).  
 XANTHORIA SOREDIATA. Rare on volcanic rock. BRY C-31610a (St. Clair 7725a).

### DISCUSSION AND CONCLUSIONS

**Species distribution patterns-** The lichen flora at Stony pass is diverse and well-developed. Stony Pass is dominated by Arctic Element species (78%); with Temperate Element species comprising the balance of the flora. In comparing the lichen flora at Stony Pass with other alpine tundra sites in the Rocky Mountains, Stony Pass shares the most total species in common with Mt. Audubon in north central Colorado (40 out of 68 species). However, in terms of the degree of domination by Arctic Element species the flora at Stony Pass is more similar to two sites in north central and south central New Mexico (Lake Peak and Sierra Blanca Peak). The total contribution of Temperate Element species at most Rocky Mountain alpine tundra sites seems to be somewhat unique from site to site. For example, three sites in New Mexico (La Cal Basin, Lake Peak and Sierra Blanca Peak) share only 5-6 species in common, while Mt. Audubon and Stony Pass share only 2-3 species in common with the three New Mexico sites. The contribution of Temperate Element species to a given alpine tundra site



tends to be the most important factor influencing the degree of similarity between any two sites. Overall, the Arctic Element of Rocky Mountain alpine tundra lichen floras tends to be more homogenous across sites.

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