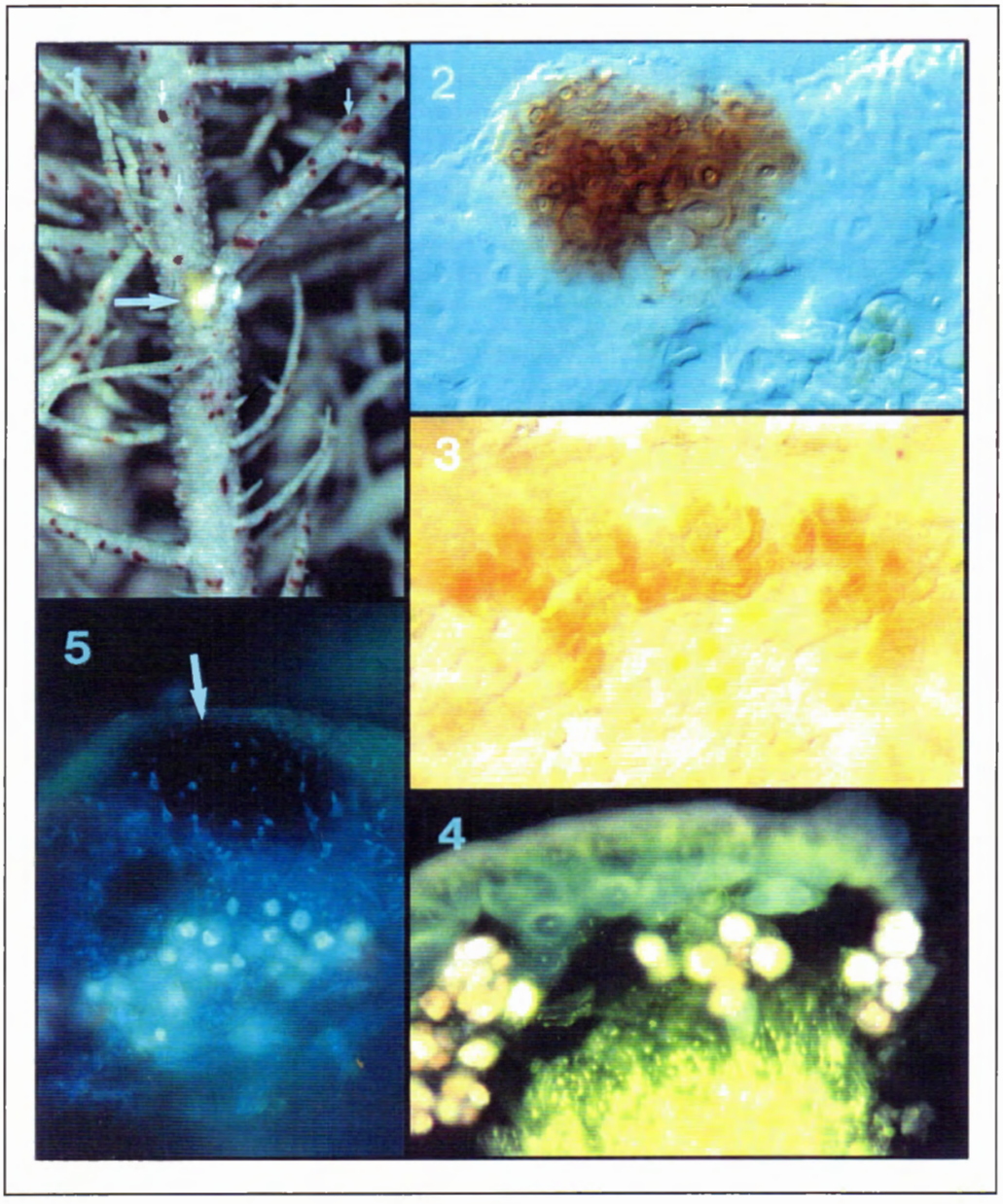
Bulletin of the

California Lichen Society



Volume 5 No. 1 Summer 1998

The California Lichen Society seeks to promote the appreciation, conservation, and study of the lichens. The focus of the Society is on California, but its interests include the entire western part of the continent. Dues are $15 per year ($20 for foreign subscribers) payable to The California Lichen Society, 362 Scenic Avenue, Santa Rosa, CA, 95407. Members receive the *Bulletin* and notices of meetings, field trips, and workshops.

The Bulletin of the California Lichen Society (ISSN 1093-9148) is edited by Isabelle Tavares, Shirley Tucker, William Sanders, Richard Moe, and Darrell Wright and is produced by Richard Moe. The *Bulletin* welcomes manuscripts on technical topics in lichenology relating to western North America and on conservation of the lichens, as well as news of lichenologists and their activities. Manuscripts may be submitted to Richard Moe, Bulletin of the California Lichen Society, University Herbarium, 1001 Valley Life Sciences Bldg. #2465, University of California, Berkeley, CA 94720-2465. The best way to submit manuscripts apart from short articles and announcements is by E-mail or on diskette in Word Perfect or Microsoft Word format; ASCII format is a very good alternative. Manuscripts should be double-spaced. Figures are the usual line drawings and sharp black and white glossy photos, unmounted, and must be sent by surface mail. A review process is followed. Nomenclature follows Esslinger and Egan's Sixth Checklist (The Bryologist 98: 467–549, 1995), and subsequent on-line updates http://www.ndsu.nodak.edu/instruct/chcklst/chcklst7.htm. The editors may substitute abbreviations of author's names, as appropriate, from R.K. Brummitt and C.E. Powell, *Authors of Plant Names*, Royal Botanic Gardens, Kew, 1992. Style follows this issue. Reprints will be provided for a nominal charge. The *Bulletin* has a World Wide Web site at the URL http://ucjeps.herb.berkeley.edu/rlmoe/cals.html.

Volume 5(1) of the *Bulletin* was issued August 20, 1998.

Cover: Figures accompanying "The red spots of *Usnea wirthii*", by W.B. Sanders, on p. 19

1. *Usnea wirthii*. 10x; detail of thallus, showing red spots on cortex (vertical arrows). Yellow pigment on surface of cord also visible where cortex has been severed (horizontal arrow).
2. *U. wirthii*. 400x; cross section through cortex, detail, with red spot.
3. *Usnea rubicunda*. 400x; Cross section through cortex.
4. *U. wirthii*. 400x; cross section through cortex, with uv epifluorescence.
5. *U. wirthii*. 320x; cross section through cortex, detail, showing appearance of red spot (arrow) with uv epifluorescence.

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Key to Crustose Lichen Genera of California

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The keys are modified from an unpublished manuscript prepared by Harry Thiers. Additional information was gathered from Purvis et al. (1995), Sonoran keys (unpubl.) by B. Ryan and T.H. Nash, and Fink (1935). Some genera are in more than one key. Fifty other genera, not mentioned in the keys, occur in California but are infrequently collected. The number of species in California is provided in the keys; most are listed in Tucker and Jordan (1979), but not necessarily under the same name. Currently accepted lichen names are to be found in Esslinger and Egan (1995). Index to genera covered is at end, on p. 11.

1. Lichen bearing noticeable fruiting bodies . . . . . 2 (5 choices)
1. Lichen sterile or with inconspicuous, sunken perithecia 4

2. Fruiting body a mazaedium (circular, flat open center, black-powdery to the touch, raised on a stalk of varying height; no hymenium) . . Key A
2. Fruiting body mushroom-like (basidiomycetous lichen) . . . . . *Omphalina* (2 spp.)
2. Fruiting body a lirella (elongate, narrow, round, branched, or irregular in outline) (this and subsequent entries are ascomycetous lichens) . Key B
2. Fruiting body a perithecium (conical or mound-shaped with a tiny opening or ostiole; internally the globose cavity is lined with a hymenium) . . . . . Key C (see also key G)
2. Fruiting body an apothecium (circular, with open disk, not conspicuously stalked or powdery to the touch); hymenium occupying relatively flat disk 3

3. Apothecium lecanorine (has a concolorous or light-colored exciple or rim, a thalline margin, contrasting with the disk in color; section shows algae in exciple) . . . . . Key D
3. Apothecium lecideine (exciple or rim the same color as disk; section shows no algae in exciple) . . . . . Key E

4. Crustose . . . . . Key F
4. Squamulose . . . . . Key G

KEY A. CRUSTOSE LICHENS WITH MAZAEDIAL FRUITING BODIES

1. Ascocarps stalked 2
1. Ascocarps sessile (not stalked, but may be raised in warts) 3

2. Spores non-septate 4
2. Spores septate 5

3. Spores brown, 1-septate; apothecia sessile or immersed, with dark lateral exciple 6
3. Spores brown, non-septate to 1-septate; apothecia on raised warts; thin, hyaline lateral exciple . . . . . *Thelomma* (6 spp.)

4. Mazaedium yellow; spores hyaline (colorless) . . *Chaenotheca furfuracea* (L.) Tibell (9 spp.; Syn.: *Coniocybe f.*)
4. Mazaedium brown; spores ovoid to ellipsoid . 7

5. Ascocarp with small, punctiform disk; spores brown, 3–7-septate . . . . . *Stenocybe* (2 spp.)
5. Ascocarp with open disk; spores brown, 1-septate . . . . . *Calicium* (8 spp.)

6. Outer spore wall blistered, covered with a cellular layer from surrounding paraphyses, obscuring its two-celled nature; rare . . . . . *Texosporium sancti-jacobi* (Tuck.) Nádv.
6. Spore wall not so blistered . *Cyphelium* (9 spp.)

7. Well-developed thallus, often granulose . . . . . *Chaenotheca* (9 spp.)
7. Thallus usually inconspicuous, often within the substrate, non-lichenized, saprophytic . . . . . *Mycocalicium* (3 spp.)

Note: several additional genera belong in this section and occur in California: *Microcalicium* (green spore mass; 2 spp.), *Phaeocalicium* (spores brown, unicellular or 1-septate, not forming a spore mass; 2 spp.), *Sphinctrina* (spores brown, unicellular, with thick wall and gelatinous coat, tardily forming a spore mass; 4 spp.)

KEY B. CRUST WITH LIRELLINE ASCOCARPS

1. Paraphyses unbranched, parallel, and distinct 2
1. Paraphyses branched and interwoven 3

2. Spores non-septate . . . . . *Xylographa* (3 spp.)
2. Spores transversely septate or muriform 4

3. Spores muriform . . . . . *Arthothelium* (10 spp.)
3. Spores transversely septate 6

4. Spores transversely septate 5
4. Spores muriform, spores hyaline at maturity . . . *Graphina parilis* (Kremp.) Müll. Arg.; two other species have been found in northern California

5. Spores 2-celled, cells cylindrical . . . . . *Melaspilea constrictella* (Stirton) A.L. Sm.
5. Spores 4-celled or more 9

6. Several ascocarps embedded in a stroma . . . 7
6. Ascocarps not in a stroma 8

7. Spores hyaline . . . . . *Chiodecton* (2 spp.)
7. Spores brown . . . . . *Sclerophyton* (2 spp.)

8. Exciple tissue present around hymenium, carbonaceous, black and opaque . *Opegrapha* (15 spp.)
8. Exciple lacking or rudimentary; asci pear-shaped, among bark cells; no well developed hymenium or paraphyses . . . . . *Arthonia* (35 spp.)

9. Spores hyaline at maturity 10
9. Spores brown at maturity *Phaeographis* (3 spp.)

10. Lirellae elongate, often branched; thalline margin thin and inconspicuous . . . . . *Graphis* (5 spp.)
10. Lirellae round, irregular, or slightly elongate; thalline margin conspicuous; on seacoast 11

11. Thallus gray to whitish gray 12
11. Thallus brownish; cortical hyphae intertwined . . . . . *Roccellina conformis* Tehler

12. Thallus whitish gray; cortical hyphae perpendicular to surface . . . . . *Dirina catalinariae* Hasse
12. Thallus gray; cortical hyphae intertwined . . . . . *Roccellina franciscana* (Zahlbr. ex Herre) Follmann

KEY C. CRUST WITH PERITHECIAL ASCOCARPS

1. Thallus squamulose or umbilicate, gray or brown, on soil . . . . . 2 (see also key G)
1. Thallus crustose 4

2. Spores non-septate . . . *Dermatocarpon* (7 spp.)
2. Spores transversely septate or muriform 3

3. Spores transversely septate . . . . . *Heterocarpon ochroleucum* (Tuck.) Müll. Arg. (Fungus growing on lichen as lectotypified by H. Harada, Systema Ascomycetum 10 [1]: 1–6. 1991).
3. Spores muriform; hymenial algae in perithecium . . . . . *Endocarpon* (9 spp.)

4. Perithecia clustered, separated only by partitions; opening through irregular pores; spores transversely 1–3-septate . . . . . *Mycoporum californicum* (Zahlbr.) R.C. Harris (Syn.: *Tomasellia californica* (Zahlbr.) R.C. Harris) and *M. lacteum* (Ach.) R.C. Harris (Syn.: *Tomasellia lactea* (Ach.) R.C. Harris)
4. Perithecia separate, opening through round pores 5

5. Algal symbiont blue-green 6
5. Algal symbiont green 7

6. Marine, often on attached mollusc shells and barnacle tests . . . . . *Pyrenocollema halodytes* (Nyl.) R.C. Harris
6. Terrestrial on rock *Hassea bacillosa* (Nyl.) Zahlbr.

7. Algal symbiont grass-green (*Trebouxia* or other genus, but not *Trentepohlia*), yellow-green (Xanthophyte), or brown 8
7. Algal symbiont yellow-green, or golden brown (*Trentepohlia*) 18

8. Paraphyses indistinct, disappearing 9
8. Paraphyses, distinct, persistent 15

9. Many small spores per ascus 10
9. Spores 8 or fewer per ascus 11

10. Asci soon disintegrating; ascocarp partly immersed . . . . . *Trimmatothele umbellulariae* Herre
10. Ascocarp persistent, entirely covered by a thalline layer except for pore *Thelocarpon hassei* de Lesd.

11. Spores non-septate, hyaline, often with granular contents . . . . . *Verrucaria* (23 spp.)
11. Spores transversely septate or muriform . . . 12

12. Spores transversely septate . *Thelidium* (2 spp.)
12. Spores muriform 13

13. Algal cells present in hymenium . . . . . *Staurothele* (7 spp.)
13. Algal cells lacking in hymenium 14

14. On rock; spores hyaline to pale brownish . . . . . *Polyblastia* (2 spp.)
14. On bark; spores brown . . . . . *Pyrenula pyrenuloides* (Mont.) R.C. Harris, *P. thelomorpha* Tuck.

15. Paraphyses much-branched and anastomosing; ascocarp often with nearly closed opening, resembling a perithecium; ascocarp often immersed in wart; spores often large and thick-walled . . . . . *Pertusaria* (17 spp.)
15. Paraphyses with few branches, if any (except in *Thelenella*) 16

16. Ascus containing many tiny spores . . . . . *Thelocarpon hassei* de Lesd. (See also Key D 15)
16. Spores usually 8 per ascus, or if ascus multispored, spores are large 17

17. Spores non-septate . . . . . *Thrombium* (2 spp.)
17. Spores muriform, hyaline . . . *Thelenella* (6 spp.; Syn.: *Microglaena*, *Polyblastiopsis*)

(Photobiont *Trentepohlia*:)
18. Spores 1-septate, many per ascus . . . . . *Thelopsis isiaca* Stizenb.
18. Spores with 1 or more septa, usually 8 per ascus 19

19. Paraphyses branched or not, but interwoven; spores hyaline or brown, transversely septate 20
19. Paraphyses unbranched, straight, distinct ; spores transversely septate, hyaline or brown 22

20. Spores hyaline; white or gray crust on bark 21
20. Spores brown; a saprophyte, growing on other lichens . . . . . *Kirschsteiniothelia aethiops* (Berk. & Curt.) D. Hawksw.

21. Common; two cells of spore often unequal in size . . . . *Anisomeridium biforme* (Borrer) R.C. Harris
21. Less common; cells of spore equal in size . . . . . *Arthopyrenia* (6 spp.)

22. Spores hyaline 23
22. Spores brown . . . . . *Pyrenula* (5 spp.)

23. Perithecial wall black or dark brown; asci with thick apical domes . . . . . *Strigula stigmatella* (Ach.) R.C. Harris
23. Perithecial wall some other color 24

24. Perithecial wall may contain yellow pigments . . . . . *Porina* (4 spp.)
24. Perithecial wall may contain violet pigments; ascus wall thin, with apical chitinized ring . . . . . *Pseudosagedia* (3 spp.)

KEY D. CRUSTS WITH LECANORINE APOTHECIA

1. Algal symbiont blue-green 2
1. Algal symbiont green (but see also 13; blue-green algae may be associated with *Schismatomma* and *Roccellina*) 4

2. Thallus squamulose, peltate, or umbilicate . . . 3
2. Thallus crustose; ascus thin-walled, with 8 hyaline, non-septate spores . . . . . *Psorotichia* (4 spp.) (For *Pyrenopsis*, see E 6)

3. Many spores per ascus . . . . . *Peltula* (8 spp.)
3. Eight spores per ascus . . . . . *Heppia* (3 spp.)

4. Algal symbiont *Trentepohlia* (yellow-green, or golden brown) 5
4. Algal symbiont *Trebouxia* (grass-green) 14

5. Spores muriform; ascocarp low-conical or doughnut-shaped . . . . . *Thelotrema* (2 spp.)
5. Spores transversely septate only 6

6. Spores brown . . . *Thelotrema californicum* Tuck.
6. Spores hyaline 7

7. Paraphyses small, branched and contorted; apothecia usually gray, white, brown, or black 8
7. Paraphyses unbranched; apothecium yellow or orange . . . . . *Dimerella* (2 spp.)

8. On soil; thick thallus . . . *Roccellina franciscana* (Zahlbr. ex Herre) Follmann
8. On bark; thallus variable in thickness 9

9. Apothecia usually pruinose 10
9. Apothecia not usually pruinose 13

10. Spores 25 µm long or less 11
10. Spores mostly over 25 µm long 12

11. Apothecia usually circular, 0.5–1.0 mm in diameter, with well developed thalline margin; spores 15–24 μm long, 3-septate . . . . . *Sigridea californica* (Tuck.) Tehler
11. Apothecia circular, irregular, or elongated, 0.3–0.8 mm in diameter; apothecial margin not lecanorine; spores 20–25 μm long, 3–9-septate . . . . . *Schismatomma rediunta* (Hasse) Tehler

12. Apothecia circular to irregular, to 1.5 mm in diameter, margin often convoluted; spores 25–30 μm long, 7-septate . . . . . *Lecanographa hypothallina* (Zahlbr.) Egea & Torrente
12. Apothecia circular to irregular, 0.6–2.0 mm in diameter, spores 30–42 μm long, 3-septate . . . . . *Lecanactis abietina* (Ach.) Körber

13. Thallus thick, often with black hypothallus; apothecia 0.5–2.0 mm in diameter; spores 40–50 μm long, 7–13-septate . . . . . *Schismatomma pluriloculare* Zahlbr.
13. Thallus thick, conspicuous round to lobed apothecia . . . . . *Roccellina conformis* Tehler

14. Ascus with many tiny spores 15
14. Ascus with 8 spores, rarely 16 . 19 (4 choices)

15. Apothecium resembling a perithecium, minute, globose, covered by a thin thalline margin except for a small pore; thallus of dispersed yellow areoles *Thelocarpon hassei* de Lesd. (See also Key C 16)
15. Apothecia disk-like, immersed or not; thallus crustose or squamulose, grayish, brownish, or yellowish 16

16. Thallus crustose; spores 1- or 2-celled; apothecia adnate or sessile *Maronea constans* (Nyl.) Hepp
16. Thallus crustose, minutely lobed, or squamulose; spores unicellular 17

17. Thallus umbilicate, somewhat lobed at margin, whitish; apothecia compound . . . . . *Glypholecia scabra* (Pers.) Müll. Arg.
17. Thallus areolate, not umbilicate, yellow or brownish 18

18. Thallus yellow or brownish, adnate; paraplectenchymatous cortex; simple ascus wall . . . . . *Acarospora* (37 spp.)
18. Thallus yellow, adnate, with lobed margin; cortex prosenchymatous; ascus apex with ocular chamber, I+ blue interior area . *Pleopsidium* (2 spp.)

19. Spores polarilocular 20
19. Spores muriform 25
19. Spores unicellular 26
19. Spores transversely septate 43

20. Spores brown 21
20. Spores hyaline . . . . . *Caloplaca* (67 spp.)

21. Non-lichenized; thallus of isodiametric cells, ascolocular apothecia; rare . . . . . *Lichenothelia scopularia* (Nyl.) D. Hawksw.
21. Lichenized; crustose thallus of differing-sized cells 22

22. Thallus with lobes 23
22. Thallus lacking lobes 24

23. Thallus with radiate, plicate lobed margins . . . . . *Dimelaena* (4 spp.)
23. Effigurate crust with irregular lobate marginal squamules; brown rhizohyphae below . . . . . *Phaeorrhiza sareptana* (Tomin) H. Mayrh. & Poelt

24. Thin, inconspicuous crust, not inflated, greenish to brown . . . . . *Rinodina* (30 spp.)
24. Crust with more or less inflated, convex areoles . . . . . *Mobergia* (2 spp.)

25. Spores hyaline . . . . . *Phlyctis* (2 spp.)
25. Spores brown . . . . . *Diploschistes* (7 spp.)

26. Paraphyses branched and fusing, netlike . . . . . 27 (3 choices)
26. Paraphyses unbranched, straight, distinct . . . 28

27. Hymenium open and exposed, often pinkish orange; no soraliate warts or cephalodia; large spores with thick, uniform walls; common, on bark or rock . . . . . *Ochrolechia* (14 spp.)
27. Hymenium usually immersed in warts, often resemble perithecia; spores large, thick-walled; spores 2, 4, or 8 per ascus . . . . . *Pertusaria* (17 spp.)
27. Soraliate warts with cephalodia; on rock, rare . . . . *Coccotrema pocillarium* (Cummings) Brodo

28. Thallus yellow to yellow-orange; spores simple or 1-septate 29
28. Thallus not yellow 30

29. Thallus and hymenium K– . *Candelariella* (7 spp.)
29. Hymenium strongly K+ purple . . . . . *Fulgensia fulgens* (Sw.) Elenkin

30. Thallus with lobed, subfoliose margin closely appressed to substrate; cephalodia and soredia present on upper surface; apothecia pinkish . . . . . *Placopsis gelida* (L.) Lindsay
30. Thallus usually not lobed; if lobed, cephalodia lacking 31

31. Apothecia adnate to sessile, not usually immersed 32
31. Apothecia usually immersed in thallus areoles 40

32. Thallus subfruticose 33
32. Thallus crustose, not subfruticose 34

33. Thallus has dense medulla with algae scattered in clumps . . *Cladidium bolanderi* (Tuck.) B.D. Ryan
33. Thallus has algae in a definite layer; medulla loose . . . . . *Lecanora* in part

34. Crust lobed or umbilicate 35
34. Crust not lobed, or if margin lobed, yellow in color 37

35. Crust lobed, colony removeable as a whole . 36
35. Crust umbilicate . . . . . *Rhizoplaca* (6 species)

36. Sunken apothecia . . . . . *Lobothallia* (3 spp.)
36. Apothecia usually adnate or sessile . . . . . *Lecanora*: *Placodium* group

37. Yellow areolate crust . . . . *Pleopsidium* (2 spp.)
37. Crust not yellow 38

38. Spores with halo; on rock . . *Bellemerea* (2 spp.)
38. Spores lacking halo; various substrates . . . . . 39 (3 choices)

39. Apothecia of various colors including black; hypothecium colorless; paraphyses usually simple, septate, each with a swollen cap; very common . . . . . *Lecanora* (71 spp.)
39. Apothecia large with black disk, thalline margin prominent or lacking; purple to green epithecium, ochraceous hypothecium; paraphyses swell strongly in water; occasional . . . *Tephromela* (3 spp.)
39. Crust some shade of brown; ascospores narrow; caps of paraphyses are swollen and brown; rare . . . . . *Protoparmelia* (3 spp.)

40. Spores over 30 µm long, thallus pale, warty; disk black . . . . . *Megaspora verrucosa* (Ach.) Hafellner & V. Wirth
40. Spores smaller than 30 µm long 41

41. Spores with halo . . . . . *Bellemerea* (2 spp.)
41. Spores lacking halo 42

42. Crust not usually lobed . . . . *Aspicilia* (16 spp.)
42. Crust usually lobed . . . . . *Lobothallia* (3 spp.)

(Transversely septate spores, from 19:)
43. Spores brown 44
43. Spores hyaline 46

44. Thallus lobed, subfoliose on margins . . . . . *Dimelaena* (5 spp.)
44. Thallus not lobed 45

45. Crust continuous or areolate . *Rinodina* (38 spp.)
45. Thallus with convex, swollen areoles . . . . . *Mobergia* (2 spp.)

46. Spores 3-septate or more, acicular (elongate, narrow) 47
46. Spores 1-septate (rarely to 3-septate) 49

47. On rock; crust yellow-green, coarse, areolate, warty, not sorediate; apothecia red, immersed or not, with thalline margin . . . . . *Ophioparma lapponica* (Räsänen) Hafellner & R.W. Rogers
47. On bark . . . . . 48 (3 choices)

48. Crust sorediate, yellowish to yellow-gray; apothecia red-brown; rare . . . . . *Loxospora elatina* (Ach.) A. Massal.
48. Crust not sorediate, whitish, granular; apothecia scarlet, thalline margin present, soon disappearing; epihymenium K + blue, thick paraphyses; on bark or wood, locally common . . . . . *Ophioparma rubricosa* (Müll. Arg.) S. Ekman
48. Crust on bark, whitish to grayish, apothecia scarlet, immersed or sessile, distinct thalline margin . . . *Haematomma persoonii* (Fée) A. Massal. (Staiger & Kalb 1995)

49. Thallus marginally lobate or squamulose . . . . . *Solenopsora* (2 spp.)
49. Thallus not lobed 50

50. Apothecia pink at maturity, on stumps or debris . . . . . *Icmadophila ericetorum* (L.) Zahlbr.
50. Apothecia not pink 51

51. Thallus yellow or yellow-orange . . . . . *Candelariella* (8 spp.)
51. Thallus gray, pinkish tan, or brown . . . . . *Lecania* (16 spp.)

KEY E. CRUSTS WITH LECIDEINE APOTHECIA

1. Thallus squamulose, peltate, or umbilicate . . . 2
1. Thallus crustose 4

2. Epithecium brown-green; thallus squamulose, peltate, or umbilicate; fusiform spores; often on burnt substrate . . . . . *Hypocenomyce* (5 spp.)
2. Epithecium not brown-green, often K+ violet; squamulose to areolate 3

3. Epithecium K+ purple; squamulose . . . . . *Psora* (10 spp.)
3. Epithecium with various K reactions; only *Toninia sedifolia* (Scop.) Timdal is known to be K+ purple; areolate to squamulose . . . . . *Toninia* (9 spp.)

4. Algal photobiont blue-green 5
4. Algal photobiont green 7

5. Thallus usually isidiate; often with radiating lobes; apothecia dark brown to black; hymenium blue, green, or brown-violet . . *Placynthium* (3 spp.)
5. Thallus not isidiate, crustose, sometimes lobed, or minutely squamulose 6

6. Black, crustose or minutely squamulose; urceolate black apothecium; thalline exciple prominent; ascus apical dome I+ blue . . . . . Pyrenopsis (3 spp.)
6. Apothecia arise between lobes; dark apothecium lacks true thalline margin . . . . . *Metamelaena melambola* (Tuck.) Henssen

7. Algal symbiont *Trentepohlia* (yellow-green, or golden brown) . . . . . 8 (3 choices)
7. Algal symbiont grass-green (*Trebouxia*, or other coccoid green alga), or non-lichenized (*Dactylospora*, 22) 13

8. Spores unicellular, colorless, on rock . . . . . *Ionaspis lacustris* (With.) Lutzoni
8. Spores muriform or septate, thin-walled ascus apex, proper margin closely surrounded by and much surpassing the thalline covering; on bark, rock, or soil 9
8. Spores transversely septate, colorless; ascus apex thin, simple (*Dimerella*) or more differentiated 10

9. On rock or bark; spores muriform or septate . . . . . *Gyalecta* (3 spp.)
9. On soil; small urceolate apothecia; colorless 3-septate spores . . . . . *Ramonia ablephora* (Nyl. ex Hasse) R.C. Harris

10. Shaded substrates such as moss, tree bases; paraphyses unbranched, apothecia yellow, spores 2-celled . . . . . *Dimerella* (2 spp.)
10. Spores 4- to many-celled 11

11. Apothecia pruinose, pruina same color as thallus; exciple not carbonaceous, having visibly distinct hyphae . . . . . *Lecanactis* (5 spp.)
11. Apothecia not pruinose, or with pruina of different color from thallus; black apothecia; on bark . 12

12. Carbonaceous exciple, obscuring cells of the exciple . . . . . *Cresponea* (2 spp.)
12. Exciple not carbonaceous, dark brown, paler inward; excipular cells visible; ascospores acicular, colorless, multiseptate, the cells breaking apart in some . . . . . *Bactrospora* (4 spp.)

13. Squamulose; spores hyaline, simple to 7-septate; on rock or soil . . *Toninia* (9 spp.) (see 3 above)
13. Crustose 14

14. Spores many per ascus 15
14. Spores 8 per ascus 18

15. On wood or soil; apothecia pale *Biatorella* (2 spp.)
15. On rock 16

16. Thallus well developed, blackening . . . . . *Sporastatia* (2 spp.)
16. Thallus thin, inconspicuous, often disappearing, not blackening; black apothecia . . . 17 (3 choices)

17. Apothecia with carbonaceous epithecium; gyrose disk; spores narrowly ellipsoid . . . . . *Polysporina simplex* (Davies) Vězda
17. Epithecium brown, not carbonaceous; spores ellipsoid . . . . . *Sarcogyne* (5 spp.)
17. Epithecium aeruginose blue-gray, rarely pale brown, not carbonaceous; globose spores; on wood . . . . . *Strangospora moriformis* (Ach.) Stein

18. Spores brown . . . 19 (also *Lopadium dodgei*, 23)
18. Spores hyaline 23

19. Paraphyses with enlarged tips, unbranched, not forked; spores polarilocular or muriform 20
19. Paraphyses branched, lacking enlarged tips; spores 1-septate or muriform; on rock . . . . . *Rhizocarpon* (23 spp.)

20 Thallus has lobate margin, black rhizines below; apothecia lateral on lobes . . . . . *Catolechia wahlenbergii* (Ach.) Körber
20. Thallus crustose, lacking lobes 21

21. Submuriform to muriform spores . . . . . *Diplotomma* (4 spp.)
21. Polarilocular spores 22

22. Pycniospores bacilliform, short *Buellia* (27 spp.)
22. Pycniospores filiform, long . . . . . *Amandinea punctata* (Hoffm.) Coppins & Scheid. (Syn.: *Buellia punctata* (Hoffm.) A. Massal.); non-lichenized *Dactylospora* (2 spp.) also keys here.

23. Spores muriform . . . . . *Lopadium dodgei* Herre
23. Spores simple, septate or polarilocular . . . . . 24 (4 choices)

24. Spore 1-septate . . . . . 25 (3 choices)
24. Spore 2-septate or more . . . . . 28 (3 choices)
24. Spore polarilocular; crustose or subfruticose, orange shades . . . . . *Caloplaca* (67 spp.)
24. Spores simple (*Fulgensia* and *Catillaria* have simple to septate spores) 31

25. Squamulose to placodioid thallus, yellow; spores 1-septate or simple . . . . . *Fulgensia fulgens* (Sw.) Elenkin
25. Thallus foliicolous . . . . . *Fellhanera bouteillei* (Desmaz.) Vězda
25. Crustose thallus 26

26. Halo around spore; apothecia black . . . . . *Catinaria atropurpurea* (Schaerer) Vězda & Poelt
26. No halo around spore 27

27. Abundant pycnidia that are K+ purple . . . . . *Cliostomum griffithii* (Sm.) Coppins
27. Pycnidia inconspicuous; spores simple or 1-septate . . . . . *Catillaria* (9 spp.)

28. On soil . . . . . *Ramonia ablephora* (Nyl. ex Hasse) R.C. Harris (see also 9)
28. On rock, rarely on wood; spirally twisted, needle-like spores . . . . . *Scoliciosporum umbrinum* (Ach.) Arnold
28. On bark 29

29. Spores acicular (needle-like) . . . 30 (3 choices)
29. Spores long and narrow, 9–18 x 4–5 µm, 3-septate, 8–16 per ascus; black apothecia; crust gray-green to gray; pale yellow hypothecium . . . . . *Arthrosporum populorum* A. Massal.

30. Apothecia pale tan to brown or black; proper exciple of thick-walled hyphae; spores acicular, 3–16-septate . . . . . *Bacidia* (12 spp.)
30. Apothecia pale pink, orange, through brown; proper exciple of thin-walled hyphae with broad lumina; no crystals in cortex . . . . . *Bacidina* (4 spp.)
30. Apothecia red or red-brown . . . . . *Ophioparma* (2 spp.) (see also Key D, 47, 48)

31. Spores very large, thick-walled, 1–2 per ascus . . . . . *Mycoblastus* (2 spp.)
31. Spores small, thin-walled, more than 2 per ascus 32

32. Proper exciple well developed 33
32. Proper exciple poorly developed, spores sometimes becoming septate . . . . . *Micarea* (5 spp.)

33. Medullary hyphae not amyloid; black apothecia with proper exciple; epithecium green, black, or brown; hypothecium various colors; paraphyses unbranched, free, easily separated in water; ascospores unicellular (rarely, 1-septate), 8/ascus, with moderately thick, even walls . *Lecidella* (10 spp.)
33. Medullary hyphae often amyloid (I+ blue); paraphyses somewhat coherent . . . . . *Lecidea* sensu lato (in the broad sense) (to determine to which segregate genus of *Lecidea* a lichen belongs, continue 34 through 58)

34. Thallus squamulose 35
34. Thallus crustose 37

35. On burnt wood, sorediate/isidiate or not; apothecia with proper margin; ellipsoid-fusiform spores, sometimes 1-septate . . . . . *Hypocenomyce* (5 spp.) (see Keys E 2, G 14)
35. On soil, moss, or rock; no isidia 36 (4 choices)

36. Squamules free and upright, white, pink, tan, gray or brown, often white below; margins sometimes white or pruinose; apothecia usually black, globose, hypothecium usually brown; on soil or rock . . . *Psora* (10 spp.) (see also Keys E 3, G 15, G 17)
36. Squamules brown-gray to ashy white, on black hypothallus; apothecia red-brown to black, flat to convex, adnate, 0.4–1 mm diameter; hypothecium hyaline; spores 10–18 x 5–8 µm; on gravels and peaty soil . . . . . *Lecidoma demissum* (Rutstr.) Gotth. Schneider & Hertel
36. Squamules brown or greenish with black margins, darker below, covered below with dark, blue-green rhizoids; on rock; apothecia black, 0.3–0.9 mm diameter, flat to convex, adnate; hypothecium hyaline; spores 8–15 x 5–7 µm . . . . . *Psorula rufonigra* (Tuck.) Gotth. Schneider
36. Squamules on soil, wood, or turf; white squamulose, C+ red, sometimes with small circular scars (in *Trapeliopsis wallrothii*, G17); or granular or areolate, green-gray to ashy or brownish; with soralia; apothecia 1–2 mm diameter, sessile, marginate, black (in *T. viridescens* (Schrader) Coppins & P. James), dark gray-green, pink, brown, or variegated (*T. granulosa* F5) or pink-brown to green-

gray (in *T. wallrothii*); hymenium I+ blue; paraphyses much-branched, anastomosed, coherent; spores 7–14 x 2.5–6 µm . *Trapeliopsis* (4 spp.)

37. Parasitic on *Candelariella vitellina* . . . . . *Carbonea vitellinaria* (Nyl.) Hertel
37. Not parasitic on another lichen 38

38. On rock and/or soil 39
38. On bark, wood, moss 50

39. Chiefly on soil; apothecia black, or gray, brown, or variegated 40
39. Chiefly on rock; apothecia black, rarely yellow or flesh-colored 44

40. Ascospores with an outer perispore (in *Mycobilimbia hypnorum* (Lib.) Kalb & Hafellner); 3- or more-septate (*M. sabuletorum* (Schreber) Hafellner) or not; crust pale; apothecia globose; red-brown hypothecium, pale brown epithecium; proper exciple is thin, ± persistent, pale near surface in section . . . . . *Mycobilimbia* (3 spp.) (see also 53)
40. Ascospores thin-walled, without outer layer 41

41. Crust dark greenish-brown or ashy 42
41. Crust pale . . . . . 43 (3 choices)

42. Squamulose; black apothecia, with proper margin soon disappearing; red-brown epithecium, hyaline hypothecium, no oil droplets in spores . . . . . *Lecidoma demissum* (Rutstr.) Gotth. Schneider & Hertel
42. Crustose, effuse, subgelatinous; apothecia black, with brown proper exciple, reflexed, disappearing, C-; brown epithecium, red-brown hypothecium; oil droplets in spores; branched, anastomosing paraphyses . . . . . *Placynthiella* (3 spp.) (some species of *Lecidea* sensu stricto also may have dark, brown crusts)

43. On soil and pebbles, chinky areolate, southern California; black apothecia with thin proper exciple; hypothecium pale or dusky; spores ovoid-ellipsoid, 9–12 x 6–7 µm . . . *Lecidea subplebeja* Vainio
43. On soil, tending to large squamules . . . . . see *Trapeliopsis* 36, 55
43. On soil, areolate or minute squamules; black or flesh-colored apothecia with proper exciple (sometimes also a thalline exciple?), hyaline epithecium, hyaline to brown hypothecium; branched, anastomosing paraphyses . . . . . *Trapelia* (3 spp.) (see also 46, 55)

44. Apothecia yellow or orange 45
44. Apothecia mostly black . . . . . 46 (3 choices) (If squamulose, see *Psorula*, 36)

45. Apothecia yellow; poorly developed proper exciple; pale epithecium, undefined; pale hypothecium; spores may be tear-drop-shaped; thallus yellow to yellow-green, leprose . . . . . *Psilolechia lucida* (Ach.) M. Choisy
45. Apothecia orange, with proper exciple, pale inside; hypothecium hyaline or pale brown; thallus smooth, greenish gray to yellowish . . . . . *Hymenelia epulotica* (Ach.) Lutzoni

46. Epithecium hyaline *Trapelia* (3 spp.) (see also 43)
46. Epithecium blue-black or blue-purple, purple pigment K+ green; brown to dark gray crust with black hypothallus (*Schaereria fuscocinerea* (Nyl.) Clauzade & Roux), rarely soraliate; proper exciple brown, pale inside, soon disappearing; spores globose to short-ellipsoid, 12–16 x 5–6 µm . . . . . *Schaereria* (2 spp.) (see also 55)
46. Epithecium green, brown, or blue, not K+ green 47

47. Exciple or hypothecium carbonized (dark, opaque), or dark brown . . . . . 48 (3 choices)
47. Exciple not dark brown or carbonized . . . . . 49 (3 choices)

48. Ascospores large (10–20 x 6–12 µm), with thick perispore . . . . . *Porpidia* (6 spp.)
48. Ascospores smaller (8–12 x 4–6 µm) with a thin, gelatinized perispore . . . . . *Clauzadea monticola* (Ach. ex Schaerer) Hafellner & Bellem.
48. Ascospores thin-walled, lacking perispore, 16–24 x 11–15 µm (smaller in parasitic species), becoming brown with age . . . . . *Rimularia* (2 spp.)

49. Granular or warty crust, white or pale green-gray, shiny; apothecia dull yellow to tan, convex to globose, immarginate; hypothecium pale tan; spores unicellular or 1-septate . . . . . *Biatora vernalis* (L.) Fr. (see also 58)

49. Brown crust; black flat to sunken apothecia, gyrose or umbonate in some spp.; black proper exciple; hypothecium colorless; paraphyses branched; spores unicellular, ellipsoid, with a plasma bridge . . . . . *Miriquidica* (2 spp.)
49. Continuous to areolate crust, usually gray; apothecia black or various colors, immersed to sessile; proper exciple, the outer layer being brown, the inside pale; hymenium usually I+ blue; hypothecium variable in color; paraphyses usually unbranched, with pigmented tips; ascospores hyaline, unicellular, and ellipsoid or globose, with a central plasma bridge . . . . . .

Lecidea sensu stricto (of 47 spp., the majority occurring on rock)

(from 38: on bark, wood, or moss)

50. On moss or plant debris 51
50. On bark or wood 54

51. Thallus dark brown 52
51. Thallus pale 53

52. Apothecia red-brown to black, convex, clustered, tuberculate; spores with thick wall, gelatinous sheath . . . . . *Japewia tornoënsis* (Nyl.) Tønsberg (see also 58)
52. Apothecia red-brown to black, sessile, not clustered; ascospores unicellular to 1-septate, each containing 1 to several oil droplets . . . . . *Placynthiella* (3 spp.) (see also 42, 55)

53. Often sorediate; algal cells often paired; apothecia tiny, pale, 0.1–0.5 mm diameter; emarginate; paraphyses branched *Micarea* (5 spp.) (see also 57)
53. Not sorediate; algal cells not in pairs; apothecia gray, brown, or black, globose, clustered; marginate in some spp.; unbranched paraphyses; ascospores lacking perispore . . . . . *Mycobilimbia berengeriana* (A. Massal.) Hafellner & V. Wirth; *M. hypnorum* (Lib.) Kalb & Hafellner (the latter with a warty perispore)

54. Apothecia with margin or exciple . 55 (5 choices)
54. Apothecia lacking margin or exciple, some biatorine 56

55. Crust dark olive-brown; oil droplets in ascospore . . . . . *Placynthiella*
55. Crust of white to cream squamules; spore lacking oil droplets . . . . . *Trapeliopsis*
55. Crust areolate to tiny squamules; red-brown apothecia, pale epithecium, hypothecium hyaline to brown; paraphyses branched . . . . . *Trapelia*
55. Crust areolate, gray; epithecium green, blue, or brown; hypothecium hyaline to brown; paraphyses unbranched . . . . . *Lecidea* sensu stricto (of 47 spp., a minority occurring on bark or wood; see 49)
55. On bark, dark brown punctiform soralia, proper exciple brown to greenish, epihymenium green to violet, violet pigment K + green, green pigment K - . . . . . *Schaereria corticola* Muhr & Tønsberg

56. Thallus granular, often sorediate 57
56. Thallus sometimes granular, but not sorediate 58

57. Apothecia red, tan, red-brown, black; spores brown when old . . . *Pyrrhospora* (5 spp.) (see also F5)
57. Apothecia tiny, pale, 0.1–0.5 mm diameter, emarginate; spores not turning brown; branched paraphyses . . . . . *Micarea*

58. Granular or warty crust, white or pale green-gray, shiny; apothecia dull yellow to tan, black, or red-brown, convex to globose, immarginate; hypothecium pale tan to brown; spores unicellular or 1-septate, thin-walled . . . . . *Biatora* (6 spp.)
58. Dark greenish-brown crust; apothecia red-brown to black, convex, clustered, tuberculate; spores with thick wall, gelatinous sheath . . . . . *Japewia tornoënsis* (Nyl.) Tønsberg

KEY F. STERILE CRUSTS

Note: Ascocarps may be present occasionally in some taxa, but usually these taxa are found in sterile condition.

1. Photobiont a blue-green alga (a cyanobacterium); black gelatinous thallus 2
1. Photobiont a green alga 3

2. Alga *Gloeocapsa*; cortex undifferentiated, paraplectenchymatous throughout; if urceolate apothecia or pore-like disks are present, hymenium I + blue or red-brown; apical dome of asci I + blue . . . . . *Pyrenopsis* (3 spp.)
2. Alga *Chroococcidiopsis* (*Xanthocapsa*); cortex differentiated, paraplectenchymatous; if urceolate apothecia or pore-like disks are present, asci are thin-walled, I-, lacking apical thickening; rhizines present . . . . . *Psorotichia* (4 spp.)

3. Thallus granulose/powdery, poorly organized . 4
3. Thallus a distinct crust, soraliate or not 6

4. White podetia present . . . *Leprocaulon* (2 spp.)
4. Crust lacking podetia . . . . . 5 (3 choices)

5. Yellow crust . . . . . *Chrysothrix* (bright yellow; 2 spp.), or *Pyrrhospora* (ochraceous; 5 spp.)
5. Crust of light blue granules, on soil . . . . . *Trapeliopsis granulosa* (Hoffm.) Lumbsch
5. Crust greenish or gray . . . . . *Lepraria* (thallus of spherical granules, covered with entangled hyphae; 4 spp.)

6. Thallus bright yellow; apothecia present; taste not bitter . . . . . *Candelariella* (8 spp.)
6. Thallus greenish to gray . . . . . 7 (3 choices)

7. Crust gray, smooth to warty or cracked; taste very bitter; closely attached; soredia present . . . . . *Pertusaria amara* (Ach.) Nyl.
7. Tiny green shell-like squamules; no bitter taste; soredia may be present . . . . . *Normandina pulchella* (Borrer) Nyl.
7. Thallus gray-white crust 8

8. White prothallus, inconspicuous pruinose apothecia may be present; rhizoids below; K+ yellow to red, P+ orange . . *Phlyctis argena* (Sprengel) Flotow
8. Grayish prothallus or none; thallus C+ red . . . . *Ochrolechia androgyna* (Hoffm.) Arnold (thick, shiny thallus with yellowish soralia), or *O. arborea* (Kreyer) Almb. (small orbicular thalli, thin at edge, with small greenish soralia)

KEY G. SQUAMULOSE LICHENS

Adapted from Goward et al. (1994) and Hale (1979).

1. Photobiont blue-green; upper side brown, black, gray, or blue-gray 2
1. Photobiont green; upper side various 6

2. Thallus attached by central holdfast, on vertical rock faces in arid areas . . . . . *Peltula euploca* (Ach.) Poelt
2. Thallus not attached centrally 3

3. Soredia beginning on underside of lobes . . . . . *Pannaria* (5 spp.; some nearly crustose)
3. Not sorediate; on rock, soil, or moss 4

4. Black contrasting hypothallus present 5
4. Hypothallus pale or none, on rock; olive-brown squamules attached with wefts of hyphae; apothecia sunken . . . . . *Heppia lutosa* (Ach.) Nyl.

5. On bark and wood . . . . . *Parmeliella*
5. On rock . . . *Placynthium nigrum* (Hudson) Gray

6. Upper surface has tiny black dots, pycnidia or perithecia 7
6. Upper surface lacking black dots 12

7. On soil or moss 8
7. On rock 10

8. Squamules raised, attached on one side; lower surface ± pale, easily seen from above . . . . . *Cladonia* (35 spp.)
8. Squamules appressed 9

9. Strong red-brown (to pale gray or gray brown in alpine areas) . . . . . *Catapyrenium* (14 spp.; see also key C)
9. Various dull colors, not strong red-brown . . . . . *Endocarpon pusillum* Hedwig (9 spp.)

10. Lobes upright, dark brown, not pruinose . . . . . *Endocarpon pulvinatum* Th. Fr.
10. Lobes not upright, pale brown to pale gray, ± pruinose 11

11. Upper side pruinose, or if not, lower side dark . . . . . *Dermatocarpon* (7 spp.)

11. Not pruinose; lower side pale brown . . . . . *Acarospora* (35 spp., of which many are squamulose)

12. Squamules with raised edges, attached at one side; whitish or grayish when dry, opaque, pale below; associated with upright podetia that are not always present; not overlapping shelves on dead or burnt wood . . . . . *Cladonia* (35 spp.)
12. Squamules either green and shell-like, shelves on dead wood, brownish or more or less convex 13

13. Tiny, jade green shell-like squamules; sorediate; rare . . . . . *Normandina pulchella* (Borrer) Nyl.
13. Squamules different in color 14

14. On dead or burnt wood; squamules shelf-like, often overlapping . . . . . *Hypocenomyce* (5 spp.; see key E 2, G 14), or *Waynea californica* Moberg (olivaceous squamules, no lower cortex, stipitate soralia)
14. On soil, moss, or over rock 15

15. Upper surface green-gray to yellow-brown dry, green wet; lower side covered with short pale hairs; apothecia and cephalodia frequent . . . . . *Psoroma hypnorum* (Vahl) Gray
15. Upper surface black, white, brown, gray, or pink, on soil or occasionally directly on rock 16

16. Lobes strongly convex, spores hyaline . . . . . *Toninia* (9 spp.)
16. Lobes concave or partly convex, spores hyaline or brown 17

17. Lobes white, gray or pale yellow, overlapping; medulla C+ red; coastal . . . . . *Trapeliopsis wallrothii* (Flörke) Hertel & Gotth. Schneider
17. Lobes brown or pink; squamule edges often raised; apothecia often present; mostly inland species . . . . . *Psora* (10 spp.)

CRUSTOSE LICHEN GENERA IN KEY, AND KEY (A–G) IN WHICH THEY OCCUR:

Acarospora (D, G), *Amandinea* (E), *Anisomeridium* (C), *Arthonia* (B), *Arthopyrenia* (C), *Arthothelium* (B), *Arthrosporum* (E), *Aspicilia* (D), *Bacidia* (E), *Bacidina* (E), *Bactrospora* (E), *Bellemerea* (D), *Biatora* (E), *Biatorella* (E), *Buellia* (E), *Calicium* (A), *Caloplaca* (D, E), *Candelariella* (D, F), *Carbonea* (E), *Catapyrenium* (G), *Catillaria* (E), *Catinaria* (E), *Catolechia* (E), *Chaenotheca* (A), *Chiodecton* (B), *Chrysothrix* (F), *Cladidium* (D), *Cladonia* (G), *Clauzadea* (E), *Cliostomum* (E), *Coccotrema* (D), *Coniocybe* (A), *Cresponea* (E), *Cyphelium* (A), *Dactylospora* (E), *Dermatocarpon* (C, G), *Dimelaena* (D), *Dimerella* (D, E), *Diploschistes* (D), *Diplotomma* (E), *Dirina* (B), *Endocarpon* (C, G), *Fellhanera* (E), *Fulgensia* (D, E), *Glypholecia* (D), *Graphina* (B), *Graphis* (B), *Gyalecta* (E), *Haematomma* (D), *Hassea* (C), *Heppia* (D, G), *Heterocarpon* (C), *Hymenelia* (E), *Hypocenomyce* (E, G), *Icmadophila* (D), *Ionaspis* (E), *Japewia* (E), *Kirschsteiniothelia* (C), *Lecanactis* (E), *Lecania* (D), *Lecanographa* (D), *Lecanora* (D), *Lecidea* (E), *Lecidella* (E), *Lecidoma* (E), *Lepraria* (F), *Leprocaulon* (F), *Lichenothelia* (D), *Lobothallia* (D), *Lopadium* (E), *Loxospora* (D), *Maronea* (D), *Megaspora* (D), *Melaspilea* (B), *Metamelaena* (E), *Micarea* (E), *Microcalicium* (A), *Microglaena* (C), *Miriquidica* (E), *Mobergia* (D), *Mycobilimbia* (E), *Mycoblastus* (E), *Mycocalicium* (A), *Mycoporum* (C), *Normandina* (F, G), *Ochrolechia* (D, F), *Omphalina* (p. 1) *Opegrapha* (B), *Ophioparma* (D, E), *Pannaria* (G), *Parmeliella* (G), *Peltula* (D, G), *Pertusaria* (C, D, F), *Phaeocalicium* (A), *Phaeographis* (B), *Phaeorrhiza* (D), *Phlyctis* (D, F), *Placopsis* (D), *Placynthiella* (E), *Placynthium* (E, G), *Pleopsidium* (D), *Polyblastia* (C), *Polyblastiopsis* (C), *Polysporina* (E), *Porina* (C), *Porpidia* (E), *Protoparmelia* (D), *Pseudosagedia* (C), *Psilolechia* (E), *Psora* (E, G), *Psoroma* (G), *Psorotichia* (D, F), *Psorula* (E), *Pyrenocollema* (C), *Pyrenopsis* (E, F), *Pyrenula* (C), *Pyrrhospora* (E, F), *Ramonia* (E), *Rhizocarpon* (E), *Rhizoplaca* (D), *Rimularia* (E), *Rinodina* (D), *Roccellina* (B, D), *Sarcogyne* (E), *Schaereria* (E), *Schismatomma* (D), *Sclerophyton* (B), *Scoliciosporum* (E), *Sigridea* (D), *Solenopsora* (D), *Sphinctrina* (A), *Sporastatia* (E), *Staurothele* (C), *Stenocybe* (A), *Strangospora* (E), *Strigula* (C), *Tephromela* (D), *Texosporium* (A), *Thelenella* (C), *Thelidium* (C), *Thelocarpon* (C, D), *Thelomma* (A), *Thelopsis* (C), *Thelotrema* (D), *Thrombium* (C), *Tomasellia* (C), *Toninia* (E, G), *Trapelia* (E), *Trapeliopsis* (E, F, G), *Trimmatothele* (C), *Verrucaria* (C), *Waynea* (G),*Xylographa* (B).

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Lichens from the "Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl" Known from the Point Reyes National Seashore, the Golden Gate National Recreation Area and Mt. Tamalpais State Park with Notes on other Lichens from the Record of Decision

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This list, taken in part from materials for a macrolichen flora of Marin County, was requested by Ms. Kim Cooper, National Park Service vegetation specialist at the Point Reyes National Seashore, Marin County, California, in connection with the Federal Forest Plan mandated by the Clinton administration for management of the habitat of the Spotted Owl, *Strix occidentalis* (the northern race of this threatened species). According to Ms. Cooper, Marin County with its comparatively high density of spotted owls is a refuge for this rare species, so that management for protection of the owl in Marin County is especially important. Such management calls for protection of the entire habitat with all its biota, including the lichens.

Only collections from areas which come under the provisions of the Forest Plan are cited: these are the Point Reyes National Seashore (PR), the Golden Gate National Recreation Area (GGNRA) and Mt. Tamalpais State Park. All collections were made by me and are in my personal herbarium. Nomenclature follows T. Esslinger and R. Egan, A Sixth Checklist of the Lichen-forming, Lichenicolous, and Allied Fungi of the Continental United States and Canada, The Bryologist 98: 467–549, 1995, and on-line revisions.

***Bryoria spiralifera* Brodo & D. Hawksw.:**
When this species was described it was thought to be restricted to *Pinus contorta* ssp. *contorta* dune forest on the Samoa Peninsula west of Eureka, Humboldt County (Brodo and Hawksworth 1977). However, I just received a report that Bruce McCune has found it in a dune forest near Coos Bay, Oregon. If the birds which presumably disperse *B. spiralifera* prefer the dune forests of the North Coast, the species is unlikely to be found in Marin County, which has no dune forests and lies outside the range of *Pinus contorta* (Griffin and Critchfield 1972).

***Buellia oidalea* (Nyl.) Tuck.:**
On bark of *Salix* in "Horsetail Canyon" off Walker Creek southeast of Tomales, *5197*, 2.vii.1994. It might be expected at Point Reyes and in the GGNRA. A greenish gray areolate crust with prominent, initially concave, later strongly convex lecideine apothecia. The proper margin is excluded in age. A black prothallus may be present. Spores are brown, 49 x 24μm, and muriform with 3 cross walls and 1 longitudinal wall.

***Calicium glaucellum* Ach.** (PR):
On dead, decorticate *Pinus muricata* on Mt. Vision Rd. ca. 1.6 km from Sir Francis Drake Blvd., *3525*, 3.xi. 1988. Material collected by Charis Bratt from this population was identified by Leif Tibell. Tiny, black, tack-like fruiting bodies, spores extruded from the apothecium in a mass (mazaedium).

***Collema nigrescens* (Hudson) DC.** (PR):
On *Baccharis* at the Mt. Vision "hot spot" (a locality in which an unusually large number of species are present or where one or more species is unusually abundant; usage adopted from S. Sillett, poster at Humboldt State University discussing *Pseudocyphellaria rainierensis*), *4168*, 18.viii.1990 (see *Pannaria rubiginosa* below). Upper surface with small blisters.

***Dendriscocaulon* intricatulum (Nyl.) Henssen** (PR):
Reported (as "*D. intricatum*") from conifer bark "in the small pygmy [cypress] forest off Little Lake Road", Mendocino, Mendocino County, by J. Malachowski (1975). If it prefers conifers on impoverished soils, it might be found on the stunted *Pinus muricata* on podzol-like soil on the east side of Mt. Vision (access by the fire road which contours south from the top of Perth Way, Inverness). See *Kaernefeltia californica* below.

Fuscopannaria leucostictoides (Ohlsson) P.M. Jørg. (In list as *Pannaria leucostictoides* Ohlsson) :
What is presumably this species was found once in oak-madrone woodland on Big Rock Ridge south of Novato, *4507*, 1.ii.1992. It might be expected on Mt. Tamalpais. Small gray foliose species with light, 0.5 mm orangish brown disks. The pruinose lobes have dissected margins. Might be mistaken for a *Physcia* except for the color of the disks and the photobiont which is blue-green rather than green.

***Heterodermia leucomelos* (L.) Poelt** (GGNRA, PR):
Fairly common on moss on tree branches in Olema Valley (Copper Mine Gulch, on fallen *Umbellularia* trunks, *1806*, 28.iii.1987) and about the Point Reyes peninsula (Sky Trail, 1.6 km west of the Bear Valley Trail, on dead, fallen wood beneath *Pseudotsuga menziesii*, *3464*, 30.vii.1988). Pale gray to green foliose species with narrow, elongate lobes which are white and sorediate below and have long, black, marginal cilia.

***Hypotrachyna revoluta* (Flörke) Hale**:
Closest approach to Marin County of which I know is at the Joy Road "hot spot" (see *Collema nigrescens*) not far north of the Marin-Sonoma county line, on moss on an old fallen fencepost, *5008*, 25.xi.1993. Apparently rare in northern California. Small gray foliose species with narrow, eciliate lobes; light chestnut disks; soredia marginal and laminal, mixed with pustular outgrowths; lobe margins in part turned under; rhizines dichotomously branched; C+ red.

***Kaernefeltia californica* (Tuck.) Thell & Goward** (in list as *Cornicularia californica* [Tuck.] Du Rietz, PR):
On stunted *Pinus muricata* on podzol-like soil, fire road extension contouring south from the end of Perth Way, 1.6 km beyond the pavement, Inverness, *4189*, 3.ix.1990. Apparently confined to these pines, which were damaged by fire fighting equipment during the Point Reyes fire of 1995 (this spot was not burned). Fertile fruticose species with pale brown to olive branches and subterminal apothecia with olive green to nearly black disks. *Bryoria furcellata* is also present here.

***Lobaria hallii* (Tuck.) Zahlbr.**:
This uncommon to rare species of oak woodland is in Humboldt and Mendocino Counties (for example, on the Bell Springs Road) but does not seem to reach the San Francisco Bay Area.

***Lobaria pulmonaria* (L.) Hoffm.** (PR, Mt. Tamalpais State Park):
Known to me from 5 localities in Marin County, this species flourishes in the Arroyo Hondo, *3693*, 26.xi.1988, at the southern end of Inverness Ridge (seaward side), 1.6 km northwest from the road to Point Reyes Bird Observatory. It grows on mossy bark of *Acer macrophyllum* with *Nephroma resupinatum*, (see below), and *Pseudocyphellaria anthraspis*. It is abundant on just one *Umbellularia* trunk, as far as I saw, just outside the National Seashore boundary on the fire road on the east side of Mt. Vision about one mile south of Perth Way. There is a small population on the Lagunitas Fire Road to Potrero Meadows on Mt. Tamalpais, *4330*, 13.iv.1991, where it grows on the exposed root of a live oak. Bill Hill and I saw a few thalli in hardwood-conifer woods on Bolinas Ridge a short distance north of the Bolinas-Fairfax Road (Kent Lake drainage). Other populations are on private property, including one in Redwood Canyon on Big Rock Ridge just south of Novato. The situation in Marin contrasts sharply with that in western Sonoma County, where *L. pulmonaria* is much more plentiful, as on oaks on the Stewarts Point-Skaggs Springs Road west of Geyserville.

***Lobaria scrobiculata* (Scop.) DC.** (Mt. Tamalpais State Park):
In Marin I know this from a single population on the face of a large rock shaded by trees on Ridgecrest Blvd., Bolinas Ridge, 4.8 km north of Rock Springs, Mt. Tamalpais, 600 m elevation, *5149*, 30.v.1994. It is not rare in Lake County to the north (for example, Lake Pillsbury) or in Santa Cruz County to the south (for example, Castle Rock State Park). Unlike *L. pulmonaria*, this species has a peculiar yellowish cast and is only weakly ridged above, the white spots in the tomentum below are not raised, and the photobiont is blue-green.

***Nephroma laevigatum* Ach.** (PR, Mt. Tamalpais State Park):
See under *Pannaria rubiginosa*. Found also on the International Trail on Mt. Tamalpais, 685 m elevation, *5100*, 16.iv.1994, on bark of *Quercus* and *Umbellularia*, also with *Lobaria pulmonaria* on the Lagunitas Fire Rd. to Potrero Meadows, *4331*, 13.iv.1991. Uncommon to rare in Marin, but the least rare *Nephroma*. Brown upper surface; dark red-brown apothecia on the underside of the lobe tips; yellow pigment in medulla (K+ red), usually conspicuous.

***Nephroma parile* (Ach.) Ach.**:
I have a fragmentary collection which is probably this species from rock on the southwest side of Oat Hill north of Lake Alpine, *5631*, 20.x.1995. It has a rugulose, reddish brown lower surface and black soredia on the margins as well as in round laminal soralia. It is on Marin Municipal Water District lands but is not far from Mt. Tamalpais State Park. Found just once. Does not seem to have been reported previously from the San Francisco Bay Area.

***Nephroma resupinatum* (L.) Ach.** (PR):
Found just once in Marin County, in the Arroyo Hondo, southern Point Reyes National Seashore, *3696*, 26.xi.1988. Lower surface with white spots in the tomentum. See *Lobaria pulmonaria* above. Evidently commoner further north.

***Pannaria rubiginosa* (Ach.) Bory** (PR):
Found once at the "hot spot" (see above under *Collema nigrescens*) on Mt. Vision Rd. at an elevation of 275 m about 1.6 km from Sir Francis Drake Blvd., *4171*, 18.viii.1990, where it grew on *Baccharis* in a foggy

draw (fog track) with *Pinus muricata* woods on either side. Also present were *Sticta limbata*, *Collema nigrescens*, *Parmotrema chinense* and abundant *Nephroma laevigatum*. This is the only Marin locality known to me for the *Pannaria* and the only place where I have found *Nephroma* abundant.

***Peltigera collina* (Ach.) Schrader** (PR):
Occasional on soil banks or moss on bark, Pine Gulch Creek, 1 km south of its confluence with Copper Mine Creek ("Box Elder Flat"), Olema Valley, *3270*, 19.iii.1988; Lagunitas Fire Rd. to Potrero Meadows, 0.2 km north of Ridgecrest Blvd., Mt. Tamalpais, *4329*, 13.iv.1991. Marginal soralia above, dark veins in pale tomentum below.

***Pseudocyphellaria anomala* Brodo & Ahti**:
Occasional, often with *P. anthraspis*. I have it from the Elliott Nature Preserve near Fairfax and the Arroyo San Jose south of Novato: it should be expected in the GGNRA. Bluish soredia on ridges on brown upper surface; tiny, unrimmed pores (pseudocyphellae) on pale, finely tomentose lower surface. Not found fertile by me in Marin County.

***Pseudocyphellaria anthraspis* (Ach.) H. Magn.** (PR):
Occasional in dry woodland as well as in more mesic places, *3695*, 26.xi.1988, Arroyo Hondo. Network of pits on brown upper surface; tiny, unrimmed pores in pale, finely tomentose lower surface. Usually fertile, occasionally sterile, but then without any tendency to be sorediate.

***Pseudocyphellaria rainierensis* Imshaug**:
Not known as yet from California. According to S. Sillett (Humboldt State University, personal communication, iii.1998), the most likely place for it would be the Smith River drainage in Del Norte County; Marin County is likely to be well south of its range. *P. rainierensis* is distinguished from all other North American *Pseudocyphellaria* species by having a green algal primary photobiont with a cyanobacterial photobiont confined to internal cephalodia (Sillett and Goward 1998). I have seen material of *P. rainierensis* at Humboldt State University with a gross resemblance to forms of *P. anthraspis* in which the cortex is weakly reticulately pitted.

***Pyrrhospora quernea* (Dickson) Körber** (PR):
On *Pinus muricata* at the *Kaernefeltia californica* locality, (see above), *5162*, 4.vi.1994; on planted *Pinus radiata* on Sunset Way, Muir Beach, *1981b*, 18.iv.1987. Frequent on fences and other lignum in west Marin. A yellowish granular crust with purplish to black, lecideine disks which bleed red when KOH is applied.

***Ramalina pollinaria* (Westr.) Ach.** (PR):
Rather rare in Marin County. On dead, fallen *Umbellularia* on the Arroyo Hondo fire road 150 m from the road to Point Reyes Bird Observatory, southern Point Reyes National Seashore, *4482*, 26.x.1991. A small *Ramalina* with narrow lobes which are sorediate on the inside of burst tips.

***Ramalina thrausta* (Ach.) Nyl.**:
The only locality so far known for California is on the road from Cazadero to Fort Ross, Sonoma County (Sanders 1997). William Sanders advises watching for it, and I would think Point Reyes would be a real possibility. Branch tips recurved to inrolled. Easily overlooked among the other fruticose species with which it grows and detected most readily under the dissecting microscope. A detailed illustration is in *American Arctic Lichens, I. The Macrolichens,* by John Thomson (Columbia University Press, 1984, p. 382).

***Sticta fuliginosa* (Hoffm.) Ach.** (PR):
Occasional on mesic sites on bark and soil banks, *4166*, 18.viii.1990, on *Baccharis* at the Mt. Vision "hot spot" (see above under *Collema nigrescens*). Abundant, tiny, black isidia on dark brown upper surface; rimmed pores (cyphellae) on lower surface.

***Sticta limbata* (Sm.) Ach.** (PR, Mt. Tamalpais State Park):
Found twice in Marin, on *Baccharis* at the Mt. Vision "hot spot" (see above under *Collema nigrescens*), *4167*, 18.viii.1990; on moss on rock, Bolinas Ridge north of Rock Springs, *5145*, 30.v.1994. Rimmed pores (cyphellae) on lower surface, soredia on margins of lobes.

***Teloschistes flavicans* (Sw.) Norman** (PR):
Rare in Marin County as in the rest of California. On dead *Baccharis* branches west of the marsh at the east end of the Estero, Limantour Beach, *2288*, 2.vii.1987; on *Ceanothus thyrsiflorus* on a tributary of the fire road above Perth Way, Inverness, 2 km from the end of the Perth Way pavement, *4198*, 3.ix.1990. Scattered in this area, especially on the Nature Conservancy property 0.4 km further south. Sorediate orange fruticose species: *T. chrysophthalmus* (L.) Th. Fr. and *T. exilis* (Michaux) Vainio, also present in Marin County, have apothecia and are not sorediate.

***Tholurna dissimilis* (Norman) Norman**:
Not much reported from the U.S. Earlier known in North America only from high montane situations in Canada, Washington and central Oregon (1 population), it was found in 1978 by a helicopter survey in the top of a spruce on the coast of Vancouver Is., B.C., Canada, at 150 m elevation (Otto 1983). There was an unconfirmed report from small conifer twigs possibly in Mendocino

County (*fide* I. Tavares, University of California Herbarium). It might turn up at Point Reyes. Detect it by holding a small branch (fallen from high in the tree?) up to the light so that the tiny bottle-shaped apothecia may be seen in silhouette.

***Usnea longissima* Ach.:**
The closest population to Marin County known to me is near Salt Point State Park, Sonoma County (Doell 1994). This lichen of the redwood zone in California is also in San Mateo County (Doell 1997). It is less rare further north, as in Humboldt County, where it occurs erratically in the Mattole region. Might be found in the *Pseudotsuga menziesii* forests of Bolinas and Inverness Ridges. The length to 3 m or more, the fibrils at right angles to the branches, the flexuousness and the cross-draped thalli (*Ramalina menziesii* does not do this) are good macrocharacters. With a lens, verify crumbling cortex on main branches, I+ blue axis (see Tavares 1997).

***Usnea subgracilis* Vainio** (in list as *U. hesperina* Mot.) (PR):
Found just outside the Point Reyes National Seashore on Inverness Ridge within the Vedanta Retreat south of Bear Valley (an inclusion of private property within the Seashore boundaries), altitude 365 m, *5006*, 20.xi.1993. More green than yellow-green; cortex thick (18%), verrucose, isidiose; medulla white, a thin (9%) fuzz on a massive (45%) white axis; K-, PD+ (indication of protocetraric acid by TLC); annular cracks coarse, the better developed ones white-margined. For a discussion of the nomenclature, see the new preliminary key (Tavares 1997, p. 22, note 3).

***Vermilacinia cephalota* (Tuck.) Spjut & Hale** (in list as *Niebla cephalota* (Tuck.) Bowler & Rundel) (PR):
On bark of *Salix* on the road from Upper Pierce Ranch to McClure's Beach, *3799*, 8.iv.1989. Occasional, reaching further inland than other *Vermilacinia* or *Niebla* species and also the only one on bark and lignum. Round lobes with sharply delimited elliptic soralia which are usually bluish (parasitized?). The author would prefer to report this species in *Niebla* until an evaluation of the recent generic split (Spjut 1996) has been published. It is reported here in *Vermilacinia* because of previous use of that name by the *Bulletin*.

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Information on How to Grow Lichens

Several CALS members have asked about how to encourage lichens to grow. The British Lichen Society has a four page printout on this subject, entitled "Lichens on man-made surfaces. Encouragement and removal." It is available free of charge from the following address:
Mr. W.G.R. Stevens,
29 Limerick Road, Redland,
BRISTOL BS6 7DY, U.K.
e-mail: wstevens@cix.co.uk

If you have access to a World Wide Web browser, however, it will be faster and cheaper to connect to the British Lichen Society Web page, where you can download the text of this and other documents, and learn the scope of the activities of the BLS. The URL is
http://www.argonet.co.uk/users/jmgray/

San Francisco Watershed Field Trip,
31 January, 1998

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The San Francisco Watershed, in which Crystal Springs Reservoir is situated, is located in the San Andreas Fault Rift Zone, which traverses the boundaries of the Franciscan (sandstone) Association and the Montara (diorite) block, in the Santa Cruz Mountain range of California, in San Mateo Co. The area visited is in the southeast part, upstream of the influx of Hetch-Hetchy aqueduct, adjacent to the Edgewood Preserve, at the corner of Edgewood and Cañada Roads in western Redwood City (USGS map, Woodside Quad.). It is traversed from south to north by West Union Creek, and encompasses mostly mixed Franciscan sandstone, serpentine rock and sand. The Montara Mountain block of diorite is located well downstream to the northwest, and hardly influences the area visited. (USGS map, Montara Quad.; Bailey et al. 1964.) The area is second growth mix of chaparral, redwood stands, Douglas fir, meadow, and mixed hardwoods. The main meadow area we visited is bounded by coast live oak stands and coastal scrub, with the usual association of corticolous lichens. Rocks collected in the meadow proved on washing to be serpentine fragments, well covered with clayey mud over and around the lichens. The route taken on the trip followed the Old Post Road. From there, the majority of the group proceeded up the mixed hardwood/poison oak slopes toward the Filoli Estates, uphill to the East, while others returned to (or had remained) near the entrance, for more intensive collecting in the coastal scrub/oaks and the roadside exposures of serpentine adjacent to Edgewood Preserve, southeast along Edgewood Road.

Present were Doris Baltzo, Mona Bourell, Charis Bratt, Susan Crutchfield, Janet Doell, Bill Hill, William Freedman (Mycological Society of San Francisco), Ann Knopf, Barbara Lachelt, Christine Lindquist, Mikki McGee, Judy Robertson, William Sanders, and David Toren.

The California Lichen Society has a long-term interest in documenting the lichen flora of California. We are particularly interested in areas where collections have been made previously, so that we can see how changing conditions, vegetation, and increasing human population have influenced the lichens. The request to survey the relatively unimpacted, protected San Francisco Watershed and the surrounding San Francisco State Fish and Game Refuge was welcome. We hope that the survey will provide the Water Department of San Francisco a useful addition to their inventories of the flora of the area.

History of lichen study in Watershed

The only work specifically dealing with the lichens of the Watershed was that of William Jordan, whose master's thesis, "Corticolous and Lignicolous Lichens of the San Francisco Watershed", (Jordan, 1968) is available at the Herbarium of San Francisco State University. Prior to Jordan's work, collections from the Watershed area were included in the publications of A.W.C.T. Herre dealing with the lichens of the Santa Cruz Peninsula (Herre, 1910; 1936). Before Herre, the Watershed may have been visited by H.N. Bolander, who collected lichens and other plants around San Francisco in the 1860's and 1870's.

The principal purpose of Jordan's study was to census the corticolous and lignicolous lichens. The secondary purpose was to compare his findings with those of Herre (1910). Jordan listed 126 species of lichens in 49 genera. Some of these were not treated in Herre (1910). Jordan found that, with respect to numbers of corticolous and lignicolous species, the Watershed rivaled the entire Santa Cruz Peninsula as studied by Herre. The Watershed, in short, was a region of high species diversity.

Site descriptions

1. Fieldstone gate facade; many kinds of stone (some local?), oriented N–S along Cañada Rd., opposite Edgewood. This decorative, apparently recent, structure is the gateway to one of the large estates in the area.
2. Sign Post; a painted, weathered, wooden sign 4 ft. x 4 ft. x 48 in., in the center of a small meadow.
3. Coast live oak, near Cañada Road. This occupied the southwest corner of the field in the Watershed property west of Cañada Road. An older tree with northwest exposure, and on the edge of the hedgerow.
4. Stones and soil, under oak. This is the vicinity of #3, with clayey soil and serpentine stones.

5. Boulders, first creek crossing. This area had live oak, boulders, grassy areas, and coyote brush. This number refers to specimens from the boulders, growing with moss and *Cladonia*.
6. Coast live oak, near boulders. Smaller than #3, but very similar.
7. Hummock to the northwest of the road crossing of West Union Creek. This was rather open scrub, including coyote brush, etc., and soil lichens were collected.
8. Various trees along trail. The trail wandered northward, through mixed hardwood and evergreen stands.
9. Roadside, alongside flooded meadow. The end of the trail for following the Post Road. Lunch. West of Filoli grounds. Mixed hardwoods, moderately open, banked roadside.
10. Oak along Filoli Loop.
11. Oak along Filoli Loop.
12. Dead tree along Filoli Loop.
13. Oak along Filoli Loop.
14. Oak, near corner of car park, Edgewood and Cañada Roads, outside the watershed proper. Larger and coarser barked than coast live oak.
15. Weathered serpentine outcrop 1/8 mi. E on Edgewood, adjacent to Edgewood Preserve. This was also in the Edgewood Road right of way, a low humped outcrop of very weathered, crumbly serpentine.

Nomenclature follows Esslinger and Egan (1995) or subsequent on-line revisions.

BH, Bill Hill; CB, Charis Bratt; DEB, Doris Baltzo ; DT, David Toren; JD, Janet Doell; JR, Judy Robertson; MM, Mikki McGee; WS, William Sanders

***Acarospora* sp.**, 5DEB dark brown
***Aspicilia cf. caesiocinerea* (Nyl. ex Malbr.) Arnold**, 4MM (on fragment of serpentine; det. B. Ryan)
***Aspicilia* sp.**, 5DEB, green feathery hypothallus
***Buellia cf. lepidastra* (Tuck.) Tuck.**, 7MM (on pebble, with *Leptochidium*)
***Buellia cf. vernicoma* (Tuck.) Tuck.**, WS; det. I. Tavares (with *Pannaria cf. rubiginosa*)
***Calicium* sp.**, 11JR; 11(?)BH; (Thallus white, thin, on wood, K−; pedicel black with clear sheath (I+red-brown), 0.1 x (1–3)mm.; Apothecium black, with white pruinose rim; spores 3–4 x 8–9 μm, bilocular, minutely punctate)
***Caloplaca cf. squamosa* (de Lesd.) Zahlbr.**, 15MM (serpentine)
***Caloplaca* sp.**, 4,9,14MM (corticolous; thallus immersed or wanting)
***Caloplaca* sp.**, 5DEB, spores 14.4 x 4.8 μm
***Candelaria concolor* (Dickson) Stein**, 2,3,4,8DEB; 2JR; 9,14MM; 9BH
***Catapyrenium* sp.** (identified in the field as *Endocarpon*) 4CB
***Cladonia fimbriata* (L.) Fr.**, 4DEB; 5JR
***Cladonia chlorophaea* (Flörke ex Sommerf.) Sprengel**, 5DEB
***Cladonia furcata* (Hudson) Schrader**, 7JR; 11BH
***Cladonia transcendens* (Vainio) Vainio**, 5MM
***Cladonia* sp.**, 5JR
***Collema nigrescens* (Hudson) DC.**, 10JR
Collema sp., 4JD (Thallus black [rarely brown], appressed, isidiose, cylindrical; phytobiont *Nostoc*; apothecia 0.3–0.7mm; disk dark brownish-black, exciple smooth; spores hyaline, muriform, septa thin, 9–13 x 20–25 μm)
***Dermatocarpon miniatum* (L.) W. Mann**, 1JR
***Dimelaena* sp.**, 15MM (serpentine)
***Endocarpon pusillum* Hedwig**; 4JR (on soil, among liverworts)
***Evernia prunastri* (L.) Ach.**, 3,7DEB; 9MM; 6BH
***Flavoparmelia caperata* (L.) Hale**, 3JR; 3DEB; 9BH
***Flavopunctelia flaventior* (Stirton) Hale**, 2,7DEB
***Fuscopannaria leucostictoides* (Ohlsson) P.M. Jørg.**, 10JR
***Heterodermia leucomelos* (L.) Poelt**, 2,7,8DEB; 6,14MM
***Hypogymnia imshaugii* Krog**, 3JR
***Hypogymnia cf. metaphysodes* (Asah.) Rass.**, 3MM (according to B. Ryan, possibly a new species)
***Hypogymnia* sp.**, 2DEB
***Hypogymnia* sp.**, 3DEB (medulla dark)
***Lecanora albella* (Pers.) Ach. var. albella** 12JR
***Lecanora cf. caesiorubella* Ach. subsp. merrillii Imshaug & Brodo**, 3DEB (spores: 14.4 x 7.2μm)
***Lecanora pacifica* Tuck.** 9BH; (no pruina, thallus with crystals; apothecia to 1.2mm (MM); det. B. Ryan)
***Lecanora* sp.**, 2DEB; 2JR
***Leproloma* sp.**, 3JR
***Leptochidium albociliatum* (Desmaz.) M. Choisy**, (5?),7DEB; WS; 7MM
***Melanelia subaurifera* (Nyl.) Essl.**, 2DEB (7DEB - isidia and soralia small)
***Normandina pulchella* (Borrer) Nyl.**, 9DT (in JR); 11BH
***Ochrolechia subpallescens* Vers.**, 3JR; 3,9MM; 9BH
***Ochrolechia* sp. (pallescens group)**, 3DEB (spores 40.8 x 26.4μm)
***Ochrolechia* sp.**, 6,14MM
***Pannaria cf. rubiginosa* (Ach.) Bory**, WS
***Parmelia sulcata* Taylor**, 3JR; 3,4DEB; 9BH
***Parmotrema chinense* (Osbeck) Hale & Ahti**, 10JR; WS; 6DEB
***Peltigera canina* (L.) Willd.**, 7JR
***Pertusaria amara* (Ach.) Nyl.**, 3DEB(KC+red); 3 (oak), 7(buckeye)JR
***Pertusaria cf. rubefacta* Erichsen**, 12JR
***Physcia adscendens* (Fr.) H. Olivier**, 1,9,14MM; 4DEB
***Physcia dubia* (Hoffm.) Lettau**, 1BH,1MM
***Physcia tenella* (Scop.) DC. subsp. tenella**, 3JR
***Physconia isidiigera* (Zahlbr.) Essl.**, 8JR; 2,3,14MM
***Physconia* sp.**, 4DEB
***Platismatia glauca* (L.) Culb. & C. Culb.**, 12JR
***Pseudocyphellaria anomala* Brodo & Ahti**, 8JR; WS; 8MM in moss: *Alsia californica*, *Dendroalsia* sp.
***Punctelia subrudecta* (Nyl.) Krog**, 3JR,3DEB
***Ramalina farinacea* (L.) Ach.**, 6,7DEB; 6JR; 4,9,14MM; 9BH

***Ramalina leptocarpha* Tuck.**, 6,11BH
***Ramalina menziesii* Taylor**, 6JR; 14MM; 7DEB (abundant [DEB])
***Ramalina pollinaria* (Westr.) Ach.**, 6JR
***Ramalina puberulenta* Riefner & Bowler**, 2,4DEB; 2,14MM
***Rinodina exigua* (Ach.) Gray**, 3JR
***Staurothele* sp.**, 5DEB (dark brown)
***Sticta fuliginosa* (Hoffm.) Ach.**, WS
***Tephromela atra* (Hudson) Hafellner**, 4JR; 7DEB
***Thelomma occidentale* (Herre) Tibell**, 2MM (det. MM, B. Ryan)
***Tuckermannopsis chlorophylla* (Willd.) Hale** WS
***Usnea arizonica* Mot.**, 3,4DEB; 9BH (sterile, 2DEB)
***Usnea californica* Herre**, WS; 7DEB(redwood); 9,11BH
Usnea cf. filipendula, 7DEB (redwood; isidiose, small papillae)
***Usnea glabrata* (Ach.) Vainio**, 7DEB
***Usnea cf. glabrata* (Ach.) Vainio**, 3DEB (sorediate, no papillae)
***Usnea kujalae* Räsänen**, 7DEB (pale; inflated; axis narrow; papillae few, small to medium; soredia minute; medulla lax with long radiate hyphae; C7% M40% A10%; P+ orange [soredia, medulla]); 7DEB (no isidia)
***Usnea scabiosa* Mot.**, WS
***Usnea subfloridana* Stirton**, 3,7DEB
***Usnea substerilis* Mot.**, 3,7DEB
***Usnea wirthii* Clerc**, 6JR; 3,7DEB
***Usnea* sp.**, 9MM
***Usnea* sp.**, 3JR
***Vermilacinia cephalota* (Tuck.) Spjut & Hale**, 6MM; 6,7DEB
***Waynea californica* Moberg**, 8JR; WS; 8MM; 8BH
***Xanthoparmelia* sp.**, 5DEB
***Xanthoria candelaria* (L.) Th. Fr. (?)** 3,6,7,8DEB
***Xanthoria fallax* (Hepp) Arnold var. fallax**, 3JR
***Xanthoria cf. fulva* (Hoffm.) Poelt & Petutschnig**; 2,3, 14MM fertile, rhizines, soredia (=blastidia) terminal/ sub-terminal
***Xanthoria cf. hasseana* Räsänen** (?) 6JR
***Xanthoria polycarpa* (Hoffm.) Rieber**, 3JR; 4DEB; 9BH (as *X. cf. ramulosa* (Tuck.) Herre (?) 6JR)
***Xanthoria* sp.**, 2DEB

Results and summary

Four principal and several other collectors spent four hours or slightly more in a small area (about 1%) of the San Francisco Watershed, visiting half or less of the total habitat types. An estimated 18 collector hours yielded lichens of 87 taxa, 20 of which were identified only to genus. One of these unidentified collections is now in the hands of a specialist, and four or five more are intended to be sent to specialists. Several of these seem to be immature or otherwise indeterminable. In view of the limited scope of the collecting activity, the number of taxa is noteworthy. A few of the collectors feel that diligent search would produce significantly more taxa even in that limited area. Most of the material collected will be maintained in the following collections: personal herbarium of Doris Baltzo, Herbarium, University of California at Berkeley, and the California Academy of Sciences. Some of the duplicate material will be in the teaching collection at San Francisco State University. Limited specimens will be maintained temporarily as reference material by the collectors.

Acknowledgements

Members of the California Lichen Society wish to express their gratitude to the San Francisco Water Department for permission to enter the Watershed, and to Dr. William Freedman for arranging and leading the trip, explaining the history of the area, and arranging a fine break in the El Niño weather. We also express our regret that Shirley Tucker was not able to make the trip. This was a disappointment for those who hoped to see her again, especially for this recorder, who appreciates the wonderful lichens detected by her sharp eye and easily identified through her experience.

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Bulletin of the California Lichen Society 5(1), 1998

The Red Spots of *Usnea wirthii*

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The genus *Usnea* is notorious among the macrolichens for the difficulties presented in understanding and recognizing its species. The variability and frequent intergradation of characters have caused professionals and enthusiasts alike to throw up their hands and move on to other less frustrating lichens. However, some species of *Usnea*, at least as currently understood, are easy to learn to recognize. *Usnea longissima* Ach. is one example, although it is increasingly rare in California (Doell 1997). *Usnea wirthii* Clerc is another distinctive species, although it is less well known. Indeed, it was formally described, based on European material, only in the last decade (Clerc 1984) and formally reported for western North America just a few years ago (Clerc and Diederich 1991). This is particularly surprising since, while rare in Europe, the species is actually quite common throughout coastal California, as well as the Pacific Northwest (McCune and Geiser 1997). Its neglect might be explained in part by its small size combined with its typically sparse occurrence among larger and more abundant Usneas and other macrolichens. However, *Usnea wirthii* may on occasion cover branches in dense, almost pure stands, as it does, for example, on shrubs in the Oakland Hills (San Francisco Bay Region).

Usnea wirthii has two distinctive characteristics, which, while not unfailingly present, are extremely useful in recognizing the lichen in our area. These characters are the yellow pigment on the surface of the central cord, and the irregular scarlet-red spots in the outer cortex (Fig. 1). Although other thallus features, such as the eroding soralia, the shiny cortex, the lax medulla and narrow central cord are also characteristic, they are variable and may be present in other short sorediate Usneas, such as *U. glabrata* (Ach.) Vainio and members of the *U. fragilescens* Hav. ex Lynge group. The yellow cord and the red spots, however, do not seem to occur on any other *Usnea* in our area. Details of thallus characteristics are given in Tavares et al. 1998.

Red cortical pigmentation is not unusual in this genus. *Usnea rubicunda* develops extensive orange-red pigmentation in the outer cortex. *Usnea subcornuta* has an apparently similar pigment deeper within the cortex. Outside of California there are a host of other species with different and often characteristic distributions of red pigment within the cortex (Tavares, manuscript in preparation). *Usnea cirrosa* Mot. from Mexico often has a spot of red over the pycnidia, and sometimes a crown of tiny red spots around the rim of the apothecia (Tavares and Sanders 1998). However, the red spots of *U. wirthii* seem to be irregularly scattered, although they often seem to be concentrated on the side of the thallus facing the sun (see Tavares et al. 1998). They remind one of the familiar symptoms of measles or chicken pox, and indeed some observers have wondered whether the spots might be caused by some pathogenic agent.

The scarlet red of the *Usnea wirthii* spots is a clearly different color from the orange red seen in *U. rubicunda* (compare Figs. 2 & 3). It may well be a different type of pigment altogether, although no studies on these lichen pigments have yet been published. In both lichens the red pigment is found within the mycobiont cell wall material; however, the specific localization of the pigment is noticeably different in the two species. The red spot of *U. wirthii* occupies a diffuse area of wall material between cortical cell lumina (Fig. 2). Its deposition is not obviously associated with individual cells of the cortex. In *U. rubicunda*, by contrast, the pigment occurs in distinctive wall layers clearly associated with individual cells within the cortex (Fig. 3). The pigmented wall layers tend to be interior, lying near or at the cell lumen, such that the form of individual, hypha-like cells of the cortex are delimited and stand out from their unpigmented neighbors. Unless very thin sections are examined with high magnification, the pigment in *U. rubicunda* may actually appear to be in the cell cytoplasm.

Pigments produced within the chloroplasts of the lichen alga function in harvesting light for photosynthesis, and in protecting the photosynthetic apparatus from damage by excessive radiation. Pigments produced by the lichen fungus have been far less studied, but in many cases are likely to serve a protective function. A number of secondary compounds found in the lichen cortex absorb significantly within the ultraviolet wavelengths that can cause damage to living cells. The possible photoprotective and photosynthesis-enhancing roles of lichen pigments are discussed in detail by Rikkinen (1995).

Many photoactive substances are capable of absorbing the invisible ultraviolet radiation and reradiating (fluorescing) it at longer wavelengths which are colors of the visible spectrum. Examining a cross section of *U. wirthii*

with UV-epifluorescence microscopy reveals a variety of photoactive substances (Fig. 4). The algal cells, with their large quantities of chlorophylls and accessory photosynthetic pigments, fluoresce orange. The cortex shows a light greenish glow, and the central cord fluoresces bright yellow (Fig. 4), probably due to deposited secondary metabolites. All of these compounds may offer some protection against UV-light, since they can absorb and reradiate it as lower energy visible light. It is also possible that some of the reradiated visible light may be absorbed by algal chlorophyll and used in photosynthesis.

The red spots of *Usnea wirthii* do not fluoresce under the UV lamp. Instead they appear very black, even darker than the non-fluorescing parts of the sample which faintly reflect some visible light (Fig. 5). This indicates that the spots strongly absorb visible light, and possibly some of the UV wavelengths as well.

Could the red spots have a photoprotective or even a photosynthesis-enhancing role? Often the spots appear more concentrated on the side of the thallus exposed to the sun. But the total area of the spots seems much too small for such a function. Sometimes many rod-like particles less than 1 μm long can be observed when the thallus is sectioned. These fall within the size range of certain bacteria, although no structure can be resolved with the light microscope. The presence of bacteria might suggest an explanation for the red spots, but the rod-like particles do not seem to correlate in distribution with the red spots. Electron microscopy is needed to determine if these particles are indeed bacteria. This would not, however, prove that the red spots are caused by bacteria (an experimental infection of unspotted thalli by the suspected pathogen would be necessary for proof). If the red spots are indeed the result of some disease, one would want to understand why the thalli otherwise appear to be healthy, and why such an overwhelming percentage are "afflicted" in our area without any other species being similarly affected.

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Call for Collaborators

One of the attractions of lichenology is that it is a discipline in which the amateur can actually contribute to current research. Now an opportunity for input from CALS members has opened up, and I am hoping to persuade a number of you to become involved. Darrell Wright and I are interested in preparing a detailed report on the current status of *Usnea longissima* Ach. in California. This will provide a baseline for future monitoring and aid in our ultimate goal of arranging for some kind of protected status for this lichen.

Usnea longissima is one of the state's most distinctive lichens. A tall tree festooned with it and standing in the sunshine is truly a sight to behold. The individual strands, sometimes more than six feet long, have an unmistakable silver sheen because the main branches partly lack the cortex found on other pendulous lichens. Unfortunately this lichen is very susceptible to air pollution. This, together with habitat destruction, has taken its toll of *U. longissima* throughout its range in California.

I am calling on all CALS members to keep an eye out for *U. longissima* on your excursions into this range. Look for it in the northern half of the state along the coast and inland about 20 miles, roughly the same area where you find redwood trees. It is generally found on large trees, either conifers or broad-leaved species, and often at the edge of a ravine or canyon where the air is moving and there is adequate light.

For those of you who want to assist us in this survey, please include in your report the following information: date, geographic location, substrate species, surrounding vegetation, and altitude if available. Also, please include a short (4 to 5 in.) piece of the thallus for a voucher specimen. There should be a fragment on the ground. Don't attempt a dangerous climb to secure a specimen. Time-wise, our goal is to put together a progress report by the summer issue of the *Bulletin* in 1999. Let's see how many locations we can determine by then. I have volunteered to keep track of all these reports, so please mail them to:

Janet Doell
1200 Brickyard Way #302
Point Richmond, CA 94801
(510)236-0489 or e-mail: doell@slip.net

Aggressive Lichens, or Goodbye *Cladonia*

Janet Doell
1200 Brickyard Way #302
Point Richmond, CA 94801

Don't think for a moment that lichens, those slow growing, unobtrusive organisms, are all peace and serenity. In their own cautious way they also demonstrate greed for territory and sometimes sinister means of getting it. This became obvious to me over the past few years at Jasper Ridge, Stanford University's Biological Preserve in San Mateo County. Gradually the thalli of the *Cladonia chlorophaea* (Flörke ex Sommerf.) Sprengel, growing on some greenstone rocks at the west end of the dam across Searsville Lake, were disappearing, to be replaced by *Diploschistes muscorum* (Scop.) R. Sant., a small grayish-white crustose species. Closer examination disclosed what looked like a regular invasion by the *Diploschistes* into the territory of the *Cladonia*. In the latter genus the primary thallus or body of the lichen consists of small leaf-like structures known as squamules. From a squamule a hollow stalk called a podetium develops. The podetium in *C. chlorophaea* and some other species has a cup-shaped tip. Red or brown apothecia (fruiting bodies) may form on the rim of the cup in different species. In other species there is no cup at all, and the podetium is branched or pointed. In the case of the *Cladonia* being discussed here, the gray podetia were being squeezed out by the encroaching invader, and the squamules were becoming covered by the thalli of the *Diploschistes*. In Chris Andrews's illustration of this encounter, (Fig. 1), the small, round disklike fruiting bodies of the *Diploschistes* are prolific and vigorous, while the solitary *Cladonia* podetium is stressed and about to succumb. The process we are witnessing here seems to be similar to that described by T. Friedl of the University of Bayreuth, Germany, in 1987. In Friedl's study, hyphae of the *Diploschistes* first invaded the squamules of the *Cladonia* and simultaneously the victim formed warty growths along its surface. These growths were packed with cells of the green alga *Trebouxia irregularis*, which is known to be favored by species of *Cladonia*. The *Diploschistes* used these cells as a photobiont (algal partner) in early development. Gradually this alga was replaced by *Trebouxia showmanii*, a species frequently found in *Diploschistes*. Although both species of alga could be present for a time, as the *Diploschistes* matured and the *Cladonia* died, the *T. irregularis* was entirely replaced by *T. showmanii*. The question is often posed about how developing lichen fungi find the alga required for the generation of the shape characteristic of the lichen. *Diploschistes muscorum* demonstrates one method: use the alga of another genus to get started, eventually latch onto your favored one, and never mind if your host dies. Should you ever have the opportunity to check out this action before the *Cladonia* entirely disappears, bear in mind that these lichens are very small, and bring along a hand lens. The author wishes to thank Dr. Shirley Tucker for reviewing this article.

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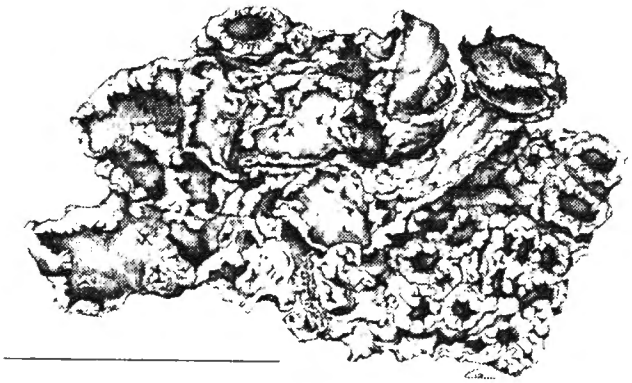

Fig. 1. *Cladonia* podetium (on right) being squeezed and stressed by encroaching *Diploschistes*. Bar = 5mm

NEWS AND NOTES

Completed Workshop Series

January 10,1998 — Eleven CALS members met at the University and Jepson Herbaria at the University of California, Berkeley to hear Mona Bourell of the California Academy of Sciences lecture on curating lichens: collection techniques, preparation of specimens, labelling, and storage, reminding us to freeze our dried specimens to guard against pest infestation. In the afternoon William Sanders spoke about the origin, methods and results of his studies on the growth patterns of *Ramalina menziesii*. Attending were Mona Bourell, Stephen Buckhout, Susan

Crutchfield, Janet Doell, Bill Hill, Marck Mencke, Dick Moe, Judy Robertson, John Rusk, William Sanders, and Stella Yang.

February 21, 1998 — Despite heavy rain Cathleen Cannon, Bill Hill, Judy Robertson, and Stella Yang met at San Francisco State University for a very productive workshop of discussion about the role of CALS in providing direction and advice for parks and lands management organizations. We also identified more crustose specimens from the December workshop material.

March 21, 1998 — This workshop focused on *Usnea*. Doris Baltzo explained unique *Usnea* terminology and led us through the *Usnea* key published in the CALS 1997 winter *Bulletin*. The participants, Susan Crutchfield, Bill Hill, Judy Robertson, and Stella Yang, drew on Doris's expertise to identify their own *Usnea* specimens.

Field Trips

Report of Field Trip to Ashland, Oregon — California Lichen Society members met with members of the Oregon Native Plant Society and representatives of the U.S. Forest Service and Bureau of Land Management at Southern Oregon University for the Oregon field trips May 23 and 24, 1998. A wide variety of habitats and elevations was explored during the two days in the field, providing an extensive species list.

On Saturday May 24, the group explored Pilot Rock, a landmark monolith on the ridge between the Rogue River and Klamath River watersheds. Guided by Rogue River Forest Botanist Wayne Rolle, the group of 18 lichen enthusiasts began the walk at an elevation of about 5200 feet in an old growth conifer forest. A few patches of snow remained under the canopy. The trail rose gently to emerge in a steep opening with large lichen-covered rocks. Continuing on to an elevation of approximately 5600 feet, the group passed through other habitats, including juniper, meadow, oak and chaparral.

Steven Jessup of the Biology Department at SOU arranged for the group to meet Saturday evening at the University for a lab session to identify the day's finds.

On Sunday May 24, the group met again, this time to be guided by David Wagner, Botanical Consultant, to the Enchanted Forest Trail in the lowlands near the Applegate River. This area provided mixed hardwoods, meadow and chaparral with a few large conifers (and an abundance of poison oak). Wildflowers were in fine bloom at this lower elevation.

In order to obtain permission to collect in this area, the Society agreed to furnish the managing agency (Bureau of Land Management) with a list of species found. Participants should send identifications with collection information to:

Stella Yang,
1389 Heckman Way,
San Jose, CA 95129
yscottie@juno.com

Please include relevant notes such as substrate, habitat, exposure, relative abundance at the site, elevation, longitude and latitude if possible with the collection number. Lists of identified species will be published in a subsequent issue of the *Bulletin*.

Submitted by Veva Stansell

On April 8, 1998 Janet Doell led a lichen field trip in the Santa Cruz Mountains for the Santa Clara Chapter of the California Native Plant Society. The trip was instigated by CALS and CNPS members Stella Yang and Steve Buckhout. Twelve CNPS members enjoyed the sunny day in the woods and learned that lichens seen in their native habitat were more impressive than those studied in a herbarium.

Stanford University's Jasper Ridge Biological Preserve opened its gates to the public on May 17, 1998 in celebration of the 25th anniversity of the establishment of the preserve. Over 3,000 people took advantage of this opportunity to visit the preserve and become acquainted with the work being done there. The lichen exhibit was visited by a continuous stream of people of all ages for the whole seven hours of the event. CALS members Chris Andrews, Elizabeth Rush, Janet Doell (Jasper Ridge Docents) and Barbara Lachelt manned the table with help from other interested Jasper Ridge docents.

Reminder to those who travelled to Santa Cruz Island for the CALS Foray September 1997. Please send your lichen lists to Cherie Bratt. This information will be published in a future *Bulletin*.

Reference Collection

CALS now has a traveling reference collection compiled by Dr. Shirley Tucker. These boxed specimens are available to any CALS member for loan for a month. The lichen specimens included in the collection are:
Acarospora socialis, *Alectoria sarmentosa*, *Arthonia pruinata*, *Arthonia radiata*, *Bryoria abbreviata*, *Caloplaca cerina*, *Caloplaca coralloides*, *Candelaria concolor*, *Candelariella rosulans*, *Chrysothrix candelaris*, *Cladina rangiferina*, *Cladonia chlorophaea*, *Cladonia furcata*, *Cliostomum griffithii*, *Cyphelium tigillare*, *Dimelaena radiata*, *Diploschistes scruposus*, *Diplotomma penichrum*, *Evernia prunastri*, *Flavoparmelia caperata*, *Graphis scripta*, *Heterodermia leucomelos*, *Hyperphyscia adglutinata*, *Hypogymnia imshaugii*, *Hypogymnia mollis*, *Lecanora caesiorubella* subsp. *merrillii*, *Lecanora confusa*, *Lecanora pacifica*, *Lecanora sierrae*, *Lecidea tessellata*, *Lecidella*

asema, *Leprocaulon microscopicum*, *Leptochidium albociliatum*, *Leptogium corniculatum*, *Letharia columbiana*, *Letharia vulpina*, *Melanelia glabra*, *Melanelia subaurifera*, *Ochrolechia oregonensis*, *Opegrapha herbarum*, *Parmotrema chinense*, *Parmotrema hypoleucinum*, *Peltigera collina*, *Pertusaria amara*, *Pertusaria flavicunda*, *Pertusaria texana*, *Physcia clementei*, *Physcia stellaris*, *Physconia perisidiosa*, *Psora tuckermanii*, *Punctelia subrudecta*, *Pyrrhospora quernea*, *Ramalina farinacea*, *Ramalina leptocarpha*, *Ramalina menziesii*, *Sigridea californica*, *Teloschistes exilis*, *Thelomma mammosum*, *Tuckermannopsis platyphylla*, *Umbilicaria phaea*, *Usnea rubicunda*, *Usnea wirthii*, *Vermilacinia procera*, *Vulpicida canadensis*, *Xanthoparmelia cf. cumberlandia*, *Xanthoparmelia taractica*, and *Xanthoria polycarpa*.

We are in the process of developing a card file to accompany the specimens highlighting the field identification characters of each lichen. We would like to add to this collection. If you can provide any of the specimens listed below or any others you feel would be good study material please send them to me with a collection label and a 3 X 5 card listing the distinctive characters. We will package the specimen and add it to our collection.

Desiderata: *Cladonia macilenta*, *Cladonia verticillata*, *Collema* spp., *Dermatocarpon miniatum*, *Flavopunctelia flaventior*, *Kaernefeltia merrillii*, *Lecanora muralis*, *Leptogium* spp., *Lobaria pulmonaria*, *Niebla homalea*, *Normandina pulchella*, *Parmelia sulcata*, *Peltigera* spp., *Physcia adscendens*, *Physcia aipolia*, *Platismatia glauca*, *Pseudocyphellaria anomala*, *Pseudocyphellaria anthraspis*, *Psora nipponica*, *Sphaerophorus globosus*, *Sticta* spp., *Usnea arizonica*, *Vermilacinia cephalota*, and *Xanthoria candelaria*.

Send to:

Judy Robertson
362 Scenic Avenue
Santa Rosa, CA. 95407

UPCOMING EVENTS

Workshops for Fall 1998

September 26, 1998 — San Francisco State University, Hensill Hall, 10 am to 4 pm. Focus: *Xanthoria*. We will use Louise Lindblom's *Xanthoria* key (J. Hattori Bot. Lab. 83:75–172. 1997. Reviewed in Bull. Calif. Lichen Soc. 4: 28). Bring your *Xanthoria* specimens for identification.

October 24, 1998 — San Francisco State University, Hensill Hall, 10 am to 4 pm. Focus: Microscopy. Mikki McGee will explain setting up a microscope, proper care of the microscope and proper techniques for making microscope preparations.

November 21, 1998 — San Francisco State University, Hensill Hall, 10 am to 4 pm. Focus: *Physcia*, *Physconia*, *Phaeophyscia*. We will use published keys to distinguish and identify these genera and explain and demonstrate techniques for chemical testing. Bring your specimens for identification.

December 19, 1998 — San Francisco State University, Hensill Hall, 10 am to 4 pm. Focus: *Buellia* and *Ochrolechia*. Using keys published in the CALS *Bulletin* and elsewhere we will use chemical tests and study sections of specimens with the microscope in order to identify specimens of these crustose genera. Bring your unknowns for identification.

In Memoriam

CALS member Jim Trumbull passed away last year after a brief illness. He was involved in an incredible number of environmental and educational organizations on the Peninsula, and his energy and enthusiasm will be missed by many. CALS was honored to have had him as a member.

Field trips

Desert Field Trip, October 9–12, 1998 — CALS has planned a unique field trip for the weekend of October 9–12, 1998. We will be getting a look at desert lichens at the Sweeney Granite Mountains Desert Research Center, part of the University of California's reserve system. This is a beautiful part of the Eastern Mojave Desert, between Kelso and Amboy, and people living or working in the area all agree that early October is the very best time to go there.

The cost of housing at the Research Center is $4.50 a night. Camping is available for $2.00 a night. Food will be arranged by CALS and the cost will be kept within reason.

There will be lichens galore at areas requiring short drives and little or no walking, and opportunities for longer drives and longer hikes for those so inclined. A request for a collecting permit has been submitted and no problem is anticipated there.

The Granite Mountains are a good 9–10 hour drive from the Bay Area, much closer of course for our more southern members. Another alternative is to fly to Las Vegas and rent a car for the approximately two hour drive from there.

Please call, write, or e-mail Janet Doell if you are interested in this field trip and you will receive maps and program details as they develop. No need to make a commitment yet, but I would like some idea of possible attendance.

Dates again: Arrive Friday October 9 in the afternoon or evening. Collecting trips Saturday and Sunday. Depart Monday October 12 in the morning. Or any part of the above.

Janet Doell (510)236-0489
1200 Brickyard Way #302
Point Richmond, CA 94801 doell@slip.net

Field trips for 1999 are still in the planning stage.

San Francisco Watershed—We have a tentative date to revisit the Watershed **January 23.** Bill Freedman will lead us to a different area for a continuation of our lichen survey.

San Simeon State Park—We will have the opportunity to compile a complete lichen survey of this area. The date will be in April. Look for details in the Winter *Bulletin*.

Increase in Dues for Foreign Subscribers

Effective January, 1999, dues for foreign subscribers will be increased to $20.00 to cover postal costs.

PRESIDENT'S NOTES

My term as President started out with a very pleasant evening of friendship and delicious food. After the foray to the San Francisco Watershed on January 31, twelve CALS members returned to San Francisco State University where a variety of activities followed. Some of the group met in the laboratory and focused on identifying their collected specimens, the new and old boards held a board meeting, and others started preparation for dinner.

At the general meeting the new board was presented. We were then treated to a catered dinner in the unique atmosphere of the botany laboratory. Plants and greens decorated the room while caterers efficiently prepared and served a delicious meal. On behalf of the Society I presented Janet Doell with a plaque honoring her as our Founder. She was also presented with special bottles of wine from a Santa Barbara winery. Cherie Bratt made a presentation to Richard Doell for his support of the Society. The original members of CALS were recognized and we ended the celebration singing "Happy Birthday" to CALS complete with a CALS-decorated birthday cake.

After dinner, Dr. Philippe Cohen of the Jasper Ridge Biological Preserve spoke about the challenges and rewards of being a Biological Preserve Director. Previously he served as director of the Granite Mountains Preserve, the site of our coming October foray.

My goals for CALS are to build upon the excellent foundation of the past four years as we foster continued learning and growth for the Society and for the individual members. Some of the ways we can do this are through our bulletin, field trips, workshops, and our recently acquired travelling reference collection of specimens.

The *Bulletin* is an excellent resource. The editors and contributors are striving to meet the needs of the beginner and the advanced lichenologist. We welcome your contributions.

The workshops foster the community of mentors and learners as we gain expertise in the essential skills of identifying specimens, performing chemical testing, making slide preparations, and becoming familiar with library and herbarium research.

Field trips give us the opportunity to explore and map the lichen environment that surrounds us as well as meeting and sharing knowledge with other lichen enthusiasts.

I wholeheartedly invite you to participate in the area of your interest. If you have any suggestions about how we can fill your unique needs, I want to hear from you. Good luck in your lichen pursuits.

Judy Robertson

The Bulletin of the California Lichen Society

Vol. 5. Part 1 1998