Bulletin of the California Lichen Society

Volume 24 No. 1 Summer 2017

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Contents

This issue of the *Bulletin of the California Lichen Society* (ISSN 1093-9148) was edited by Shelly Benson (editor@californialichens.org) and was produced by Sarah Minnick (production@californialichens.org).

Interested in submitting an article, photo, or workshop information for an upcoming issue of the *Bulletin*?
The *Bulletin* welcomes manuscripts on technical topics in lichenology relating to western North America and on conservation of lichens, as well as news of lichenologists and their activities. The best way to submit manuscripts is by email attachments in the format of a major word processor (DOC or RTF preferred). Use italics for scientific names. Please submit figures in electronic formats with a resolution of 300 pixels per inch (600ppi minimum for line drawings); preferred minimum width for images is 2100 pixels, but widths down to 1050 pixels may be accepted. Email submissions are limited to 10MB per email, but large files may be split across several emails or other arrangements can be made. Contact Editor@californialichens.org for details of submitting illustrations or other large files. A review process is followed. Nomenclature follows Esslinger's cumulative checklist online at http://www.ndsu.edu/pubweb/~esslinge/chcklst/chcklst7.htm. The editors may substitute abbreviations of authors names, as appropriate from The International Plant Names Index - www.ipni.org/index.html. Style follows this issue. Electronic reprints in PDF format will be emailed to the lead author at no cost. The deadline for submitting material for the Winter 2017 issue is September 1, 2017.

Volume 24(1) of the *Bulletin of the California Lichen Society* was issued on June 30, 2017.

Cover image: *Letharia vulpina* growing on rock, found during Steve Sheehy's lichen inventory of Lava Beds National Monument, Siskiyou and Modoc Counties; the inventory work was supported by a CALS grant. Generally this species is found only on trees, but in the Lava Beds, it is fairly common on rock.

CALIFORNIA LICHEN SOCIETY GRANT-SUPPORTED PROJECT

Researching the *Usnea* of tropical West Africa

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The islands of São Tomé and Príncipe are part of an ancient archipelago that few people have heard of, let alone stepped foot on. For this reason, these tiny volcanic islands off the west coast of equatorial Africa (Figure 1) represent an intriguing opportunity for scientific exploration. I played a part of that exploration when Dr. Robert Drewes, a herpetology curator (now emeritus), invited me to travel with the California Academy of Sciences (CAS) to perform a comprehensive lichen inventory of the two islands. I set off in April of 2012 for my first visit and returned in the spring of 2013 for trip number two. All told I collected over 600 samples of lichens from the two islands over the two, month-long, expeditions. The collection would serve as the basis for my Master's degree research and should provide evidence for several new species to science that were found in these unique island ecosystems.

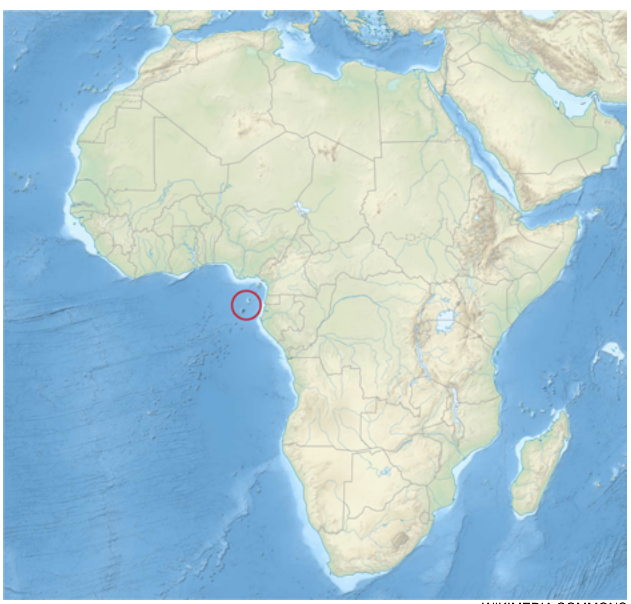
WIKIMEDIA COMMONS

Figure 1. Map showing the location of the islands São Tomé and Príncipe (circled in red).

Growing up in semi-rural Oregon instilled in me a love of the outdoors and a strong connection with nature. Therefore, while pursuing my undergraduate education at Oregon State University, I naturally gravitated to degrees in botany and environmental sciences. As many local (and not so local) lichen enthusiasts know, Corvallis, Oregon is an excellent place to study lichens under the tutelage of Dr. Bruce McCune. Unfortunately the timing wasn't quite right for me and I wouldn't get a chance to benefit from Dr. McCune's expertise until years later while working on the São Tomé material. This opportunity to meet Dr. McCune and his staff was made possible by, not only the generosity of them and their time, but also the California Lichen Society's education grant that provided me with funding to achieve this.

While working at the California Academy of Sciences in late 2011, I began discussing the possibility of traveling to São Tomé with Dr. Drewes and a small group of senior researchers and fellow graduate students. The academy had been traveling to the islands for nearly a decade performing scientific investigations on a variety of different organismal groups but no one had worked on lichens. This opportunity was made possible to me and I jumped at the chance to collect lichens from these islands where the only previous significant lichen collections were made in the 1860s by Portuguese explorers and published by the Finnish botanist William Nylander. So, in April 2012 I collected all my field gear and flew nearly 10,000 miles over 36 hours to arrive very far away from California lichens to the humid tropical air of São Tomé.

The primary collecting trip consisted of close to three weeks spent on the larger island of São Tomé and two weeks on the smaller island of Príncipe. During this excursion, I learned a great deal about collecting methods and was fortunate to have as a mentor and collecting partner James Shevock, bryologist extraordinaire. We managed to scale the highest peak on the larger island, Pico de São Tomé (Figure 2) with an elevation of over 2,000 meters. This overnight hike resulted in a large proportion of the overall collections since it was nearly pristine primary forest that was at high elevation with very clean air. Lichens were covering the trees (Figure 3) and on occasions when we would find a downed tree we might spend half an hour collecting dozens of lichen species. I returned to California in May 2012 nearly 400 collections later and with a great deal of experience to learn from as well as new friends and stories to tell. Upon my return and laboratory investigations of my collection, I made the choice to focus my studies on a single lichen genus and decided that *Usnea* with its worldwide distribution and taxonomic challenges would be a good group for dedicated study. The challenges this provided were not unanticipated, although perhaps, their magnitude was. The time of my second trip to the islands was split approximately 3:1 with most time spent on Príncipe and with a decided focus on collecting primarily *Usnea* from as many locales as possible.

There had previously been only five species of *Usnea* recorded from the islands (Nylander 1886), and each was collected on the larger island of São Tomé with no collections from Príncipe. The species *U. articulata*, *U. ceratina*, *U. florida*, *U. longissima*, and *U. trichodea* were documented by Mr. Nylander

GOOGLE MAPS

Figure 2. GPS track of route used to access Pico de São Tomé during 2012 expedition.

and part of my investigation was to determine the accuracy of these determinations. There is also the type collection of *U. speciosa* from the islands that was named from source material from the 19th century originally determined as *U. articulata* (Motyka 1936). My intention for this research project was to use modern methods of DNA sequencing and chemical analysis together with traditional morphological analysis to identify and document the *Usnea* species found on both islands.

As I began working on the identification to species of what would eventually be 132 collections of *Usnea*, I realized the difficulty of the task undertaken. *Usnea* is a very character poor genus of lichen, and identification has been unreliable or relied heavily on chemical characteristics. The morphology of my specimens was no exception. Key characters that I relied on were the diameter of the main thallus branch as well as the ratio of cortex to medulla to axis (CMA) and the color of the base of the thallus at the point of attachment based on the literature of Clerc (1998) and Ohmura (2001). Early analysis proved difficult to identify the specimens to species due to the absence of keys for the region. Eventually with the use of the Genomics/Transcriptomics Analysis Core (GTAC) laboratory at San Francisco State University (SFSU), I began sequencing the Internal Transcribed Spacer (ITS) region of the ascomycete partner of the lichen and used these data to begin matching up the morphological data. This still was not enough information to determine which *Usnea* species were present on São Tomé and Príncipe, and I would need to work out the chemistry to proceed. The California Lichen Society was instrumental in my ability to accomplish this.

While working to complete my thesis in 2014, I was trying to find access to a lab set up for thin layer chromatography (TLC). This was a challenge to find in the San Francisco Bay Area, where TLC is not used particularly often. Understanding the chemistry of my specimens was critical. Although I was working in the Harry D. Thiers Herbarium as part of the Desjardin laboratory, I was Dr. Desjardin's first graduate student to focus my thesis on lichens. The Desjardin lab at SFSU was equipped with many chemical agents, terrific microscopes and other resources, but the TLC equipment that was left from Dr. Thiers tenure at SFSU was not in condition good enough to use, so I needed to seek out other resources. With the use of the education grant from CALS, I was able to purchase TLC plates and take them and my specimens on a train to Corvallis, Oregon where I would spend a week working in the lab of Dr. Bruce McCune. With the valuable expertise of Dr. McCune and his students and staff, I learned the skills of chromatography and the nuances of identifying the various chemical compounds found in lichens. Returning to SFSU and being able to complete the DNA sequencing gave me the final information that I needed to complete my thesis, expand my knowledge and skills in lichenology and provide a piece of the puzzle to improve the clarity of our understanding of this complicated genus.

The *Usnea* of São Tomé and Príncipe is a long distance from California but, with *U. ceratina*, *U. florida*, *U. trichodea* and *U. longissima* all occurring in California, there was some interest in finding out if these species were really present in such a geographically remote and climatologically different location as these tropical West African islands. What I discovered through the course of compiling *A Monograph of Usnea from São Tomé and Príncipe* (Nadel 2015), was that the four species mentined above were not collected during my two field collecting expeditions and are unlikely to occur on the islands.

MIKO NADEL

Figure 3. Southwest view from peak of Pico de São Tomé through *Usnea* draped foliage.

In my study, I determined the presence of nine distinct clades in two subgenera of *Usnea*: *Eumitria* and *Usnea*. Surprisingly two species identified fall within the subgenus *Eumitria* and have a distinctive cavitate central axis (Figure 4), but were never identified from the nineteenth-century collection. This easily identifiable feature somehow escaped the investigators of that era. These two species *U. firmula,* and *U. baileyi* were reported new for the islands. One other species complex falls within the *Eumitria* subgenus though lacking the hollow axis; *U. pectinata,* was also reported new for the islands. From the subgenus *Usnea,* I determined *U. krogiana*, *U. picta, U. sanguinea, U. articulata,* and *U.* aff. *flammea.* Of these, all but *U. articulata* were new for the islands. The data also pointed to three new species that remain unnamed (Figure 5). They are distinct from any previous ITS sequence data available and have morphology and chemistry unlike anything found in the literature. I hope to publish these findings and add these new species to the literature.

The findings of this study indicate that species with similar morphology that are geographically distant may often have been determined inaccurately historically due to not having access to modern techniques. Indeed, it appears that of the six species in the historical records for São Tomé and Príncipe, only one of them may occur on the islands and out of the 11 species that are posited to occur most have a relatively small geographic distribution stretching into East Africa or north to the Canary Islands. There is yet work to be done and further research should provide clearer evidence and species delineation. Even though the research experience provided by this undertaking has been priceless, the granted means from organizations like the CAS, the Mycological Society of San Francisco (MSSF), and CALS made all this possible. Being able to take my small measure of expertise half way around the world from one ecological hotspot to another I did my best to represent California lichenology positively. It has been an unforgettable journey and I hope other students finding an interest in lichens and exploration will be fortunate enough to undertake similar ones.

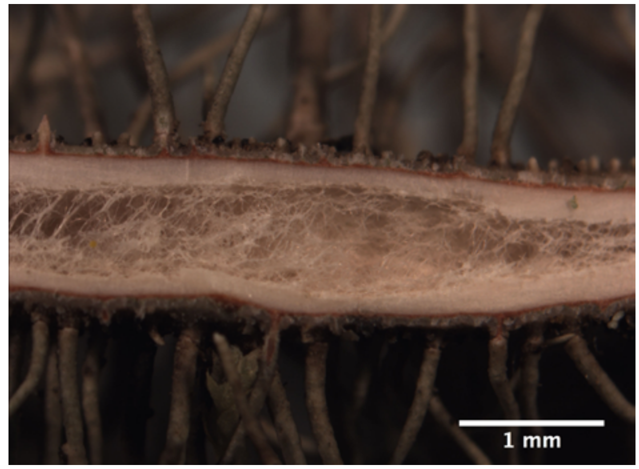

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Figure 4. Longitudinal section of *Usnea firmula* showing distinct cavitate central axis.

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ALL IMAGES: MIKO NADEL

Figure 5. Plate showing unidentified *Usnea* species from thesis: *A Monograph of Usnea from São Tomé and Príncipe*. A) Thallus of smooth morphotype, B) Main branch showing articulation with annular cracks, C) Longitudinal section of the smooth morphotype showing a compact cottony medulla, D) Papillate morphotype of same species, E) Main branch with papillae and fibrils, F) Longitudinal section of the papillate morphotype showing a web-like cottony medulla.

California Lichen Society Grant-Supported Project

Grant enables increase to lichen list of Lava Beds National Monument in Siskiyou and Modoc Counties, California

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Lava Beds looking north from Hippo Butte

History

On a cold morning in November 1872, armed militia routed a sleeping Modoc Indian camp. Shouts rang through the people, “Ktai Tala” *Into the lava beds!* This was the start of the Modoc War that waged from winter 1872 through the spring of 1873. This war brought attention to the home of the Modoc Tribe where 55 Modoc warriors held off hundreds of U.S. Army soldiers in the brush and lava flows that later became Lava Beds National Monument (NM). This area, including the monument and Medicine Lake volcano, is known to the Modoc people as *the land of burned out fires*.

In 1916, Judson Dean Howard or more commonly, J. D. Howard, started exploring the lava flows. He was responsible for finding and naming most of the caves. At many of the caves, you can still see his name and the date when he found it. He was instrumental in the forming of Lava Beds NM in 1925. He continued to explore the area until 1933. The monument was first under the management of the U.S. Forest Service and in 1933 it was transferred to the National Park Service (NPS), where it remains today.

Geography

Lava Beds NM lies on the northern flank of Medicine Lake, a large shield volcano, on the eastern side of the Cascade Range in Siskiyou and Modoc counties, approximately 12 miles south of the Oregon-California border. Elevation of the park ranges from 1,219 meters in the north to 1,737 meters in the south. The monument has more than 700 caves and many miles of collapsed lava tubes. It also contains old lake beds, juniper and sagebrush steppe, and a small area of conifer forest at the southern end of the park. The lava flows are made up of a'a and pahoehoe lava. Cinder cones dot the landscape. There are multiple craters with Mammoth Crater being the largest at approximately 400 meters across and 75 meters deep. On the eastern edge of the park is Big Crack, a large pull (2 meters wide and 6 meters deep in places), which runs nearly the full north-south length of the monument. This is an amazing area for only being 48,000 acres.

Geology

The surface geology of Lava Beds NM is made up of approximately 14 different types of substrate. They range in age from more than 2 million to 1,100 years old. Gillem Bluff, one of the oldest, is made up of talus, basalt, basaltic andesite, porphyritic basalt and rhyodacite tuff. Devils Homestead lava flow is approximately 10,500 years old and comprised of basalt and andesite. Most of the area is covered with basalt from Mammoth Crater from 35,000 years ago. The andesite of the Schonchin Butte flow was laid down 65,000 years ago. Callahan lava flow formed 1,100 years ago from Cinder Butte, which stands just outside the southwest corner of the monument. This is the youngest and the roughest of the a'a flows and is made up of basaltic andesite. Valentine flow in the southeastern portion of the monument is also composed of basaltic andesite laid down 10,850 years ago.

Climate

In 2016, the maximum air temperature reached 96°F in August at the Indian Well weather station in the southern portion of the park. The low was 1°F in January. I placed a data logger on a south facing, exposed rock face with existing lichens to determine the temperature variation they are exposed to. The maximum rock temperature reached 128°F. The minimum rock temperature was -4°F. As indicated by the data logger, in one day the temperature varied 69°F, exposing the lichens to a huge swing from the darkness of early morning to the sun of mid-afternoon. The average annual precipitation is 39 centimeters. There is no surface water in the monument. All the lichens receive their water in the form of rain, snow, or fog.

Lichen Inventory

In November of 2011, I applied for a research permit to collect lichens at Lava Beds NM. I was issued my first permit on January 1, 2012, which has been renewed annually since then. In 2013 I became an official volunteer at the monument. In 2014 I was awarded the NPS, George and Helen Hartzog, Pacific West Region Individual Volunteer of the Year for my work on lichens and resource management. Resource management duties include helping with Crystal Ice Cave tours, Fern Cave tours and cave entrance vegetation surveys. I have led lichen hikes for the Oregon Native Plant Society and lichen classes for Siskiyou Field Institute in 2015 and 2016.

In 2012, when we started the lichen inventory of Lava Beds NM, there were only 19 lichens on the park's species list. By the summer of 2014 the list had grown to 113 lichen species, which are reported in the *Bulletin of the California Lichen Society* (Sheehy 2014). Since that publication, we have added another 83 species bringing the current total for the park to 196 (Appendix A). Katherine Glew, spent three days working with me on the project in 2014. Then in May

STEVE SHEEHY

Umbilicaria phaea var. *coccinea*

2015, CALS held a three-day lichen collecting and identifying field trip at the monument. Participants at that event included Tom Carlberg, Kathy Faircloth, Eric Peterson, John Villella, and myself. During 2016, my inventory efforts were supported by a grant from CALS.

The CALS grant helped immensely in allowing me to spend almost a month searching the park. During the 12-month span of 2016, I made 29 trips into Lava Beds NM. Although some trips had dual reasons, they always ended in search of new lichens to collect and identify. I added 34 lichen species to the list in 2016 alone. The grant also helped in purchasing chemicals, microscope pieces, lab supplies, and books.

I selected lichen collecting sites subjectively, targeting areas with interesting habitats such as rock formations with large north facing elements. Other features sampled were buttes, craters, and steppe areas. The latter were good for soil crust lichens. Many areas have been visited on several occasions on account of return trips to collect additional material of accidental finds discovered upon sitting down to identify a collection. So far I have covered about four square miles which leaves 69 to go. My plan is to cover as much of the monument as humanly possible. Most of the monument has not been covered due to the fact I have just not been there yet!

Microclimate conditions at cave entrances create habitat for more moisture reliant lichens. Inside the protection of the cave, foliose lichens are more common than crustose lichens. *Physcia, Umbilicaria, Cladonia* and *Xanthoria* species are common. Collapsed lava tubes offer different microclimate conditions. In east-west running collapses, the interior wall on the south side of the tube (i.e. the shaded side due to north-facing aspect) has an abundance of species. Common genera in this habitat include *Umbilicaria, Xanthoria* and *Xanthoparmelia*. Species composition changes with aspect of the lave tube wall. An area that protrudes from a wall will have different species as you go around it. The top will have its lichens, the bottom will have others and lichens on the sides will change as you go from east to west. Everything has a niche it prefers and it can readily be seen. The interior wall on the north side of the tube (i.e. the sunny side due to south-facing aspect) has far less diversity. Here, crustose species dominate, mostly of the same few species. *Aspicilia, Lecanora*, and *Lecidea*, are some of the more common. Foliose lichens are limited to the darker pigmented forms, *Umbilicaria* and *Melanohalea* types are the most common. In areas where these south-facing walls are shaded, species diversity was greater but not like that seen on north-facing walls. The majority of the soil type lichens, like *Diploschistes, Acarospora* and *Endocarpon,* live on a pumice-rich, grainy soil or on detritus and moss. The only "dirt" soils are in rock crevices, in which soil lichen can also be found, but not in great numbers. *Psora* seem to prefer these areas.

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Xanthoparmelia subhosseana

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Diploschistes scruposus (upper lichen in photo) & *Lecidea tessellata* (lower lichen in photo)

Crustose lichens have the most diversity throughout the monument with 111 species. Foliose lichens are common with 78 species but fruticose lichens are limited to just a few species, 7 in all. *Alectoria sarmentosa* has only been collected on rock so far. One of only two *Evernia prunastri* (I know, technically it's foliose) finds was on rock in Big Crack.

I greatly appreciate the help and encouragement CALS and its members have given me in this endeavor. I would like to thank all the people who have helped me with this project: the natural resource management staff at Lava Beds NM (past and present), Tom Carlberg, John Villella, Kathy Faircloth, Dr. Eric Peterson, Dr. Bruce McCune, Dr. Katherine Glew, Scot Loring, Dr. Ted Esslinger, Dr. Daphne Stone, Dr. Kerry Byrne, Dr. Roger Rosentreter, Dr. Ann DeBolt, Dr. James Lendemer and anyone else I have badgered to get identifications to build this list. Thank you!!

As of December 31, 2016, 197 species in 76 genera have been identified and added to the list including *Rhizoplaca melanophthalma*, a very common lichen and one on the original NPS list, however it's so common I forgot to collect and voucher it and add it to the list. I believe when all is said and done, the number of lichen species in Lava Beds NM will exceed 300.

The snow is beginning to recede; soon I too will be "Ktai Tala" to start my 6th year of "lichenizing" in this wondrous place.

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Sheehy, S. 2014. Scratching the surface of the lichen diversity at Lava Beds National Monument. *Bulletin of the California Lichen Society.* Vol. 21, No. 2, pp 35-39.

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Letharia vulpina growing on *Umbilicaria hyperborea*. *Letharia vulpina* generally is found only on trees, but in the Lava Beds, it is fairly common on rock. This photo of it on *Umbilicaria* is the first I have ever seen on another lichen.

STEVE SHEEHY

Lava Beds looking south to Medicine Lake Shield Volcano

Appendix A. Species list for Lava Beds National Monument. Species reported in 2014 appeared in the *Bulletin of the California Lichen Society*, Vol. 21, No. 2 (Sheehy 2014). Species lined out were removed from the list because they needed further identification; (*) indicates a new species to science found at the Lava Beds as a result of this inventory.

Species	Substrate	Reported in 2014
Acarospora badiofusca (Nyl.) Th. Fr.	rock	X
Acarospora fuscata (Schrader) Arnold	rock	
Acarospora rosulata (Th. Fr.) H. Magn.	rock	
Acarospora schleicheri (Ach.) A. Massal.	soil & moss	X
Ahtiana sphaerosporella (Müll. Arg.)	bark	X
Alectoria sarmentosa (Ach.) Ach	rock	X
Amandinea punctata (Hoffm.) Coppins & Scheid.	wood	
Arthonia glebosa Tuck.	soil & moss	
Aspicilia cinerea (L.) Körber	rock	X
Aspicilia cyanescens Owe-Larsson & A. Nordin	rock	
Aspicilia filiformis Rosentreter	soil	
Aspicilia olivaceobrunnea Owe-Larsson & A. Nordin	rock	
Aspicilia pacifica Owe-Larsson & A. Nordin	rock	X
Aspicilia reptans (Looman) Wetmore	soil	
Bryoplaca jungermanniae (Vahl) Søchting, Frödén & Arup	moss & soil	
Bryoria pseudofuscescens (Gyelnik) Brodo & D. Hawksw	rock & bark	X
Buellia badia (Fr.) A. Massal.	rock	X
Buellia epigaea (Hoffm.) Tuck.	bark	
Caloplaca demissa (Körber) Arup & Grube	rock	
Caloplaca epithallina Lynge	parasitic on other lichens	X
Caloplaca saxicola (Hoffm.) Nordin	rock	X
Candelaria concolor (Dickson) Stein	rock	
Candelariella efflorescens R. C. Harris & W. R. Buck	moss over rock	X
Candelariella rosulans (Müll. Arg.) Zahlbr.	rock & soil	X
Candelariella vitellina (Hoffm.) Müll. Arg.	soil	
Carbonea vitellinaria (Nyl.) Hertel	parasitic on other lichens	X
Chrysothrix chlorina (Ach.) J. R. Laundon	rock	X
Circinaria arida Owe-Larsson, A. Nordin & Tibell	rock	
Circinaria caesiocinerea (Nyl. ex Malbr.) A. Nordin, Savić & Tibell	rock	
Cladonia chlorophaea (Flörke ex Sommerf.) Sprengel	moss & soil	X
Cladonia coniocraea (Flörke) Sprengel	moss & soil	X
Cladonia fimbriata (L.) Fr.	moss & soil	X

Appendix A. Species list for Lava Beds National Monument. (cont.)

Species	**Substrate**	**Reported in 2014**
~~*Cladonia gracilis* (L.) Willd.~~		X
Cladonia pocillum (Ach.) O. J. Rich.	soil	X
Cladonia pyxidata (L.) Hoffm.	moss & soil	X
Cladonia subulata (L.) F. H. Wigg.	moss & soil	
Cladonia verruculosa (Vainio) Ahti	moss & soil	X
Clavascidium lacinulatum (Ach.) M. Prieto	soil	
Cyphelium inquinans (Sm.) Trevisan	wood	
Dermatocarpon bachmannii Anders	rock	X
Dermatocarpon miniatum (L.) W. Mann	rock	
Dermatocarpon reticulatum (L.) H. Magn.	rock & free-living	X
Dimelaena thysanota (Tuck.) Hale & W. L. Culb.	moss & soil	
Diploschistes muscorum (Scop.) R. Sant.	moss & soil	X
Diploschistes scruposus (Schreber) Norman	rock	X
Endocarpon pulvinatum Th. Fr.	soil	
Evernia prunastri (L.) Ach.	rock & bark	X
~~*Flavoplaca citrina* (Hoffm.) Arup, Froden & Sochting~~		X
Flavoplaca citrina (Hoffm.) Arup, Frödén & Søchting	rock	
Hertelidea botryosa (Fr.) Printzen & Kantvilas	wood	
Hypocenomyce scalaris (Ach. ex Lilj.) M. Choisy	wood	
Hypogymnia apinnata Goward & McCune	bark	
Hypogymnia imshaugii Krog	bark	X
Kaernefeltia merrillii (Du Rietz) Thell & Goward	bark	X
Lecanora albellula Nyl.	wood	X
Lecanora albellula Nyl.	rock	
Lecanora allophana Nyl. f. sorediata Vain	bark	
Lecanora argopholis (Ach.) Ach.	rock	
Lecanora bicincta Ramond	rock	X
Lecanora cenisia Ach.	rock	
Lecanora laxa (Śliwa & Wetmore) Printzen	bark	X
Lecanora mellea W. A. Weber	rock	
Lecanora polytropa (Ehrh.) Rabenh.	rock	X
Lecanora pseudomellea B. D. Ryan	rock	
Lecanora reagens Norman	rock	X
Lecanora rupicola (L.) Zahlbr	rock	X
Lecanora semitensis (Tuck.) Zahlbr.	rock	

Appendix A. Species list for Lava Beds National Monument. (cont.)

Species	Substrate	Reported in 2014
Lecanora swartzii (Ach.) Ach.	rock	X
Lecidea atrobrunnea (Ramond ex Lam. & DC.) Schaerer	rock	X
Lecidea brodoana Hertel & Leuckert	rock	
Lecidea confluens (Weber) Ach.	rock	X
Lecidea fuscoatra (group) (L.) Ach.	rock	
Lecidea lapicida (Ach.) Ach.	rock	X
Lecidea tessellata Flörke	rock	X
Lecidoma demissum (Rutstr.) Gotth. Schneider & Hertel	soil	
Lepraria jackii Tønsberg	bark	
Lepraria neglecta (Nyl.) Erichsen	moss & rock	X
Lepraria subalbicans (I. M. Lamb) Lendemer & Hodkinson	rock	X
Lepraria vouauxii Hue) R. C. Harris	rock	X
Leptochidium albociliatum (Desm.) M. Choisy	moss	
Letharia columbiana (Nutt.) J. W. Thomson	bark	X
Letharia vulpina (L.) Hue Syn	rock & bark	X
Massalongia carnosa (Dickson) Körber	rock	
Melanelia tominii (Oxner) Essl.	rock	
Melanelixia subaurifera (Nyl.) O. Blanco et al.	bark	X
Melanohalea elegantula (Zahlbr.) O. Blanco et al.	rock & bark	X
Melanohalea exasperatula (Nyl.) O. Blanco et al.	rock & bark	X
Melanohalea multispora (A. Schneider) O. Blanco et al.	bark	X
Melanohalea subolivacea (Nyl.) O. Blanco et al.	bark	X
Miriquidica garovaglii (Schaerer) Hertel & Rambold	rock	X
Miriquidica griseoatra (Flotow) Hertel & Rambold	rock	
Montanelia disjuncta (Erchsen) Divaker, A. Crespo, Wedin & Essl.	rock	X
Montanelia panniformis (Nyl.) Divaker, A. Crespo, Wedin & Essl.	rock	X
Montanelia sorediata (Ach.) Divaker, A. Crespo, Wedin & Essl.	rock	X
Myriolecis persimilis (Th. Fr.) Śliwa, Zhao Xin & Lumbsch	bark	X
Nodobryoria abbreviata (Müll. Arg.) Common & Brodo	bark	X
Nodobryoria oregana (Tuck.) Common & Brodo	rock	X
Ochrolechia turneri (Sm.) Hasselrot	wood	
Ophioparma ventosa (L.) Norman	rock	X
Parmelia hygrophila Goward & Ahti	rock	
Parmelia saxatilis (L.) Ach.	rock	X
Parmelia sulcata Taylor	rock & bark	X

Appendix A. Species list for Lava Beds National Monument. (cont.)

Species	**Substrate**	**Reported in 2014**
Parmeliopsis ambigua (Wulfen) Nyl.	bark	X
Parvoplaca tiroliensis (Zahlbr.) Arup, Sochting & Froden	rock	X
Peltigera canina (L.) Willd.	soil	X
Peltigera kristinsonii Vitik.	soil	
Peltigera ponojensis Gyelnik	soil	
Peltigera rufescens (Weiss) Humb.	soil	
Peltula bolanderi (Tuck.) Wetmore	rock	
Phaeocalicium cercocarpicola nom. inval. E. B. Peterson & Titov	bark	
Phaeophyscia adiastola (Essl.) Essl.	rock	
Phaeophyscia decolor (Kashiw.) Essl.	moss	
Phaeophyscia sciastra (Ach.) Moberg	rock	
Physcia biziana (A. Massal.) Zahlbr.	rock	X
Physcia caesia (Hoffm.) Hampe ex Fürnr.	rock	X
Physcia dimidiata (Arnold) Nyl.	rock	
Physcia occidentalis Essl. Ined.	rock	
Physcia tribacia (Ach.) Nyl.	rock	
Physconia enteroxantha (Nyl.) Poelt	bark	X
Physconia isidiigera (Zahlbr.) Essl.	rock	X
Physconia muscigena (Ach.) Poelt	rock	X
Physconia perisidiosa (Erichsen) Moberg	rock	X
Placynthiella icmalea (Ach.) Coppins & P. James	wood	
Placynthiella oligotropha (J. R. Laundon) Coppins & P. James	soil	
Placynthiella uliginosa (Schrader) Coppins & P. James	wood	X
Platismatia glauca (L.) W. L. Culb. & C. F. Culb.	rock	X
Pleopsidium flavum (Bellardi) Körber	rock	X
Polycauliona bolacina (Tuck.) Arup, Frödén & Søchting	rock	
Polycauliona candelaria (L.) Frödén, Arup, & Søchting	rock	X
Polycauliona luteominia var. *luteominia* (Tuck.) Arup, Frödén & Søchting	rock	
Polychidium muscicola (Sw.) Gray	moss	X
Protoparmelia badia (Hoffm.) Hafellner	rock	X
Protoparmelia ochrococca (Nyl.) P. M. Jørg., Rambold & Hertel	bark	
Protoparmeliopsis muralis (Schreber) M. Choisy	rock	X
Pseudephebe pubescens (L.) M. Choisy	rock	X
Psora cerebriformis W. A. Weber	soil	X
Psora decipiens (Hedwig) Hoffm.	soil	

Appendix A. Species list for Lava Beds National Monument. (cont.)

Species	Substrate	Reported in 2014
Psora globifera (Ach.) A. Massal.	soil	X
Psora himalayana (Church. Bab.) Timdal	soil	
Psora luridella (Tuck.) Fink	soi	
Psora montana Timdal	soil	
Psora nipponica (Zahlbr.) Gotth. Schneider	soil	X
Psora tuckermanii R. A. Anderson ex Timdal	soil	X
Rhizocarpon disporum (Nägeli ex Hepp) Müll. Arg.	rock	X
Rhizocarpon eupetraeum (Nyl.) Arnold	rock	X
Rhizocarpon geographicum (L.) DC.	rock	X
Rhizocarpon grande (Flörke ex Flotow) Arnold	rock	X
Rhizocarpon macrosporum Räsänen	rock	
Rhizoplaca chrysoluca (Sm.) Zopf	rock	X
Rhizoplaca melanophthalma (DC.) Leuckert & Poelt	rock	
Rhizoplaca phaedrophthalma (Poelt) Leavitt, Zhao Xin & Lumbsch	rock	X
Rinodina bolanderi H. Magn.	bark	X
Rinodina pyrina (Ach.) Arnold	wood	
Rinodina terrestris Tomin	moss	
Rufoplaca arenaria (Pers.) Arup, Søchting & Frödén	rock	
Rusavskia elegans (Link) S. Y. Kondr. & Kärnefelt	rock	X
Rusavskia sorediata (Vainio) S. Y. Kondr. & Kärnefelt	rock	
Sagedia mastrucata (Wahlenb.) A. Nordin, Savić & Tibell	soil & moss	
Schaereria fuscocinerea (Nyl.) Clauzade & Cl. Roux	rock	
Scytinium lichenoides (L.) Otálora, P. M. Jørg. & Wedin	moss	X
Scytinium palmatum (Hudson) Gray	moss	
Staurothele areolata (Ach.) Lettau	rock	X
Tephromela atra (Hudson) Hafellner	rock	
Tetramelas papillatus (Sommerf.) Kalb	moss & soil	
Tetramelas terricolus (A. Nordin) Kalb	moss & soil	
Thelomma occidentale (Herre) Tibell	wood	
Thelomma ocellatum (Körber) Tibell	wood	
Toninia ruginosa (Tuck.) Herre	soil & moss	X
Trapeliopsis glaucopholis (Nyl. ex Hasse) Printzen & McCune	soil & moss	X
Trapeliopsis granulosa (Hoffm.) Lumbsch	soil	X
Trapeliopsis steppica McCune & Camacho	soil	X
Tuckermannopsis chlorophylla (Willd.) Hale	bark	X

Appendix A. Species list for Lava Beds National Monument. (cont.)

Species	**Substrate**	**Reported in 2014**
Umbilicaria americana Poelt & T. H. Nash	rock	X
Umbilicaria angulata Tuck.	rock	
Umbilicaria hyperborea (Ach.) Hoffm.	rock	X
Umbilicaria nodulospora McCune, Di Meglio & M. J. Curtis	rock	X
Umbilicaria phaea Tuck.	rock	X
Umbilicaria phaea var. *coccinea* Llano	rock	X
Umbilicaria polaris (Schol.) Zahlbr.	rock	X
Umbilicaria polyphylla (L.) Baumg.	rock	X
Umbilicaria torrefacta (Lightf.) Schrader	rock	X
Umbilicaria vellea (L.) Ach.	rock	X
Umbilicaria virginis Schaerer	rock	
Vahliella leucophaea (Vahl) P. M. Jørg.	rock	X
Variolaria ophthalmiza (Nyl.) Darb.	bark	
Xanthocarpia tominii (Savicz) Frödén, Arup & Søchting	detritus	
Xanthomendoza fulva (Hoffm.) Søchting, Kärnefelt & S. Y. Kondr.	bark & rock	X
Xanthomendoza mendozae (Räsänen) S. Y. Kondr. & Kärnefelt	bark & rock	X
Xanthoparmelia angustiphylla (Gyelnik) Hale	rock	
Xanthoparmelia coloradoensis (Gyelnik) Hale	rock	X
Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale	rock	X
Xanthoparmelia cumberlandia (Gyelnik) Hale	rock	X
Xanthoparmelia loxodes (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch	rock	
Xanthoparmelia plittii (Gyelnk) Hale	rock	X
Xanthoparmelia subhosseana (Essl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch	rock	
Xanthoparmelia verruculifera (Nyl.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch	rock	X

California Lichen Society Grant-Supported Project

Beneath the surface

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Having just arrived in the heart of San Francisco after ten years of living off the grid in the Santa Cruz mountains, I was met with a dazzling flood for the senses. Yet, my eyes fell upon the most exquisite details as I sought to find those moments of calm, quiet wonder amongst this bustling metropolis. I made friends with sunburst lichen (*Xanthoria parietina*), which grows readily in this nitrogen rich environment. I had spent all those years sitting deep in the woods, observing lichens which grow heavily upon and drape delicately from the Douglas fir. I had spent countless hours in the manzanita undergrowth with the *Usnea* which was strewn on the forest floor after the storms. I began making work utilizing lichen while attending the San Francisco Art Institute.

I was introduced to the California Lichen Society in 2014 during a walk lead by artist in residency, Laura Palmer and CALS' very own Shelly Benson. We hiked through the Marin Headlands inviting the crossover between lichen science and the arts, with a friendly, explorative flow. My experience in the field of lichenology includes participating in field studies, collecting specimens and identifying lichens for David Arora's living library. I also collaborated with Shelly on lichen printmaking projects. In early 2015, I was graciously awarded the CALS Education Grant in support of the sculptural and printmaking work I was doing with lichens. Through printed representations and larger than life sculptures, the viewer interacts with what is often a discrete and unnoticed wonder.

LISH DAWN

Investigation below the surface: Xanthoria parietina/Sunburst Lichen. Intaglio prints on Japanese gampi paper within sculpture of resin, 2015.

In the context of the arts, the public is invited to look more closely and consider the significance of these organisms, both biological and cultural.

The work that I embarked on with the support of the CALS grant is a project titled: *Investigation below the surface: Xanthoria parietina/Sunburst Lichen*. This work includes prints made from copper plate etchings, a process known as intaglio; a found birds nest in which *X. parietina* was used as building material; and two resin sculptures inlaid with intaglio prints of *Trebouxia* algae cell drawings. The larger of the two sculptures measures about 3' x 1.5' x .8".

Intaglio printmaking is a technique dating back to the 15th century. This method involves the application of a soft coating called "soft ground" to a copper plate. The lichen specimens are placed on the plate and run through the press, leaving an impression in the soft ground. The impression is then etched into the copper by placing the plate in an acid bath. The etched plates are inked by hand and run through a hand-operated press.

The sculptures were made by first shaping clay in the likeness of sunburst lichen. I then made a silicone mold from the clay sculpture. Finally, the mold was filled with resin while carefully inlaying drawings of *Trebouxia* algae cells - the symbiotic partner in this species of lichen - which were printed using intaglio on tissue-thin Japanese paper.

For this species representation, I am looking at *X. parietina* as an indicator of air quality. This species is prevalent in environments that have high levels of nitrogen: agricultural, industrial and other areas of human and sometimes bird activity. Humans are concentrators and relocators of nutrients and this "indicator" shows a record of the coming and going of all kinds of critters as a result of either nutrient or pollutant remnants. The project suggests a willingness to observe our habits. The specimens with which these sculptures and prints were made were collected from tombstones in South San Francisco. Their wealth in numbers is likely due to the fertilizers used on the grounds, fostering recognition of our doing as well as the nature of our mortality...everything we have comes from and returns to the dirt. This work also highlights the symbiotic relationship found within the

LISH DAWN

Investigation below the surface:Xanthoria parietina/ Sunburst Lichen. Intaglio prints on Japanese gampi paper within sculpture of resin, 2015. Inlaid prints depict *Trebouxia* algae.

LISH DAWN

Xanthoria parietina/Sunburst Lichen. Intaglio print, chine cole on Japanese gampi paper, 2015.

organisms. The symbiotic relationship found within lichens speaks to the shared reliance of systems working together and reflects their delicate balance and interconnectedness. These symbiotic organisms reflects a model found within nature that can inspire the same for us with one another.

This investigation is also a result of the practice of looking closely and recognizing quiet beauty. Looking in this way fosters stillness and silence among the "doing", a humble and quiet alternative in the ever-increasing rush of society. Simultaneously, we can celebrate human creativity and the wonders of that which we have not created. The transparency of the sculptures invites looking that goes within; beyond the surface, to explore conceptually the meanings and workings below the surface of the form.

It was such a joy collaborating with Shelly to document a sampling of species. Through her wealth of knowledge and our dialogue, my experience and understanding of lichen biology expanded while informing the project. We honed in on lung and wolf lichen (*Lobaria pulmonaria* and *Letharia columbiana*), which produced impressive impressions for soft ground etchings, full of detail and texture. Specimens were always harvested in a sustainable and sensitive manner.

I will continue telling the lichens' stories and starting conversations through investigations of individual lichen species. Focusing on one species at a time, I seek to uncover the story each lichen can tell based on their unique attributes. This documentation captures the intricate fascinating forms, while educating the public about their biological significance in a way that starts dialogue that is both environmentally and culturally relevant. All of these works were displayed at the CALS annual meeting in 2016, as part of the art show and silent auction. As I submit these works to local art galleries, I will be sure to notify the society as to when and where they are on display.

Please feel free to visit my website (lishdawn.com) to see further documentation of this and other works and to contact me with any questions. I'd love to hear from you. Thank you so much for supporting this project via your contributions to CALS and happy lichening my friends!

LISH DAWN

Wolf/lung. Intaglio print, 2015. Print depicts upper and lower surfaces of *Lobaria pulmonaria* and *Letharia columbiana*

About the Artist

A sailboat is her home, anchored in the San Francisco Bay. Before moving into the heart of the city to study at the San Francisco Art Institute as a printmaker, she spent ten years living in a remote location in the Santa Cruz Mountains. She works in printmaking, photography, mixed media, artist books, sculpture and installation. Capturing a migration from mountain, to city, to sea; her work documents observation of growth in precarious areas. Through her meditative practice of close observation and connection to place, she reflects how creatures and materials exist differently depending on their environment. Exploring rhythms and dynamics within our human condition and attention to sonder, extend from this careful listening. The intricate machinery of organisms and their relationships is her constant obsession. An avid experimentalist, she forages materials from her path, utilizing substances such as nautical charts and sails, lichen, seaweed, rock, paint chips, bricks and tree bark during the paper-making, paint-making, sculptural and print-making processes. Her work has a detailed and delicate quality that provokes a ghostly dreamlike atmosphere; rooted in silent reverence and solace in moments of stillness.

Physcia millegrana can be excluded as an adventive in California

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THEODORE ESSLINGER

A small part of the holotype specimen of *Physcia duplicorticata* (COLO). The scale bar is 2mm. The area above the curved line corresponds (approximately) to the mixtum of *P. neglecta*, with weakly defined labriform soralia.

The eastern North American species *Physcia millegrana* Degel. was first reported from California (Berkeley) by Thomson (1963), who suggested its occurrence there was an example of long distance dispersal and introduction of a lichen species, supposedly transported on nursery stock from the East. A scattering of subsequent reports for the species in California have been made (Tucker 2014), and some of those have already been corrected as misidentifications of the common California species *P. tribacia* (Ach.) Nyl. (Tucker 2014). Through the kindness of curators at the University of Colorado (COLO), I recently obtained on loan the Berkeley specimen originally studied by Thomson. My examination has revealed that it is actually a typical specimen of *P. duplicorticata* W. A. Weber & J. W. Thomson. The two species are similar in gross morphology although *P. duplicorticata* can easily be distinguished by its paraplectenchymatous lower cortex, compared to the prosoplectenchymatous lower cortex of *P. millegrana*.

In addition to the above mentioned published reports, six more specimens of supposed *P. millegrana* from California are cited in the Consortium of North American Lichen Herbaria (CNALH) database. It seems certain that all these reports are based upon misidentifications of *P. duplicorticata, P. tribacia*, or possibly one of the other similar species mentioned below.

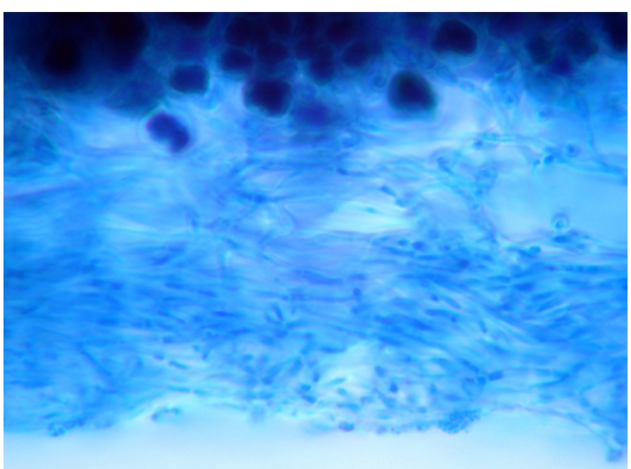
Physcia duplicorticata was first described based upon two corticolous collections from California, one from San Mateo Co., and one from Marin Co., the latter of which was chosen as the type collection (Weber & Thomson 1975), with duplicates distributed as

Lich. Exs. Colo. 476. The authors emphasized its resemblance to the eastern North American species *P. millegrana* and pointed out that a major difference was the paraplectenchymatous lower cortex of the new species. Rather oddly, they did not address the earlier report by Thomson (1963) of *P. millegrana* from California as a probable adventive. Recently, a saxicolous collection of *P. duplicorticata* was reported from the Santa Monica Mountains by Knudsen et al. (2016). An updated description of the species is provided below.

Physcia duplicorticata **W. A. Weber & J. W. Thomson**, Mycotaxon 3(1): 102-104. 1975. Thallus foliose, orbicular to rather irregular, moderately to rather closely appressed, adnate, up to ca. 3 cm in diameter. Lobes irregular and lacerate, more or less imbricate, 0.5-1.5 (2) mm broad, more or less flat, the edges or ends (in parts) ascending. Upper surface white to gray-white, not maculate, usually with a conspicuous to inconspicuous epinecral layer which is often patchy toward the lobe ends, sometimes also with a sparse crystalline pruina (faint glints). Lobe edges/ends (especially upturned ones) with rather coarse sorediod granules, early ones rather blastidioid, but often then also forming on and under edge of lobes, sometimes proliferating in older thallus parts and becoming stacked. Lower surface white to off-white, more or less flat, moderately to rather sparsely rhizinate, the rhizines conspicuous and well developed, concolorous with the lower surface, mostly simple. Thallus 150-210 µm thick, upper cortex 25-45 µm thick, paraplectenchymatous, lumina 6-12.5 µm, lower cortex 18-30 µm thick and relatively well delimited from the hyphal medulla, paraplectenchymatous, lumina 4-12 µm. Apothecia rare, only small and immature ones seen (on holotype), less than 0.5 mm; no sections made by me, but according to the protologue, the spores are 18-20 x 7-10 µm and have more or less equally thickened spore walls [i.e., pachysporaria type?]. Pycnidia not seen. Upper cortex K+ yellow, medulla K-. Producing atranorin in the cortex.

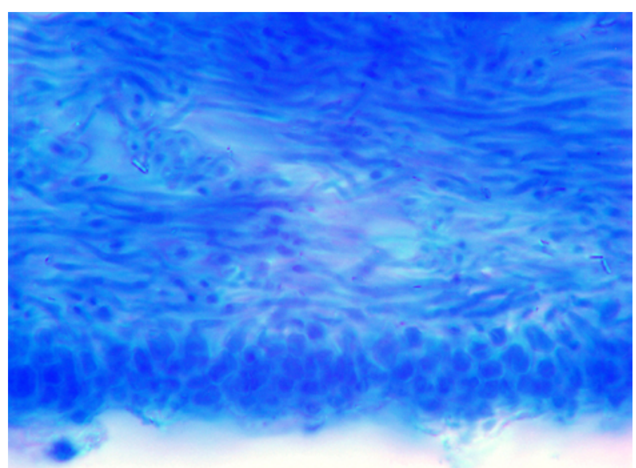
The holotype specimen (and possibly some of the isotype duplicates) contains an intricate admixture of a few scattered thalli of a second species, apparently *P. neglecta* Moberg. The general appearance of these thalli is much like *P. duplicorticata*, and some peripheral lobes are weakly ascending and bear irregular granular soredia more or less concolorous with the lobes, but the more central secondary lobes on these thalli are ascendant and have small, weakly labriform soralia which are noticeably paler than the thallus itself. These labriform soralia on the mixtum thalli were erroneously attributed to *P. duplicorticata* in the original description.

Among similar sorediate or blastidiate species occurring in California, two other species have a



THEODORE ESSLINGER

Longitudinal section of *Physcia millegrana* thallus (Morse 10046, herb. Esslinger) showing the prosoplectenchymatous lower cortex, medulla and part of algal layer; 1000 X (stained with lactophenol cotton blue).



THEODORE ESSLINGER

Longitudinal section of *Physcia duplicorticata* thallus (Carlberg 03966, herb. Esslinger) showing the paraplectenchymatous lower cortex and medulla; 1000 X (stained with lactophenol cotton blue).

similar paraplectenchymatous lower cortex. The above mentioned *P. neglecta* is a rare, usually saxicolous species which is somewhat similar to *P. duplicorticata*, but has granular soredia (not blastidia) on edges and underside of rounded, crowded/irregular, ascending lobes, which in some thalli may be weakly labriform, especially the smaller ones in the thallus center. The upper surface of *P. neglecta* typically lacks noticeable pruina or epinecral layer, and the medulla sometimes reacts K+ weak yellow in some parts of the thalli and K- in other parts. The lobe-ends and occasionally some soredia become darkened to a dark gray. The second species with paraplectenchymatous lower cortex that might be confused with *P. duplicorticata* is the rather common (in parts of California) *P. tribacia*, which is usually saxicolous. That species has a more regular, rosette-forming thallus with more elongate, weakly convex lobes downturned at the lobe-ends, which bear sparse to numerous blastidia on the edges, and sometimes granular soredia under the lobe ends as well. Throughout most of its range, including California, *P. tribacia* has a K- medulla like *P. duplicorticata*. Somewhat unusual for sorediate/blastidiate taxa, *Physcia tribacia* is also rather commonly fertile.

***P. duplicorticata* Specimens Examined:**
U.S.A. California. Alameda Co.: Berkeley, Russel St., on elm trees, 2/6/1943, *E. E. Morse*, S9983 (COLO). Marin Co.: 1.6 km E of junction Nicasio-Point Reyes Road east of Inverness, on *Umbellularia* bark, 12/3/1975, *W. A. Weber & G. Kunkel*, Lichenes Exsiccati Colo. 476 (COLO, holotype; FH, US, WIS, isotypes). San Francisco Co.: Lincoln Park Golf Course, on *Cupressus* bark, 1/14/2015, *T. Carlberg 03966* (herb. Carlberg, herb. Esslinger). San Mateo Co.: S end of San Andreas Lake, San Francisco Watershed, on *Cupressus* bark, 9/13/1967, *W. Jordan 756-B* (WIS, paratype). Ventura Co.: Santa Monica Mountains, on rock, 2/24/2016, *K. Knudsen 18258* (herb. Esslinger).

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Macrolichen inventory for Dye Creek Preserve, Los Molinos, California

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ROBERT FISCHER

Figure 1. Looking east up the main canyon of Dye Creek.

Abstract

Lichen resources at The Nature Conservancy-managed Gray Davis Dye Creek Preserve were inventoried over a three day interval in November 2015. Thirteen locations were identified as having potential for high lichen diversity due to the presence of a variety of vegetation types and unique substrates. Three locations were selected for Forest Inventory and Analysis (FIA) lichen community assessment for air quality monitoring. We sampled an additional three locations because we noted an unusual substrate or microhabitat. We documented a total of 96 species from 44 genera. Seven lichens were found on the preserve that represent significant range extensions within California and/or North America: *Blennothallia crispa, Lichinella cribellifera, L. robustoides, Peccania subnigra, Placidium imbecillum, Psora cerebriformis,* and *Rhizoplaca glaucophana*. Sixty-five species are the first reports for Tehama County; many of these reports serve to fill data gaps in these species' geographic ranges. A geologic anomaly was noted due to the presence of five species of lichens that strongly prefer calcium-rich substrates. Moderate to high levels of nitrogen (N) deposition are hypothesized, based on assessment of lichen communities present at the FIA plots surveyed; the most common lichen species encountered are all eutrophs, species with high N requirements.

Introduction

The Nature Conservancy-managed Gray Davis Dye Creek Preserve includes over 37,000 acres of southern Cascade and northern Sierra Nevada foothills in the north end of the Sacramento River Valley (Figure 1). The region is often referred to as the Lassen Foothills due to proximity to Lassen Peak and Lassen Volcanic National Park, and is notable for its intact expanse of blue oak woodlands. Elevations range from about 100 up to 700 meters. It is roughly bounded on the south and southeast by the ridge separating Dye and Mill Creeks, to the northeast by the Tehama Wildlife Area, and by private agricultural lands and State Highway 99 to the northwest and west. The creeks in the preserve lie in steep canyons that run generally east to west (Figure 2), with the result that the landscape tends to have north and south aspects. Cattle ranching was introduced to the region over 100 years ago, and this tradition is continued as a tool for protecting local biodiversity. Limited hunting and public access opportunities also exist at the preserve. The Nature Conservancy directly manages this property for its diverse conservation values, complementing nearly 100,000 acres of nearby land permanently protected by conservation easements. Due to the private nature of the ownership of the preserve, and the difficulty accessing the surrounding foothills, Dye Creek Preserve offers a unique opportunity to study resources representative of the region.

Dye Creek Preserve and in general the foothills and canyons of the California Cascades have never had a focused lichen inventory, nor has very much incidental collecting taken place. Database research prior to this inventory work found that in publicly-accessible herbaria, Tehama County had a total of 166 collections comprising 89 species, 12% of which were identified to genus only. This is the result of a 105-year span of collecting (CNALH 2016, which includes the recent addition of Judy & Ron Robertson's extensive California collections). Most of the species recorded were collected from temperate conifer forests on the Lassen and Mendocino National Forests, on the east and west edges of the county. To date, the foothills and valley canyons in this region are not merely underrepresented, they are scarcely represented at all. Lichens in general are so underexplored that focused inventory work frequently results in new discoveries. For example, in the course of a 3-hour hike on the preserve in 2014, *Rhizoplaca glaucophana* was found, a western North American endemic lichen. Previously its northernmost occurrence was in Yosemite National Park, 320+ air kilometers to the south.

Climate can influence the impact of air pollution on lichens. Lichens are passive water regulators, and they glean water and nutrients from the air, and from surface water flowing on their substrate. In dry climates, pollutants can accumulate on the surface of the lichen, and become highly concentrated when moisture becomes available. Regular precipitation can increase the pollution tolerance of lichens as it lowers the deposition accumulated on the lichen surface. One of the most common ecological pollutants in California is nitrogen (N) as NO_3-, NH_3 and NH_4+ from combustion exhaust and agricultural endeavors. Often in California, N deposition occurs during the dry summer months. Hot dry summer air laden with N compounds from urban and agricultural areas to the south can move into the northern Central Valley, where it becomes trapped against the surrounding mountain ranges. Deposits of these compounds in places like Dye Creek Preserve can lead to accumulations of compounds that are very toxic to sensitive lichen species (Jovan 2008).

In order to manage significant biological resources, it is essential that they be thoroughly mapped and cataloged. In the course of planning this inventory work, we expected to encounter lichen species at Dye Creek Preserve that would challenge known ranges and distributions for lichens. The purpose of this inventory is to provide baseline data for lichen species (foliose, fruticose and squamulose growth forms) found within Dye Creek Preserve, expand the range of known species, fill in gaps in existing ranges and enhance our understanding of lichen distributions in California, and to establish and survey standardized FIA plots. The data presented here will contribute to our understanding of lichens in California and North America, help local resource managers understand and steward assets, and provide a baseline from which to monitor change.

Methods

Thirteen locations within Dye Creek Preserve were identified as having potential for high macrolichen diversity (Figure 2), based on vegetation and substrate diversity. These sites included a variety of habitats comprising different vegetation types and substrates known to support different lichen communities, and were surveyed comprehensively for macrolichens using an intuitively-controlled survey method. Three locations (low, medium and high elevation) were selected for the installation of standardized Forest Inventory and Analysis plots, and were surveyed according to standard protocol (USDA 2010). An additional three opportunistic locations were surveyed when a unique microhabitat or substrate was encountered; these were surveyed only to collect species unique to that substrate/habitat. Common or showy crustose lichen species were occasionally collected at the discretion of the lichenologist.

Habitats inventoried

We surveyed five main habitat types. 1) *Quercus douglasii* woodland, which typically occurs on the flat tabletops between the creek canyons. Occasional associates are *Q. wislizeni* var. *wislizeni, Rhamnus ilicifolia, Ceanothus cuneatus* and *Juniperus californica*. *Aesculus californica, Cercocarpus betuloides* var. *betuloides* and *Arctostaphylos manzanita* ssp. *manzanita* are sometimes present. There is an understory of annual grasses and *Centaurea melitensis*. 2) Mixed hardwood/ oak woodland sites tended to be more heavily wooded than the *Q. douglasii* woodlands and have greater substrate diversity, with no clear pattern of domination. Slopes tended to be steeper. Overstory cover values were as high as 60%; overstory trees included *Q. douglasii, Q. wislizeni* var. *wislizeni, Aesculus californica*, and in one instance a strong

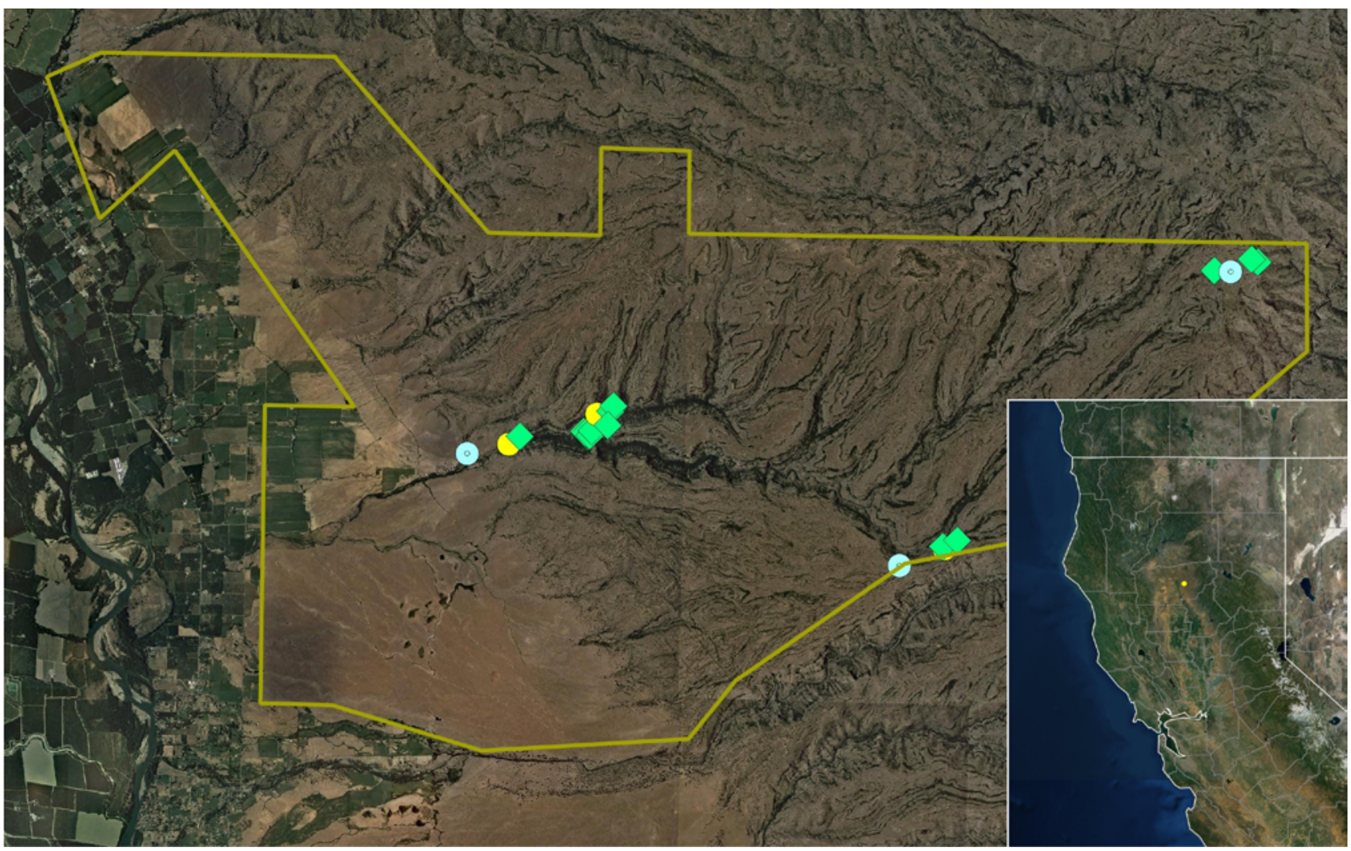


Figure 2. Map of study area and location within California. Green diamonds are comprehensive macrolichen inventory locations, blue circles are FIA plot locations, yellow circles were sampled opportunistically.

component of *Umbellularia californica*; understory often included regenerating individuals of these species along with *Cercis occidentalis, Cercocarpus betuloides* var. *betuloides, Arctostaphylos manzanita* ssp. *manzanita, and Ceanothus cuneatus* var. *cuneatus*. Ground covers were composed primarily of annual grasses, *Centaurea melitensis, Toxicodendron diversilobum* and occasionally patches of *Selaginella hansenii*. 3) The dominant habitat at the higher elevations of the preserve is made up of lightly-vegetated thin soils atop rocky volcanic tables. This habitat tends to be treeless, with extremely thin soils and scant cover of grasses, but with abundant growth of *Selaginella hansenii* and rarely stands of *Eriodictyon californicum*. It appears that cattle do not favor *Selaginella hansenii*, since this habitat showed little sign of herbivory or trampling. 4) The vertical cliffs at the east and southeast edges of the preserve are part of the Tuscan Formation, which comprises volcanic mudflows encapsulating tuffs, breccias, sandstone, and ash deposits. The conglomerate nature of the rock results in abundant niches and holes; these cavities accumulate soil and debris, creating numerous terrestrial micro-niches. 5) Creek banks have the same geology as vertical cliffs, but tended to be moister. The amount of moisture availability/retention depended on elevation, proximity to water, seasonality of water, presence/absence of springs, and aspect.

FIA plots

FIA plots were established at three locations within the preserve, one each at high, intermediate, and low elevations. Blue oak woodland sites were preferentially chosen to minimize variation due to substrate diversity. Locations were selected based on uniformity of habitat, slope, aspect and understory cover. The goal of the FIA field sampling protocol (USDA 2010) is to find as many macrolichen species as possible within established guidelines. Only epiphytic foliose and fruticose species are collected. Field personnel collect a sample of each lichen species and assign an abundance code according to a categorized scale. This protocol is timed; surveyors conduct a time-constrained search (maximum of 2 hours) of all standing natural woody substrates above 0.5 meter, with the survey coming to an end if no new lichen species is found within any 15 minute period.

In order to quickly assess relative air quality, we used information from McCune and Geiser (2009) that rates lichen species sensitivity to air pollution to assess the lichen communities. The designations are O = oligotroph (lichens preferring low N loads), M = mesotroph (lichens preferring moderate N loads), and E = eutroph (lichens that respond positively to excess N deposition).

A complete reference collection of the species found in this inventory is stored at the herbarium of the California Academy of Sciences, San Francisco, California (CAS). A partial set of duplicate collections is at the California State University, Chico State Herbarium (CHSC). Data and specimens from FIA work was sent to the FIA office in Portland, Oregon. Nomenclature follows Esslinger's cumulative online checklist (Esslinger 2016).

Results

Lichenologists Tom Carlberg and Jennifer Riddell, with local botanist Robert Fischer, spent three days inventorying lichen resources at Dye Creek Preserve during early November 2015. From a total of 319 vouchers, we report 96 macrolichen species from 44 genera (Appendix A). Of the species reported, 64% were foliose, 8% were fruticose, and 19% were squamulose.

Significant species

Fourteen species are noteworthy because they are either intrinsically interesting, rare/uncommon, or range extensions within California or North America. These species are described in detail below. **Bold** type indicates a cyanolichen. Additionally, this inventory discovered 65 lichen species that are new reports for Tehama County.

Blennothallia crispa (Syn.: *Collema crispum*; photo on back cover)

Common in arid portions of the American Southwest, Iceland, Europe, northern Africa, and the Near and Middle East, often on calcareous soils. This appears to be a range extension of approximately 400 kilometers NW from the nearest location in the foothills of the southern Sierra Nevada, and is a new report for Tehama County. Determined by Matthias Schultz, Biozentrum Klein-Flottbek, Hamburg, Germany.

Cladonia pocillum (Figure 3)
Widespread in western and northeastern North America but apparently absent from Nevada (Brodo et al. 2001), and known from only a handful of locations in California, all in the southern half of the state. Collected from dry exposed south-aspect vertical cliffs. A new record for Tehama County.

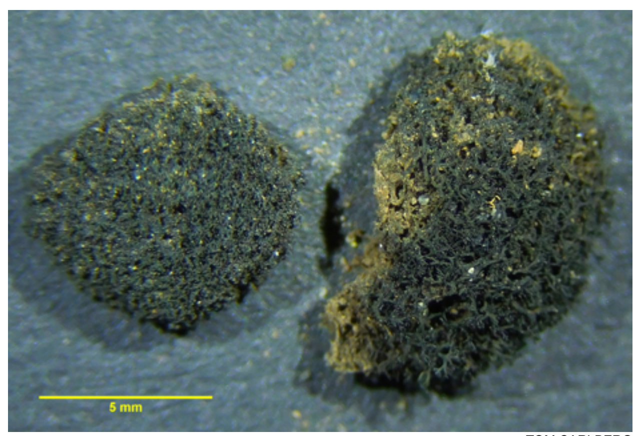
TOM CARLBERG
Figure 3. *Cladonia pocillum*. Tic marks are millimeters.

Dermatocarpon bachmannii (photo on back cover)
Collected from Tuscan mudflow conglomerate rock on the north bank of Dye Creek, near its confluence with the north fork of Dye Creek. Known from Sequoia National Forest in Tulare County to the south, and several reports from Fremont National Forest in Klamath County, Oregon to the north. This is a new report for Tehama County. Material from North America is possibly conspecific with *Dermatocarpon deminuens* (Nash et al. 2002, Heiđmarsson & Breuss 2004).

Leptogium milligranum (photo on back cover)
This North American endemic is abundant in the South and the Midwest, with scattered reports from the Appalachians, Florida, Maine, southeast Arizona and northwest Mexico. In California there are apparent disjuncts around the San Francisco Bay Area (Brodo et al. 2001), and there are two confirmed reports from Butte County (Fischer 2015). Common in blue oak woodlands at Dye Creek Preserve, growing on the trunks of blue oaks.

Lichinella cribellifera
Known from Baja California, the Mexican states of Chihuahua and Sonora, and in the U.S. from the southern portions of Arizona, Nevada and California. The location nearest to the preserve is Pinnacles National Park, approximately 402 air kilometers south. This is a new report for Tehama County.

Lichinella robustoides (Figure 4)
Prior to the current inventory at Dye Creek Preserve, *Lichinella robustoides* appeared to be endemic to a limited area encompassing Sonora and Baja California Sur in Mexico, and the Channel Islands off the coast of Ventura, California. That range is now extended north by approximately 700 kilometers from Santa Cruz Island. Within this range it appears to be rare; only seven reports exist (CNALH 2016; Schultz 2005), even though portions of its range constitute some of the most intensively-researched lichen study areas in the U.S. (Channel Islands and Baja California Sur). This is a new report for Tehama County. Verified by Matthias Schultz, Biozentrum Klein-Flottbek, Hamburg, Germany.

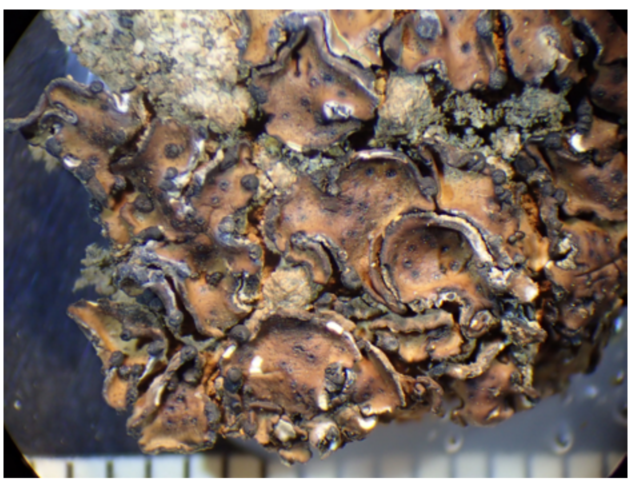


TOM CARLBERG
Figure 4. *Lichinella robustoides*. Similar to minute species of *Scytinium*, but with a different cyanobacterium genus and lacking the cellular cortex of *Scytinium*.

Peccania subnigra (photo on back cover)
This small black soil-dwelling North American endemic cyanolichen is currently known from only 34 sites in the U.S., primarily from central and southern Arizona, but also in the drier parts of southern California, and with remote disjuncts in Idaho and west-central North Dakota. Given its minute size, it is certainly overlooked in many dry/high-elevation locations in the western states, but it

does provide another indication of a desert component in the Dye Creek Preserve lichen flora. This is a new report for Tehama County, and a range extension of approximately 770 air kilometers north from the nearest extant location, in the Mojave Desert. Determined by Matthias Schultz, Biozentrum Klein-Flottbek, Hamburg, Germany.

Placidium imbecillum (Figure 5)
A small brown squamulose lichen growing on calcareous soils, easily overlooked. Reported from a few locations in Oregon east of the Cascade crest, typically in grazed juniper/sagebrush/cheatgrass hillsides. Also known from northern Utah, southeast Arizona, and sub-Mediterranean Europe (Breuss 1990, Nash et al. 2004). Distinguished from *P. pilosellum* by having cylindrical conidia, and from *P. yoshimurae* by having shorter conidia. This is a new report for Tehama County and for California, and represents significant range extensions of 560 kilometers south and 870 kilometers west from previously-known sites. Verified by Othmar Breuss, Naturhistorisches Museum Wein, Botanische Abteilung, Wein, Austria.



TOM CARLBERG
Figure 5. *Placidium imbecillum*. Black spherical growths are pycnidia. Tic marks are millimeters.

Placynthium nigrum **(**photo on back cover)
This widespread and common lichen is often associated with calcareous rock and soils (Nash et al. 2007). It is known throughout the U.S., but appears to be absent from the Great Basin, the northern Sierra Nevada, and the Cascade Mountains in California and Oregon. This is a first report for Tehama County.

Polycauliona impolita (Figure 6)
This western North American endemic was previously known to extend only as far north as Sutter Buttes, 100 air kilometers to the south. A new record for Tehama County. Common within the preserve, on vertical rock walls.

TOM CARLBERG
Figure 6. *Polycauliona impolita*.

Psora cerebriformis (photo on back cover)
A very unusual find for the western foothills in California, both for the geology and the geography. This western North American endemic is common and widespread in the southwest at 1,200 to 3,000 meters elevation, and typically grows on calcareous soils. It reaches its southern limit in the mountains of northern Arizona and New Mexico, and apparently extends no further west than the eastern Sierra Nevada, where there are a handful of collections from Inyo County. The Butte County report contains anecdotal location information that seems to place it in Inyo County, where there are several other reports of this species, and as such the coordinate data should be disregarded. This is a new report for Tehama County, and a westward range extension of 290 kilometers.

Rhizoplaca glaucophana (photo on back cover)
Uncommon in southern California south of Point Conception, on various rock substrates, including serpentine. Also reported from Yosemite National Park (Hutten 2013), the occurrence at Dye Creek Preserve of this distinctive white N-loving lichen with large brown immersed apothecia represents a

range extension of approximately 330 air kilometers. This is a new report for Tehama County. Found at two widely separated locations in the preserve, one on house-size rocks at the bottom of Dye Creek, near the mouth of the canyon, and another on vertical east-facing cliffs at the extreme northeast corner of the preserve.

Toninia sedifolia (Figure 7)
Common throughout the western U.S., with the exception of NW Utah, Arizona, and central and northern California. This is the first report of this lichen species from Tehama County.

Waynea californica
This is a tiny green squamulose lichen that develops globose structures that burst to release vegetative propagules. It is recently described (Moberg 1990), and a frequent inhabitant of oak woodlands and grasslands, although its small size and habit of growing among mosses makes it very easy to overlook. This is the first report of this lichen species from Tehama County.


TOM CARLBERG

Figure 7. *Toninia sedifolia*.

FIA plots
Our species list from Dye Creek Preserve includes many species that fall into both the mesotroph and eutroph categories (Table 1).

Table 1. Species with known levels of pollution tolerance found at Dye Creek Preserve (from McCune and Geiser 2009, p. xxxiv). N rating: O = oligotroph, M = mesotroph, and E = eutroph. N requirements: Low = <2.5 kg/ha/year; Moderate = 2.5-4.5 kg/ha/year; Moderate-High = >6 kg/ha/year; High = >4.6 kg/ha/year *and* all species are eutrophs; Broad = found across N deposition gradient. N Dep@peak freq kg/ha/yr: N deposition in kilograms per hectare per year at the point along the N deposition gradient in Oregon and Washington west of the Cascade crest (0.8 to 8.0 kg/ha/yr) where the lichen is most frequently found. **Bold** type indicates a cyanolichen.

Species	N rating	N requirement	N-Dep@ peak freq (kg/ha/year)
Candelaria concolor	E	High	6.1
Collema nigrescens	E	Broad	6.1
Evernia prunastri	E	High	6.1
Scytinium lichenoides	O	Low	1.1
Melanelixia californica	M	Moderate - High	3.3
Melanelixia subaurifera	E	High	6.1
Melanohalea elegantula	E	Moderate - High	5.0
Melanohalea exasperatula	M	Moderate - High	3.2
Physcia adscendens	E	High	6.1
Physcia biziana	E	High	6.1
Physcia tenella	E	High	6.1
Physconia americana	M	Moderate	3.3
Physconia enteroxantha	E	High	6.1
Physconia isidiigera	M	Moderate	3.2
Physconia perisidiosa	E	High	6.1
Xanthomendoza fallax	E	High	6.1
Xanthoria polycarpa	E	High	6.1

Common lichen species

The seven most common lichens at Dye Creek Preserve are summarized in Table 2. These species were encountered in more than one third of the locations surveyed. In contrast to the relatively small number of common species, 46 species (50% of all species) were uncommon, observed at only one survey location.

Table 2. Table 2. The seven most common lichen species encountered during the 2015 lichen inventory. Species from FIA plots were included in the calculation. **Bold** type indicates a cyanolichen.

Species	Growth Form	Frequency
Melanelixia californica	foliose	50.0
Physconia americana	foliose	50.0
Scytinium lichenoides	foliose	50.0
Xanthomendoza fallax	foliose	43.8
Candelaria concolor	foliose	37.5
Physconia enteroxantha	foliose	37.5
Physconia isidiigera	foliose	37.5

Discussion

Species of significance

New reports for Tehama County are hardly surprising, given that from 1909 to 2016 there had been only 166 collections comprising 89 species in publicly accessible herbaria (CNALH 2016). A large majority of these were collected on the Lassen and Mendocino National Forests, predominately from mesic locations in conifer forests at moderate elevations. For this inventory we collected 319 vouchers, and made all collections from a landscape that is drier, lower in elevation, largely unforested but includes tree species that reflect a hotter, drier habitat, and has numerous large flat areas of thin exposed soils, and rock. As such, the high number of new county records results from 1) inventory work that focuses on lichens; 2) inventorying habitats significantly different than those of prior reports; and 3) inventorying a previously unexplored foothill location.

Similarly, many of the species found during this inventory appear to be range extensions. Undoubtedly a number of them are, but some must be considered provisional extensions until the adjacent regions have been surveyed for lichens, at which time it may be evident that many Dye Creek Preserve reports are simply filling in gaps in our understanding of lichen distributions in California.

Calciphiles

The presence of five species at Dye Creek Preserve (*Blennothallia crispa, Placidium imbecillum, Placynthium nigrum, Psora cerebriformis,* and *Toninia* cf. *sedifolia*) that are almost invariably associated with calcareous soils and/or parent material is very interesting. Some lichens are faithful to a particular habitat, or a certain substrate, but most are not, being more general in their preferences, i.e. preferring conifer bark to hardwood bark, while still others show no preference at all. Saxicolous lichens (those that grow on rock) can be divided into species that prefer siliceous or calcareous substrates, and this preference can be extended to lichens that grow on soil, as soils are derived from the parent rock. Dye Creek Preserve is described as having a monotypic geology made up of Tuscan mudflow, with soils (Toomes-Guenoc and Toomes series) derived from that (Barrett 1978, USDA 1967). This is not a calcareous material. Maps from the California Department of Conservation (2017) indicate no surface rocks in the Dye Creek watershed that might contribute calcium.

There are several possible explanations for the presence of calciphiles at Dye Creek Preserve. One, which is most likely, is that it is an example of species deviating from their known habitat; however, this would have to be a separate event for each of the five species, and the cumulative probability becomes less likely as the number of calcium-associated species increases. Another is that since the Tuscan formation is a conglomerate rock, it is possible that there are inclusions of calcareous material. This seems less likely, as the Tuscan material is largely made up of volcanic breccias (Anderson 1933; Conlin 2017). Additionally, placing hydrochloric acid on pieces of the Tuscan formation produced no reaction, indicating low or no presence of calcium. A third possible source of calcium is the Chico Formation, which underlies all of the Tuscan material, and is exposed in several not very large locations in adjacent Mill Creek; this layer is sea floor sandstone that is high in carbonates, and could contribute background calcium through long-distance dust dispersal from exposed locations, or more directly through the movement of groundwater in the form of springs (Conlin 2017).

FIA plots

All three plots had very similar species compositions, composed of many eutrophs, species with high N tolerance. FIA Plot #1 (the high elevation site) had 14 species, including several thought to be N sensitive (the genera *Scytinium* and *Leptogium* are made up of lichens with cyanobacterial photobionts, and are thought to be largely oligotrophs). FIA Plots #2 and #3 each had 15 species, and were more similar in their species composition, including several common moderately to highly pollution tolerant species such as *Melanelixia subargentifera*, *Melanelixia subaurifera*, *Parmelina coleae*, *Phaeophyscia hirsuta*, and *Physcia adscendens*. This could indicate either that air quality is more compromised at lower elevations, or that more precipitation at higher elevations makes for a slightly cleaner habitat. The most common species we found in all sites were *Melanelixia californica, Physconia americana, Scytinium lichenoides, Xanthomendoza fallax, Candelaria concolor, Physconia enteroxantha,* and *Physconia isidiigera* (Table 2). Most of these species are designated as eutrophs (N-preferring).

Based on the lichen species found in this survey, we would hypothesize that there is a moderate to high level of N deposition occurring at Dye Creek Preserve. In some locations that N deposition can be local due to animal grazing and emissions, but weather patterns and statewide conditions in the western Sierra Nevada foothills (Fenn et al. 2008) suggest that it could be largely due to air movement patterns from urban and farming areas upwind of the preserve.

Acknowledgements

Inventory work at Dye Creek Preserve was performed under contract for The Nature Conservancy. The authors would like to thank Andrew Conlin of Natural Resources Conservation Service in Chico for consulting on the availability of calcium at the preserve.

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Appendix A. Lichen species found at The Nature Conservancy-managed Dye Creek Preserve, based on records from the 2015 formal inventory effort, and from the January 2017 annual meeting of the California Lichen Society (see Miller in this issue). Y means that species was found in that year; N means it was not. **Bold** type indicates a cyanolichen.

Reported in 2015	Reported in 2017	Species	Growth Form	Substrate	Calcareous tendency?
Y	N	*Acarospora socialis* H. Magn.	crustose	rock	
N	Y	*Aspicilia* cf. *confusa* Owe-Larsson & A. Nordin	crustose	soil on rock	
Y	N	***Blennothallia crispa*** (Hudson) Otálora, P. M. Jørg. & Wedin	squamulose	calcareous soil	Y
N	Y	*Buellia badia* (Fr.) A. Massal.	squamulose	moss on soil	
N	Y	*Caloplaca demissa* (Körber) Arup & Grube	crustose	rock	
Y	Y	*Candelaria concolor* (Dickson) Stein	foliose	bark	
Y	N	*Candelaria pacifica* M. Westb. & Arup	foliose	bark	
Y	N	*Candelariella citrina* B. de Lesd.	crustose	moss on rock	
Y	Y	*Candelariella rosulans* (Müll. Arg.) Zahlbr.	crustose	rock	
N	Y	*Circinaria contorta* (Hoffm.) A. Nordin, Savić & Tibell	crustose	rock	
Y	N	*Cladonia* cf. *pocillum* (Ach.) O. J. Rich	fruticose	rock	
Y	N	*Cladonia chlorophaea* (Flörke ex Sommerf.) Sprengel	fruticose	bark and moss on rock	
Y	N	*Cladonia ochrochlora* Flörke	fruticose	moss on rock	
Y	N	*Cladonia subfimbriata* Ahti	fruticose	moss on rock	
Y	Y	***Collema furfuraceum*** (Arnold) Du Rietz	foliose	bark	
Y	N	***Collema nigrescens*** (Hudson) DC.	foliose	bark	
N	Y	*Dermatocarpon americanum* Vanio	foliose	rock	
Y	N	*Dermatocarpon bachmannii* Anders	foliose	rock	
Y	Y	*Dermatocarpon reticulatum* H. Magn.	foliose	rock	
Y	Y	*Dermatocarpon taminium* Heiđmarsson	foliose	rock	
Y	N	*Diploschistes diacapsis* (Ach.) Lumbsch	crustose	rock and moss on rock	
Y	N	***Enchylium tenax*** (Sw.) Gray	squamulose	rock	
Y	N	*Endocarpon loscosii* Müll. Arg.	squamulose	Soil and soil on rock	
Y	Y	*Evernia prunastri* (L.) Ach.	foliose	bark	
Y	N	*Flavopunctelia flaventior* (Stirton) Hale	foliose	bark	
Y	N	*Flavopunctelia soredica* (Nyl.) Hale	foliose	bark	
N	Y	***Fuscopannaria mediterranea*** (Tav.) P. M. Jørg.	squamulose	soil on rock	
N	Y	***Fuscopannaria praetermissa*** (Nyl.) P. M. Jørg.	squamulose	soil on rock	
N	Y	***Heppia adglutinata*** (Kremp.) A. Massal.	squamulose	soil	
Y	Y	*Imshaugia aleurites* (Ach.) S. F. Meyer	foliose	bark	

Appendix A. Lichen species found at Dye Creek Preserve (cont.)

Reported in 2015	Reported in 2017	Species	Growth Form	Substrate	Calcareous tendency?
N	Y	*Lepraria neglecta* (Nyl.) Erichsen	crustose	rock, moss on rock, soil on rock	
Y	Y	***Leptochidium albociliatum*** (Desm.) M. Choisy	foliose	bark, moss on rock	
Y	N	***Leptogium milligranum*** Sierk	foliose	bark	
Y	Y	***Leptogium pseudofurfuraceum*** P. M. Jørg. & Wallace	foliose	bark	
Y	Y	***Lichinella cribillifera*** (Nyl.) P. P. Moreno & Egea	squamulose	rock	
Y	N	***Lichinella nigritella*** (Lettau) P. P. Moreno & Egea	squamulose	rock	
Y	Y	***Lichinella robustoides*** Henssen, Büdel & T.H. Nash	fruticose	rock	
N	Y	***Massalongia carnosa*** (Dickson) Körber	squamulose	moss on rock	
Y	Y	*Melanelixia californica* A. Crespo & Divakar	foliose	bark, moss on rock	
Y	N	*Melanelixia subargentifera* (Nyl.) O. Blanco et al.	foliose	bark	
Y	N	*Melanelixia subaurifera* (Nyl.) O. Blanco et al.	foliose	bark	
Y	N	*Melanohalea elegantula* (Zahlbr.) O. Blanco et al.	foliose	bark	
Y	N	*Melanohalea exasperatula* (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch	foliose	bark	
Y	N	*Neofuscelia loxodes* (Nyl.) Essl.	foliose	rock	
Y	N	*Neofuscelia verruculifera* (Nyl.) Essl.	foliose	rock	
Y	N	*Normandina pulchella* (Borrer) Nyl.	squamulose	bark	
Y	N	*Parmelina coleae* Argüello & A. Crespo	foliose	bark	
Y	N	*Peccania subnigra* (B. de Lesd.) Wetmore	squamulose	soil	
Y	N	***Peltigera neopolydactyla*** (Gyelnik) Gyelnik	foliose	moss on rock	
Y	N	***Peltigera polydactylon*** (Necker) Hoffm.	foliose	moss on rock	
Y	N	***Peltigera ponojensis*** Gyelnik	foliose	moss on rock	
Y	Y	***Peltula bolanderi*** (Tuck.) Wetmore	squamulose	rock	
Y	Y	***Peltula euploca*** (Ach.) Poelt ex Ozenda & Clauzade	squamulose	rock	
N	Y	***Peltula patellata*** (Bagl.) Swinscow & Krog	squamulose	calcareous soil	
N	Y	***Peltula zahlbruckneri*** (Hasse) Wetmore	squamulose	rock	
Y	Y	*Phaeophyscia hirsuta* (Mereschk.) Essl.	foliose	bark	
Y	N	*Phaeophyscia orbicularis* (Necker) Moberg	foliose	bark	
Y	N	*Physcia adscendens* (Fr.) H. Olivier	foliose	bark, rock	
Y	N	*Physcia aipolia* (Ehrh. Ex Humb.) Furnr.	foliose	bark	
Y	N	*Physcia biziana* (A. Massal.) Zahlbr.	foliose	bark	

Appendix A. Lichen species found at Dye Creek Preserve (cont.)

Reported in 2015	Reported in 2017	Species	Growth Form	Substrate	Calcareous tendency?
Y	N	*Physcia dimidiata* (Arnold) Nyl.	foliose	bark	
Y	Y	*Physcia phaea* (Tuck.) J. W. Thomson	foliose	rock	
Y	N	*Physcia stellaris* (L.) Nyl.	foliose	bark	
Y	N	*Physcia tenella* (Scop.) DC.	foliose	bark	
Y	Y	*Physcia tribacia* (Ach.) Nyl.	foliose	bark and rock	
Y	Y	*Physconia americana* Essl.	foliose	bark	
Y	N	*Physconia californica* Essl.	foliose	bark	
Y	N	*Physconia enteroxantha* (Nyl.) Poelt	foliose	bark, rock, moss on rock	
Y	N	*Physconia fallax* Essl.	foliose	bark	
Y	N	*Physconia isidiigera* (Zahlbr.) Essl.	foliose	bark	
Y	N	*Physconia muscigena* (Ach.) Poelt	foliose	moss on rock	
Y	Y	*Physconia perisidiosa* (Erichsen) Moberg	foliose	bark	
Y	N	*Placidium imbecillum* (Breuss) Breuss	squamulose	calcareous soil	Y
Y	N	*Placidium squamulosum* (Ach.) Breuss	squamulose	Soil	
Y	Y	*Placynthiella icmalea* (Ach.) Coppins & P. James	squamulose	Soil on rock	
N	Y	*Placynthiella oligotropha* (J. R. Laundon) Coppins & P. James	crustose	Soil and dead organic material	
Y	N	***Placynthium nigrum*** (Hudson) Gray	squamulose	calcareous rock	Y
Y	N	*Polycauliona impolita* (Arup) Arup, Frödén & Søchting	crustose	rock	
Y	N	*Polycauliona polycarpa* (Hoffm.) Frödén, Arup, & Søchting	foliose	bark	
Y	Y	***Polychidium muscicola*** (Sw.) Gray	fruticose	moss on rock	
Y	Y	*Porpidia crustulata* (Ach.) Hertel & Knoph	crustose	rock	
Y	N	*Psora cerebriformis* W. A. Weber	squamulose	calcareous soil	Y
Y	Y	*Psora globifera* (Ach.) A. Massal.	squamulose	Soil on rock	
Y	N	*Psora luridella* (Tuck.) Fink	squamulose	rock, soil on rock	
N	Y	*Psora nipponica* (Zahlbr.) Gotth.	squamulose	soil on rock	
N	Y	*Psora pacifica* Timdal	squamulose	soil on rock	
Y	N	*Ramalina subleptocarpha* Rundel & Bowler	fruticose	bark	
Y	N	*Rhizoplaca glaucophana* (Nyl. ex Hasse) W. A. Weber	foliose	rock	
Y	N	*Rhizoplaca subdiscrepans* (Nyl.) R. Sant.	foliose	rock	
Y	Y	***Scytinium lichenoides*** (L.) Otálora, P. M. Jørg. & Wedin	foliose	bark, rock, moss on rock	

Appendix A. Lichen species found at Dye Creek Preserve (cont.)

Reported in 2015	Reported in 2017	Species	Growth Form	Substrate	Calcareous tendency?
Y	N	***Scytinium palmatum*** (Hudson) Gray	foliose	moss on rock	
N	Y	***Scytinium platynum*** (Tuck.) Otálora, P. M. Jørg. & Wedin	foliose	moss on rock	
Y	N	*Toninia sedifolia* (Scop.) Timdal	squamulose	calcareous soil	Y
Y	Y	*Trapeliopsis glaucopholis* (Nyl. ex Hasse) Printzen & McCune	squamulose	bark, moss on rock, soil on rock	
Y	Y	*Umbilicaria phaea* Tuck.	foliose	rock	
Y	N	*Waynea californica* Moberg	squamulose	bark	
Y	N	*Xanthomendoza fallax* (Hepp ex Arnold) Søchting, Kärnefelt & S. Y. Kondr.	foliose	bark	
Y	N	*Xanthomendoza fulva* (Hoffm.) Søchting, Kärnefelt & S. Y. Kondr.	foliose	bark	
Y	N	*Xanthomendoza hasseana* (Räsänen) Søchting et al.	foliose	bark	
Y	N	*Xanthoparmelia coloradoënsis* (Gyelnik) Hale	foliose	rock	
Y	N	*Xanthoparmelia conspersa* (Ehrh. ex Ach.) Hale	foliose	rock	
Y	N	*Xanthoparmelia cumberlandia* (Gyelnik) Hale	foliose	rock	
Y	N	*Xanthoparmelia hypofusca* (Gyelnik) Hodkinson & Lendemer	foliose	rock	
Y	N	*Xanthoparmelia mexicana* (Gyelnik) Hale	foliose	rock	
Y	N	*Xanthoparmelia planilobata* (Gyelnik) Hale	foliose	rock	

CALS annual meeting report: Dye Creek Preserve

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The California Lichen Society gathered for its annual meeting and field trip at The Nature Conservancy-managed Dye Creek Preserve in Tehama County on January 28, 2017. About 25 intrepid lichenologists attended. A fine time was had by all in the beautiful foothill woodlands, canyons, and buttes of the preserve. Although the lichen community at the preserve appears to be substantially affected by air pollution, we observed a diverse assortment of lichens, in part because of the diversity of habitats that occur there.

The lichenologists set out for a hike into the preserve from the field station mid-morning. The trail first passed through a blue oak woodland with diverse epiphytes in the family Physciaceae, and then crossed Dye Creek, beyond which rose a cluster of outcrops and escarpments. These provided much fodder for the lichen enthusiasts, and several members of the group remained there for the entirety of the day, in true "1 meter per hour" lichenologist form. In addition to the saxicolous lichens, several interesting soil crusts were found among the rocks and patches of club moss.

Those who continued past the outcrop followed the trail through riparian stands of sycamore and then gently uphill along a slope contour north of the creek. Several members of the group stopped for lunch at a high spot with a view of a major fork in Dye Creek. From here, the group split up, with some members heading down to the creek to look for non-lichen organisms (shouts of "It's an evening cloak" thundered up the canyon), and others proceeding up to the top of Campo Seco, the butte above the creek fork.

The lichenologists returned to the field station after the hike, and the CALS Board of Directors held an open meeting, and used the meeting to enact the changes in the board resulting from last fall's general election. Outgoing president Shelly Benson said farewell, while outgoing vice-president Tom Carlberg stepped up to take on the president's duties, and Hanna Mesraty became vice-president. Sarah Minnick is still our secretary, Kathy Faircloth remains treasurer, and

JESSE MILLER

Lichenologists inspect soil and rock lichens among *Selaginella*.

KEN-ICHI UEDA

Hiking

Julene Johnson is now our member-at-large. During this time, others conversed and prepared a potluck dinner.

After dinner, Dr. Daphne Stone gave an engaging presentation on lichens of the oak woodlands of the Willamette Valley. With 30 years of experience, Dr. Stone is widely regarded as one of Oregon's most skilled lichenologists, and she is an instructor for the Northwest Lichenologists' certification exam. No stranger to oak lichens, Daphne wrote her dissertation on lichen succession on oak twigs, and has since worked as a consulting lichenologist. During her presentation, she provided fascinating accounts of many of the smaller macrolichens that often go unnoticed in oak habitats. Updates on taxonomic revisions of *Leptogium* and *Collema* (*sensu latu*), a group with which Dr. Stone has particular expertise, were shared with the group. The scale at which Dr. Stone observes the natural world is perhaps best represented by a statement that drew chuckles from the crowd: "It's not a small lichen, it gets up to a centimeter wide!"

After Daphne's presentation, cake was served to celebrate the 23rd birthday of CALS. After some announcements and discussion much of the group departed, while a few lichenologists remained late into the night, catching up on lichen gossip and discussing such pressing matters as spot tests and survey detectability. Those who spent the night on the preserve were treated to a lovely pink sunrise over the oaks. After a brief morning foray to visit a remnant bunchgrass patch, the remaining lichenologists said their goodbyes.

A 2014 lichen survey on the preserve documented 96 lichen species from 44 genera, some of which represented range extensions of hundreds of miles (see Appendix A, Carlberg et al. in this issue). The CALS foray added 16 additional species to the list: *Aspicilia* cf. *confusa, Buellia badia, Caloplaca demissa, Circinaria contorta, Dermatocarpon americanum, Fuscopannaria mediterranea, Fuscopannaria praetermissa, Heppia adglutinata, Lepraria neglecta, Massalongia carnosa, Peltula patellata, Peltula zahlbruckneri, Placynthiella oligotropha, Psora nipponica, Psora pacifica,* and *Scytinium platynum*.

The numerous substantial range extensions found at the Dye Creek Preserve highlight how little exploration for lichens has occurred in the Lassen Foothills. Despite its proximity to the agricultural Sacramento Valley, the Dye Creek Preserve is a large and wild area with substantial conservation value. The impacts of grazing are evident at the preserve, with annual grasses dominating nearly the entirety of the open spaces. Nonetheless, soil crusts consisting primarily of early successional species (e.g., *Cladonia* squamules) were rather abundant, but only in semi-protected places such as rocky areas. There was much speculation that well-developed terricolous lichen communities likely were abundant here prior to the introduction of domestic livestock.

KEN-ICHI UEDA

Looking down the canyon toward the Sacramento Valley

ROBERT D. FISCHER

Lichenologists assemble before hiking up the canyon.

News and Notes

CALS and Northwest Lichenologists team up at the Northwest Scientific Association conference

Each year the Northwest Lichenologists (NWL) hold their annual meeting in conjunction with the Northwest Scientific Association conference. That means the conference is sure to include at least one session on lichen topics, a lichen workshop, and a lichen field trip. This year's conference was held March 29-April 1 at Southern Oregon University in Ashland, Oregon. Since the location was so close to California, the NWL invited CALS to participate in the event. We rallied enough speakers to have an entire session on northern California lichens—thanks to John Villella for initiating this! CALS also had a display table with information about the society and California's 14 listed rare lichens.

Below is a rundown of the lichen-centric highlights at the conference. You can find the full conference proceedings, including abstracts for contributed papers at: https://www.northwestscience.org/page-1578186

NWL Workshop: *Biodiversity of white oak dwelling lichens and bryophytes*. The lichen portion of the workshop was led by Daphne Stone and Tom Carlberg. Daphne focused on her specialty—the itty bitty non-crustose lichens. Tom covered species in the genus *Physconia*. The bryophyte section was led by Dave Kofranek who highlighted some useful characters for distinguishing difficult species.

Lichen Ecology Session:

Roger Rosentreter: *Site suitability evaluation for translocating the federally endangered lichen,* Cladonia perforata

Ricardo Miranda-Gonzales: *Lichen-invertebrate interactions in tropical dry forests*

Abby L. Glauser: *Biodiversity and floristic patterns of epiphytic macrolichens on* Quercus garryana *in the Cascade-Siskiyou National Monument*

Nils Nelson: *Biodiversity and floristic patterns of epiphytic macrolichens on* Quercus garryana *in the Cascade-Siskiyou National Monument*

Robert J. Smith: *Vulnerability of forest lichen communities to species loss under climatic warming*

Bruce McCune: *Estimating age of rock cairns in southeast Alaska by combining evidence from successional metrics, lichenometry, and carbon dating*

Northern California Lichenology Session:

Steve Sheehy: *Cataloging the lichens of Lava Beds National Monument*

Tom Carlberg: Scytinium singulare, *a new lichen species from coastal California*

Shelly Benson: *Lichens in the mist—investigating California's fog lichens*

Alexander Young: *Zonation of epiphyte dwelling meiofauna in a Douglas-fir forest canopy*

Eric B. Peterson: *Macro-photogrammetry using structure-from-motion (SfM) to capture lichens in high-precision point clouds*

NWL Field Trip: *Lichens & mosses of Sampson Creek Preserve.* Sampson Creek Preserve is a newly established preserve that encompasses 3,000 acres of white oak and black oak woodlands, savannah, chaparral, grassland, conifer forests and riparian habitats just outside of Ashland, Oregon. It is managed to maintain and promote biodiversity in southwestern Oregon. The objective of the field trip was to conduct a baseline inventory of the lichens and bryophytes of the preserve.

SARAH MINNICK

The room is packed with folks interested in lichens during Nils Nelson's talk which was part of the Lichen Ecology Session at the March 2017 Northwest Scientific Association conference in Ashland, Oregon.

SARAH MINNICK

Lichen-lovers unite at the March 2017 Northwest Scientific Association conference in Ashland, OR. From left to right: Bruce McCune, Steve Sheehy, Daphne Stone, Eric Peterson, Tom Carlberg, and Shelly Benson.

Cait Hutnik receives the 2017 *Ramalina menziesii* Award of Excellence:

Beginning in 2014 and each year since, the CALS Board of Directors has recognized one or more members who have given outstanding service to CALS and who are dedicated to advancing the society's mission: to promote the appreciation, conservation, and study of California lichens. This January, at the annual meeting, the board announced Cait Hutnik as the 2017 recipient of the *Ramalina menziesii* Award of Excellence.

Cait Hutnik is a photographer, naturalist, and docent with the Santa Clara County Parks. She got hooked on lichens during the winter of 2013—the first year of the recent drought. Due to the dearth of mushrooms to photograph, Cait turned her eye toward lichens. She was immediately enthralled by them and read all the lichen-related material she could get her hands on. She admits that she turned into a lichen evangelist with a passion for spreading the word about lichens. Cait combined photography with her new-found knowledge about lichens to create an informative lichen pamphlet. That same winter, she led her first lichen discovery walk for the county parks and used her lichen pamphlet to convert park visitors into budding lichenologists. Since then, she has offered a series of three lichen discovery walks every year.

CAIT HUTNIK

2017 *Ramalina menziesii* Award recipient, Cait Hutnik

New members-at-large appointed to the California Lichen Society Board of Directors

The CALS Board of Directors appoints up to seven members-at-large to act as full voting members of the board. A member-at-large has a responsibility to ensure the mission and success of the society just as an elected officer does. CALS is lucky to have two new members-at-large. If you are interested in future opportunities to serve in this capacity, please contact the current president at president@californialichens.org.

Ken Kellman

I grew up on Long Island, NY. After a couple years in Boston, I moved to New Hampshire. I studied botany at the University of New Hampshire for a year and a half, but never graduated. I moved to California in 1978 where I continued studying vascular plants.

I was first introduced to lichens in a Jepson class taught by Dr. Tom Nash in 1995. Around the same time I was introduced to bryophytes, and I have spent the last 20+ years studying them almost exclusively. It was only last year that I decided to return to lichens. I am currently collecting lichens from the central coast with an eye to learning that flora.

I am now retired from a career including carpentry and commercial heating and air conditioning. As a volunteer, I curate bryophytes and lichens at UC Santa Cruz's Norris Center for Natural History.

UNKNOWN

Member-at-Large, Ken Kellman

Julene "JJ" Johnson

I serendipitously discovered my lichen bug during a 2014 BioBlitz at Muir Woods National Monument. I remember picking up a piece of *Hypogymnia heterophylla*, admiring its beauty and having no idea what it was. For some reason, I never paid much attention to lichens during my many years of hiking, backpacking, and taking pictures of nature. As fate has it (as it always does), the more I looked, the more I saw. As a result, I posted more and more lichens on iNaturalist.org, which served as a wonderful platform for me to learn about lichens. Next I discovered Sharnoff's *A Field Guide to California Lichens* and a 10x hand lens. There's a whole other world down there! My weekends these days are often spent exploring the many natural areas in northern California and hunting for lichens. I joined CALS in 2014 and appreciated getting information about lichen classes and hikes and reading the *Bulletin*. Serving on the board is one way of giving back for all the lichen mentorship I've received. For my day job, I'm a professor and cognitive neuroscientist at the University of California, San Francisco; I study human cognitive aging. I also have an interest in the history of science and have been looking into the history of California lichenology.

DONALD DABDUB

Member-at-Large, Julene "JJ" Johnson

Upcoming Events

Eagle Hill Institute lichenology seminars in 2017
The Eagle Hill Institute is located on the eastern coast of Maine and is perhaps best known for the advanced natural history science seminars and scientific illustration workshops it has offered since 1987. The institute also offers great lichenology courses. Here's a list of the 2017 classes.

May 21-27 *Crustose lichens of the Acadian forest*
Instructor: Stephen Clayden

Jun 4-10 *Undergraduate field studies: introduction to bryophytes and lichens*
Instructor: Fred Olday

Jul 2-8 *Lichens and lichen ecology*
Instructors: David Richardson and Mark Seaward

Jul 23-19 *Lichens, biofilms, and stone*
Instructors: Judy Jacob and Michaela Schmull

Aug 6-12 *Independent studies: interesting and challenging saxicolous lichens of North America*
Instructor: Alan Fryday

For more information on classes and to register, visit the Eagle Hill website:
https://eaglehill.us/programs/nhs/nhs-calendar.shtml

EAGLE HILL INSTITUTE

Introduction to lichen identification
Instructor: Shelly Benson
Date: October 28, 2017, 9:00 AM to 3:00 PM
Location: Pepperwood Preserve, Santa Rosa CA
Fee: $30
Registration: register through Pepperwood Preserve https://www.pepperwoodpreserve.org/get-involved/classes-events/

Description: In this introductory class you will learn the basics of lichen biology and ecology. We will focus on recognizing the various lichen structures that are used in identification. We will use dichotomous keys, chemical spot tests, and dissecting microscopes to identify lichens to the genus-level. The workshop structure includes a classroom lecture, a short field trip, and lab time to identify lichens. Bring a hand lens, bring a lunch, and if you have any unidentified lichens—bring them too!

Instructor bio: Shelly Benson is the former president of the California Lichen Society and has been studying lichens from British Columbia, Canada to California for the past 18 years. She finds lichens incredibly fascinating and diverse. She started teaching in order to spread the word about these amazing organisms. Her current interest is in using lichens as indicators of air quality and climate change.

Recurring Workshop

Tilden Regional Parks Botanic Garden Lichen Identification Workshop
Instructors: Irene Winston and Bill Hill
Date: 2nd Saturday of each month, 1:30 PM - 4:30 PM
Location: Junction of Wildcat Canyon Rd. and S. Park Dr., Berkeley, CA
Registration: Please RSVP to Irene Winston if you are planning to attend: irene@californialichens.org or 510-548-6734
Description: We often check some lichens in the garden and then do some keying and discuss lichen topics of interest. If you would like to have a particular topic covered, please let us know.

California Lichen Society Grants Program

The California Lichen Society offers small grants to support research pertaining to the lichens of California. No geographical constraints are placed on grantees or their associated institutions, but grantees must be members in good standing of the California Lichen Society. The grants committee administers the grants program, with grants awarded to an individual only once during the duration of a project. Grant proposals should be brief and concise.

Grant applicants should submit a proposal containing the following information:

- Title of the project, applicant's name, address, phone number, email address, and the date submitted.
- Estimated time frame for project.
- Description of the project. Outline the purposes, objectives, hypotheses where appropriate, and methods of data collection and analysis. Highlight aspects of the work that you believe are particularly important and creative. Discuss how the project will advance knowledge of California lichens.
- Description of the final product. We ask you to submit an article to the *Bulletin of the California Lichen Society*, based on the results of your work.
- Budget. Summarize intended use of funds. If you received or expect to receive other grants or material support, show how these fit into the overall budget. The following list gives examples of the kinds of things for which grant funds may be used if appropriate to the objectives of the project: expendable supplies, transportation, equipment rental or purchase of inexpensive equipment, laboratory services, salaries, and living expenses. CALS does not approve grants for outright purchase of capital equipment or high-end items such as computers, software, machinery, or for clothing.
- Academic status (if any). State whether you are a graduate student or an undergraduate student. CALS grants are also available to non-students conducting research on California lichens. CALS grants are available to individuals only and will not be issued to institutions.
- Letter of support. One letter of support from a sponsor, such as an academic supervisor, major professor, professional associate or colleague should accompany your application.
- Your signature, as the person performing the project and the one responsible for dispersing the funds. All of the information related to your application may be submitted electronically.

Review: Members of the grants committee conduct anonymous evaluation of grant proposals once a year based on completeness, technical quality, consistency with CALS goals, intended use of funds, and likelihood of completion. Grant proposals received by October 1 each year will be considered for that year's grant cycle. The grants committee brings its recommendations for funding to the California Lichen Society Board of Directors, and the board makes the final decision regarding awards.

Grant Amounts: CALS typically offers two grants each year in the denominations of $750.00 and $1000.00. Usually, the grants are awarded to separate applicants; however, on occasion, the sum of both grants may be awarded to a single applicant. All grants are partially dependent on member contributions; therefore, the amounts of these awards may vary from year to year. Contact the grants committee chair for an estimate of the available funding for a given year.

Obligations of recipients: 1) Acknowledge the California Lichen Society in any reports, publications, or other products resulting from the work supported by CALS, 2) submit an article to the *Bulletin of the California Lichen Society*, 3) submit any relevant rare lichen data to California Natural Diversity Data Base using NDDB's field survey forms (see www.californialichens.org/conservation for additional information).

How to submit an application: Please email submissions or questions to the grants committee chair at grants@californialichens.org by **October 1 of the current calendar year.** The current chair is Tom Carlberg.

President's Message

Dear CALS members - I have to tell you what a pleasure it's been to see how the annual meetings have been ranging further afield. We used Janet Doell's condominium for nearly 20 years. Since then we have been hosted at the Bouverie Preserve in Sonoma County, Edgewood Preserve in San Mateo County, UC Santa Barbara's Sedgwick Reserve in Santa Barbara County, and a few months ago we were fortunate enough to visit The Nature Conservancy-managed Dye Creek Preserve in Tehama County. Andrea Craig, manager of the preserve, offered us full use of the field station for a couple days; I am grateful to her and to Scott Hardage, the stewardship specialist at the preserve, who took care of all of our logistical needs. Many thanks, Andrea and Scott!

We (you, the members who attended!) added sixteen species to the preserve's lichen species list of 96 species; they now know of 112 lichens, many of which appear to be extensive range extensions, and the crustose lichens still need an in-depth look. See the two articles about Dye Creek in this issue. There is also an iNaturalist "Place" for Dye Creek Preserve (*www.inaturalist.org/places/gray-davis-dye-creek-preserve*); please visit and see photos of some of the very unusual lichens that have come to light there.

During Saturday's activities at Dye Creek Preserve, we held an open meeting of the CALS Board of Directors, during which we enacted the changes resulting from last fall's general election of officers. Outgoing president, Shelly Benson, made her farewells, and two continuing board members changed their positions; I am your new president, and Hanna Mesraty has moved into the vice-president's slot. Kathy Faircloth remains our treasurer, and Sarah Minnick is still secretary. We were very pleased to offer a member-at-large position to Julene Johnson, and even more pleased when she accepted. Julene is a neuroscientist at University of California at San Francisco, and also serves on the CALS Grants Committee. She is an avid iNaturalist and takes wonderful photographs, mostly of lichens, although an occasional plant photo has been known to creep in. Thirty-eight percent of you voted in that election!

Officers were not the only thing that our membership voted on last fall. You also were presented with a significant revision of the bylaws under which the California Lichen Society operates. The previous bylaws, which dated back to sometime in 1994, did not address certain significant concerns, and the board spent a large part of our meetings during 2016 discussing and refining the current bylaws, which came into effect shortly after the annual meeting.

One of the provisions of the new bylaws allows us to add additional members-at-large to the board, and after a short discussion we asked Ken Kellman if he would accept one of those positions. He agreed, and we now have six members on the board. You may already know Ken as an accomplished bryologist, after whom the rare moss *Orthotricum kellmanii* is named. He seems now to have decided to dive headlong into lichens that require extensive microscopy; to misquote James Lendemer of the New York Botanic Garden, "starting with *crusts* was a bad idea." Ken also has a strong presence on iNaturalist.

For those of you in the Bay Area, Irene Winston continues to hold regular lichen workshops at the Regional Parks Botanic Garden Visitor Center, with the able assistance of Bill Hill. They meet regularly near the beginning of each month, and are gradually compiling a list of the lichens present in the garden. Join them!

This issue of the *Bulletin* highlights the work of three individuals who have received grants through CALS. Steve Sheehy has been working on the lichens of Lava Beds National Monument for at least four years. The monument had 19 lichens on their species list in 2012, when Steve started; they now have 196! Steve was new to lichenology when he started; he probably isn't any more. Enjoy his story; you've seen part of it in a previous issue.

CALS funded an artist in 2014. Lish Dawn has an interest in lichens that are impacted by human activities; she considers the presence of certain lichens to be "a recognition of our doing as well as the nature of our mortality." She works in intaglio (copper plate etching), her lichen of choice is *Xanthoria parietina*.

Miko Nadel is the first CALS grant recipient who worked far from California. He worked on the notoriously difficult genus *Usnea* on the islands of São Tomé and Príncipe, off the coast of equatorial Africa. One of his primary conclusions has to do with the accuracy of historical identifications when dealing with cryptic character sets, a concept that applies just as much to California lichens as to those in any other part of the world.

I think that's enough news for now.
Happy lichenizing!

Tom Carlberg
President@californialichens.org

LAWRENCE JANEWAY

At Valley Creek Botanical Special Interest Area, Plumas National Forest.

California Lichen Society

PO Box 472, Fairfax, California 94978

The California Lichen Society (CALS) seeks to promote the appreciation, conservation, and study of lichens. The interests of the Society include the entire western part of the continent, although the focus is on California.

Members receive the *Bulletin of the California Lichen Society* (print and/or online access), voter rights in society elections, access to the CALS community, and notices of meetings, field trips, lectures, and workshops.

Membership Dues (in $US per year)
Student and fixed income (online eBulletin only) - $10
Regular - $20 ($25 for foreign members)
Family - $25
Sponsor and Libraries - $35
Donor - $50
Benefactor - $100
Life Members - $500 (one time)

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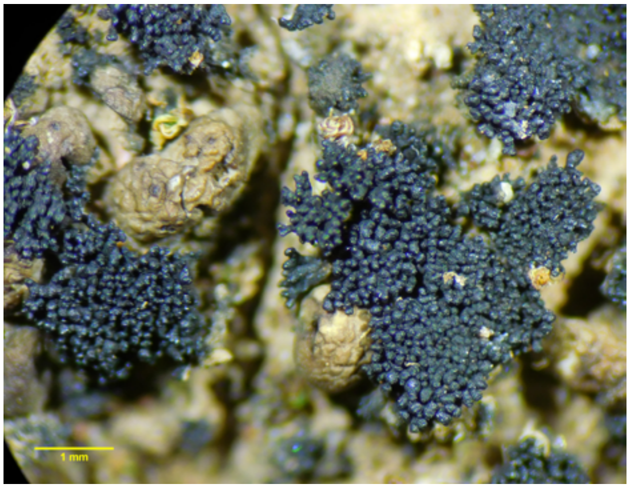
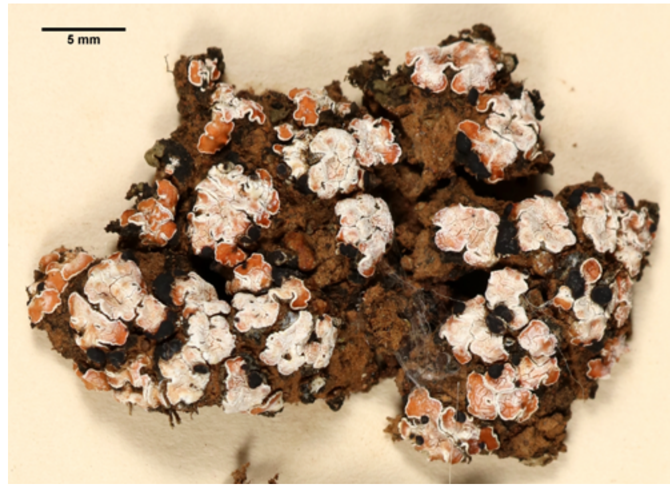
Significant species from the macrolichen inventory of Dye Creek Preserve

Los Molinos, California, November 2015

For more information and additional species of significance, see article by Carlberg et al. on page 22 of this issue. All photos by Tom Carlberg.



Peccania subnigra.

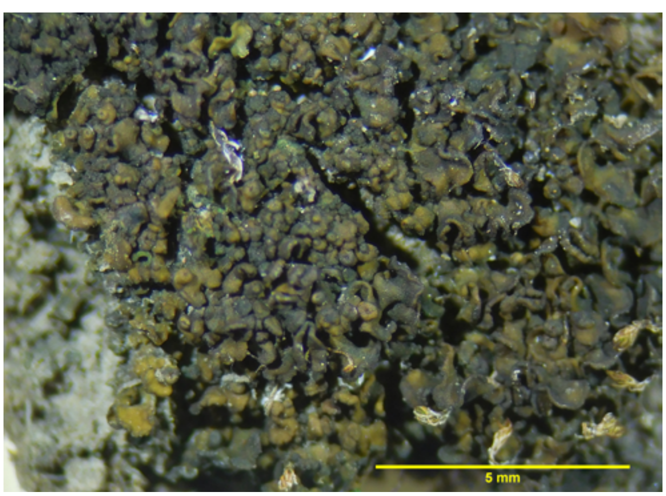


Psora cerebriformis.

Rhizoplaca glaucophana above Mill Creek.

Placynthium nigrum.

Leptogium milligranum. Lobes that branch and fuse together are a characteristic of this lichen.



Blennothallia crispa (=*Collema crispum*).

Dermatocarpon bachmannii