

APPENDIX I: CHECKLIST OF THE MOSSES OF HAWAII VOLCANOES NATIONAL PARK

Currently accepted names are listed in *bold italic* type followed by recently used synonyms, primarily since Bartram (1933), in *smaller italic* type. Determination of status (endemic, indigenous, or alien) and distribution in Hawaii follows Staples, et al. (2004) except where noted. Endemic refers to a species whose natural range is limited to the Hawaiian Islands, indigenous refers to a species whose natural range includes both the Hawaiian Islands and elsewhere, and alien refers to a species whose natural range does not include the Hawaiian Islands and which arrived in Hawaii via human transport. Status data may be different in NPSpecies than in the checklist below, because NPSpecies uses slightly different definitions. Known distribution within the Hawaiian Islands is listed with the abbreviations K=Kauai, O=Oahu, Mo=Molokai, L=Lanai, Ma=Maui, and H=Hawaii Island. Abundance of each species within HAVO, using the abundance terms defined in NPSpecies (see table below), was estimated based on the author's experience in the field. Specimens from the HAVO Herbarium (HAVO) or the Bishop Museum Herbarium (BISH) examined to verify identification are listed last. Only representative specimens are listed for species having an unwieldy abundance of herbarium specimens.

NPSpecies abundance terms

Abundant	Large number of individuals; wide ecological amplitude or occurring in habitats covering a large portion of the park.
Common	Large numbers of individuals predictably occurring in commonly encountered habitats but not those covering a large portion of the park.
Uncommon	Few to moderate numbers of individuals; occurring either sporadically in commonly encountered habitats or in uncommon habitats.
Rare	Few individuals, usually restricted to small areas of rare habitat.

Acroporium fuscoflavum (C. Müller) Brotherus, 1925

Endemic. K, O, Mo, L, Ma, H.

Abundant. In wet forests on trees and logs.

Representative specimens examined: Cuddihy 1742 ; Higashino & Katahira 9990, 9973 (HAVO).

Aerobryopsis subdivergens ssp. *scariosa* (E.B. Bartram) Nog.

Aerobryopsis scariosa Bartr. 1939

Indigenous. K, O, Mo, Ma.

Uncommon. In wet forests on humus and logs.

Specimens examined: Hoe 662.0, 1501.0 (BISH); Skottsberg 2010, 2028 (BISH); Waite 040622-03, 040710-z-01 (HAVO).

Amphidium tortuosum (Hornschuch) Cufodontis, 1951

Amphidium cyathicarpum (Montagne) Brotherus, 1902

Grimmia haleakalae Reichardt, 1877

Indigenous. Ma, H.

Uncommon. Frequent on wet rock in high elevation lava tube entrances of Mauna Loa.

Representative specimens examined: L.W. Cuddihy s.n. (HAVO); Waite 040617-06e, 040619-04-04, 040703-07-03, 040714-05a-7, 040715-03-03 (HAVO)

Andreaea acutifolia J. D. Hooker & Wilson, 1844

Indigenous. Ma, H.

Unknown abundance. On rock at high altitude.

Notes: Vitt & Hoe (1980) first report this species in Hawaii based on specimens from Haleakala and Mauna Kea.

Specimens examined: Waite 040714-06-08 (HAVO).

Anoetangium aestivum (Hedwig) Mitten, 1869

Anoetangium euchloron

Indigenous. K, O, Mo, L, Ma, H.

Common. Locally abundant on shaded, wet rock in lava tube tubes and lava cracks.

Representative specimens examined: Weber & Bujakiewicz B-81931; Waite 040608-17a-1, 040702-04b, 040703-07-04, 040703-09-04, 040715-03-01, 040715-06-11 (HAVO)

Anoetangium haleakalae (C. Müller) Paris, 1900

Endemic. K, O, Mo, Ma, H.

Uncommon. Usually intermixed with *A. aestivum* in wetter cave entrances and rocky cliffs.

Notes: Zander, et al. (1979) sunk *A. haleakalae* into *A. aestivum*. However, *A. haleakalae* is in the current list of world-wide accepted moss species (Magil et al. 2000 online at www.mobot.org).

Specimens examined: Waite 040605-09, 040605-12a, 040617-3f, 040710-z-02, 040714-05a5 (HAVO).

Baldwiniella kealeensis (Reichardt) E. B. Bartram, 1933

Baldwinella kealeensis (Reichardt) E. B. Bartram, 1933

Endemic. K, O, Mo, L, Ma, H.

Common. In very wet, shaded microhabitats such as on the forest floor in Olaa Tract and lava tube entrances in wet forest.

Specimens examined: Weber & Bujakiewicz B-81933, B-81965 (BISH & HAVO); Cuddihy s.n.; Waite s.n. (HAVO).

Barbellopsis trichophora (Montagne) W. R. Buck, 1998

Barbella trichophora (Montagne) Fleischer 1906

Endemic. K, O, Mo, Ma, H.

Uncommon. On trees in mesic to wet forest

Specimens examined: Selling, O. 4694 (BISH); Waite s.n. (HAVO).

Brachymerium exile (Dozy & Molkenboer) Bosch & Sande Lacoste, 1860

Indigenous. K, O, Mo, Ma, H.

Common. Locally abundant on exposed ash soil.

Specimens examined: Waite 040607-24, 040607-36a, 040608-02h-1, 040703-01 (HAVO).

Brachythecium hawaiiicum E. B. Bartram, 1939

Endemic. Ma, H.

Unknown abundance.

Specimens examined: None.

Brachythecium lamprocarpum (C. Müller) Jaeger, 1878

Indigenous. K, Ma, H.

Uncommon. On shaded rock or humus. Sometimes abundant in cave entrances.

Specimens examined: Winona Char s.n.; Waite 040608-17b-3.1, 040617-07-05, 040619-04-01, 040715-06-01 (HAVO);

Brachythecium plumosum (Hedwig) W. P. Schimper in B.S.G., 1853

Brachythecium oxyrrhynchium (Dozy & Molkenboer) Jaeger, 1876-1877

Indigenous. K, O, Mo, Ma, H.

Unknown abundance. On shaded damp soil.

Specimens examined: Waite 040702-02-09(HAVO).

Breutelia affinis (W. J. Hooker) Mitten, 1856

Breutelia kilaueae (C. Müller) Brothorus, 1904

Indigenous. H.

Rare or extinct. Not collected in the Hawaiian Islands since the first specimen was collected From Kilauea, Island of Hawaii (Virtanen, 1997).

Specimens examined: None.

Breutelia arundinifolia (Duby in Moritzi) Fleischer, 1904

Indigenous or possibly misidentified alien. K, O, Ma, H.

Uncommon. Locally abundant along roadsides near Kilauea Visitor Center and the Resources Management field station and likely to spread further along roadsides in the wetter parts of the park.

Specimens examined: Hoe 1623.0 from Volcano Village (BISH): Waite 040622-01 (HAVO).

Bryum argenteum Hedwig var. *lanatum* (Palisot de Beauvois) 1839

Indigenous. K, O, Ma, H.

Common. Locally abundant on ash soil or rock. Only rarely with sporophytes.

Specimens examined: Cuddihy s.n.; Waite 040607-35, 040619-05-03, 040712-03-01, 040715-06-07 (HAVO).

Bryum atrovirens Bridel, 1803

Bryum erythrocarpum Schwaegrichen, 1816

Indigenous. O, Ma, H.

Uncommon. Possibly more common but easily overlooked because of its small size.

On shaded rock in dry habitats.

Specimens examined: Cuddihy 1606, Cuddihy 1585; Waite 040703-09-07, 040722-B-03 (HAVO).

Bryum caespiticium Hedwig, 1801

Indigenous. Ma, H.

Unknown abundance. Easily overlooked because of its small size. On exposed soil or rock.

Specimens examined: Waite 040722-A-02 (HAVO).

Bryum hawaiiicum Hoe, 1974

Bryum crassicostatum Brotherus, 1927

Indigenous (Redfearn et al. (1996) extend the range of this species to China). Ma, H.

Common. Easily overlooked because of its small size. On exposed humus or soil.

Specimens examined Hoe s.n.; Cuddihy 1618; Waite 040608-02h-4, 040608-03a, 040617-05-02 (HAVO).

Buckiella draytonii (Sullivant) Ireland

Catagonium draytonii

Hypnum draytonii Sullivant, 1854

Hypnum eudorae Sullivant, 1854

Plagiothecium draytonii (Sullivant) E. B. Bartram, 1933

Endemic. K, O, Mo, Ma, H.

Uncommon. In shaded wet forest habitats.

Specimens examined: L.W. Pratt s.n.; Higashino 9900; Weber & Bujakiewicz B-81952 (HAVO).

Calymperes tenerum C. Müller, 1872

Indigenous. K, O, Mo, Ma, H.

Unknown abundance. Collected by Hoe from area along the Kalapana Highway just outside the park now covered by lava. Probably still extant in forested low elevation kipukas. On shaded rocks and branches.

Specimens examined: None.

Campylopodium medium (Duby in Moritzi) Giese & Frahm, 1985

Campylopodium euphorocladium (C. Müller) Beschereille, 1873

Indigenous. K, O, Mo, Ma, H.

Unknown abundance. Easily confused with *Campylopus* species on humus and tree trunks in wet forests.

Specimens examined: Weber & Bujakiewicz B-81910; Winona Char s.n. (HAVO).

Campylopus exasperatus (Nees & Blume) Bridel, 1826

Endemic. K, O, L, Ma, H

Abundant. On exposed rock or soil especially in dry areas but frequent along roadsides in wet areas.

Representative specimens examined: Hoe 1252; Higashino & Muller 9870; Cuddihy 1617; Waite 040608-18a, 040617-08, 040624-01-04, 040720-09-02, 040721-01-02 (HAVO).

Campylopus fragilis* ssp. *zollingerianus

Campylopus boswellii

Indigenous. K, O, Mo, Ma

Unknown abundance.

Specimens examined: Weber & Bujakiewicz B-81921; Waite 040620-07-02, 040624-01-01 (HAVO).

***Campylopus hawaiiicus* var. *densifolius* (Ångström) Frahm, 1978**

Campylopus densifolius var. *densifolius* Ångström, 1872

Endemic. K, O, Mo, Ma, H.

Abundant. On tree trunks, humus, and shaded rocks in mesic to wet forests.

Representative specimens examined: Weber & Bujakiewicz B-81907; Waite 040607-04a, 040607-25, 040607-30a (HAVO).

***Campylopus hawaiiicus* var. *hawaiiico-flexuosus* (C. Müller) Frahm, 1978**

Campylopus densifolius var. *hawaiiico-flexuosus*

Campylopus hawaiiico-flexuosus (C. Müller) Paris, 1900

Endemic. K, O, Mo, L, Ma, H.

Abundant. On tree trunks and humus in mesic to wet forests.

Specimens examined: Weber & Bujakiewicz B-81938, B-81967; Higashino & Muller 9852; Waite 040607-11a, 040616-02, 040710-x-01 (HAVO).

Campylopus hawaiiicus* (C. Müller) Jaeger, 1872 var. *hawaiiicus

Campylopus densifolius var. *purpureo-flavescens*

Campylopus purpureo-flavescens Hampe, in herbaria

Indigenous. K, O, Mo, L, Ma, H.

Abundant. On tree trunks and humus in mesic to wet forests.

Specimens examined: Waite 040609-02b, 040710-y-05, 040719-03, 040720-08 (HAVO).

***Campylopus latitextus* Sande Lacoste, 1872**

Campylopus fumarioli C. Mull., 1900

Indigenous. K, O, Mo, L, Ma, H.

Unknown abundance.

Specimens examined: None.

***Campylopus praemorsus* (C. Müller) Jaeger, 1872**

Endemic. K, O, L, Ma, H.

Unknown abundance. Very similar in appearance to *C. exasperatus*.

Specimens examined: None.

***Campylopus schmidii* ssp. *schimidii* (C. Müller) Jaeger, 1872**

Campylopus aureus Bosch & Sande Lac, 1858

Campylopus introflexus misapplied

Campylopus polytrichoides misapplied

Indigenous. K, O, Ma, H.

Abundant. Abundant on exposed soil between 1500-2100 m (5000-7000 ft.) elevation.

Representative specimens examined: Weber & Bujakiewicz B-81895; W.J. Hoe 1261; Winona Char s.n.; T. Belfield s.n.; Waite 040624-08-02, 040702-02-05, 040702-07a (HAVO).

***Campylopus umbellatus* (Schwäggrichen & Gaudichaud ex Arnott) Paris, 1894**

Indigenous. K, O, L, Ma, H.

Abundant. On exposed rock or soil in dry to wet locations.

Representative specimens examined: Waite 040608-06b, 040620-06-05, 040710-03 (HAVO).

Campylopus wheeleri (C. Müller) Hampe ex Paris, 1900

Dicranoloma wheeleri (C. Mull.) Par. 1904

Endemic. K, Ma, H.

Unknown abundance. This is recorded from the park based on a single specimen at BISH.

Specimens examined: None.

Ceratodon purpureus (Hedwig) Bridel, 1826

Indigenous. Distribution: K, O, Ma, H.

Abundant. Usually on exposed ash soil and rock but also in cave entrances at higher elevations.

Representative specimens examined: Hoe s.n.; MacDonald s.n.; Smathers s.n.; Waite 040605-03, 040702-07c, 040714-06-09, 040715-06-04, 040718-03-04, 040722-B-01 (HAVO).

Ctenidium elegantulum Brotherus, 1927

Endemic. O, Ma, H.

Unknown abundance.

Specimens examined: None.

Dicranella hawaiiica (C. Müller) Brotherus, 1901

Endemic. K, O, Mo, Ma.

Unknown abundance.

Specimens examined: Cuddihy s.n.; Waite 040718-07c-02, 040725-11-02 (HAVO).

Dicranella integrifolia E. B. Bartram, 1933

Endemic. O, Mo, Ma, H.

Abundant. On exposed ash soil.

Representative specimens examined: Hoe s.n., Weber & Bujakiewicz B-81919; Waite 040624-08-06, 040702-02-06, 040718-03-03, 040718-07a, 040718-08 (HAVO).

Dicranodontium porodictyon Cardot & Thériot, 1911

Dicranodontium falcatum Brotherus, 1927

Indigenous. K, O, Mo, Ma, H.

Uncommon. On humus and tree trunks in wet forest.

Specimens examined: Higashino & Allen 10179; Waite 040710-z-04 (HAVO).

Dicranum speiophyllum Montagne, 1843

Endemic. K, O, Mo, Ma, H.

Common. On humus and logs in mesic to wet vegetation.

Representative specimens examined: Higashino & Allen 10187; Hoe 1256; Weber & Bujakiewicz B-81923; Waite 040607-40, 040608-02a, 040702-04f (HAVO).

Didymodon insulanus (De Not.) M.O. Hill

Barbula vinealis var. *flaccida* B.S.G., 1842

Barbula vinealis Bridel ssp. *cylindrica* (Taylor) Boulay, 1884

Didymodon vinealis var. *flaccidus* (Brach. & Schimp.) RH Zander

Indigenous. O, Ma.

Unknown abundance. On soil and rock.

Specimens examined: Weber & Bujakiewicz B-81899, B-81900; Waite 040608-16a, 040715-03-02 (HAVO).

Didymodon vinealis (Bridel) Zander, 1978

Barbula vinealis

Indigenous. H (this report)

Unknown abundance. On soil.

Notes: *D. vinealis*, in its current circumscription, is a new record for the Hawaiian Islands. Old concepts of *D. vinealis* included a taxon already recorded from the Hawaiian Islands as a variety but now classified as the separate species *D. insulanus*.

Specimens examined: Waite 040702-02-07, 040703-09-03 (HAVO).

Distichophyllum freycinetii (Schwägrichen) Mitten in Seemann, 1873

Endemic. K, O, Mo, L, Ma, H.

Common. On wet soil or humus in understory of wet forests.

Representative specimens examined: Weber & Bujakiewicz B-81989; Higashino 9894, 9899; Waite s.n. (HAVO).

Distichophyllum paradoxum (Montagne in Gaudichaud) Mitten in Seemann, 1873

Endemic. K, O, Mo, L, Ma, H.

Common. On wet soil or humus in understory of wet forests.

Specimens examined: Cuddihy 1741; Higashino & Katahira 9987; Weber & Bujakiewicz B-81947; Waite s.n., 040725-08a-03 (HAVO).

Ectropothecium arcuatum Mitten in Seemann, 1873

Endemic. K, O, Ma, H.

Unknown abundance.

Specimens examined: None.

Ectropothecium decurrens (Sullivant) Nishimura, 1985

Ctenidium decurrens (Sullivant) Brotherus, 1927

Endemic. K, O, Mo, Ma, H.

Common. On humus in partially shaded mesic to wet habitats

Specimens examined: Anonymous 1913; Waite s.n., 040607-01, 040607-12, 040609-02f, 040702-02-01 (HAVO).

Ectropothecium sandwichense (W. J. Hooker & Arnott) Mitten in Seemann, 1873

Indigenous. K, O, Mo, L, Ma, H.

Unknown abundance.

Specimens examined: None.

Entosthodon subintegrus (Brotherus) H. A. Miller, H. O. Whittier & B. Whittier, 1978

Funaria subintegra Brotherus, 1927

Endemic. K, O, Mo, L, Ma, H.

Common. On partially shaded, damp soil.

Specimens examined: Cuddihy 1695; Waite 040702-02-12, 040720-02 (HAVO).

Fabronia degeneri E. B. Bartram, 1933

Endemic. O, Mo, H.

Unknown abundance. Common on *Sapindus* trees in Kipuka Puaulu.

Specimens examined: Waite 040718-02-04 (HAVO).

Fissidens bryoides Hedwig, 1801

Fissidens hawaianicus E.B. Bartram, 1933

Fissidens insularis E.B. Bartram 1933

Fissidens oahuensis E.B. Bartram 1939

Indigenous. K, O, Mo, L, Ma, H.

Abundant. On damp soil in deep shade such as under logs and in cave entrances.

Representative specimens examined: Weber & Bujakiewicz B-81949; Waite 040608-17b-2, 040617-01a, 040619-04-05, 040715-04-05 (HAVO).

Fissidens elegans Bridel, 1806

Fissidens bishopii Hoe

Fissidens baldwinii Brotherus, 1927

Indigenous. K, O, Mo, L, Ma, H.

Common. On damp soil or rock in deep shade such as in lava tube entrances.

Specimens examined: Waite 040721-01-01, 040722-01 (HAVO).

Fissidens kilaueae Hoe & H. Crum, 1971 [1972]

Endemic. K, O, L, Ma, H.

Unknown abundance. Its minute size makes it difficult to locate. Hoe & Crum (1971) described this as new species from hapu`u (*Cibotium*) stipes at Thurston Lava Tube, Hawaii Volcanoes National Park.

Specimens examined: Hoe 1072.0 (HAVO).

Fissidens lancifolius E. B. Bartram, 1939

Endemic. K, O, Mo, L, Ma, H.

Unknown abundance. This genus typically inhabits deeply shaded wet environments.

Specimens examined: None.

Funaria hygrometrica Hedwig, 1801

Indigenous. O, H.

Unknown abundance. Usually present as a weed on potting media in the green houses at near the Resource Management Field Station. An ephemeral species that usually appears in great numbers on exposed soil in the second year after fires in the park such as at Hilina Pali (CW Smith pers. comm.).

Specimens examined: Waite 040610-01 (HAVO).

Grimmia longirostris W. J. Hooker, 1818

Grimmia haleakalae Reichardt, 1877 misapplied

Indigenous. Ma.

Abundant. On exposed rock and soil at higher elevations such as at the top of the Mauna Loa Strip Road.

Representative specimens examined: Anonymous s.n.; Waite 040608-13, 040619-02-02, 040714-06-05 (HAVO).

Grimmia trichophylla Greville, 1824

Indigenous. Ma, H.

Unknown abundance.

Specimens examined: Waite 040619-05-02, 040715-06-03(HAVO).

Holomitrium seticalycinum C. Müller, 1896

Common. On tree branches in wet forests.

Endemic. K, O, Mo, L, Ma, H.

Common. On tree branches in wet forests.

Specimens examined: Cuddihy 1509; Hoe 1584; Waite 040612-04-04 (HAVO).

Homaliodendron flabellatum (Smith) Fleischer, 1906

Indigenous. K, O, Mo, L, Ma, H.

Common. On tree trunks in wet forests.

Representative Specimens examined: Cuddihy 1562; Higashino & Muller 9866; Weber & Bujakiewicz B-81948; T. Belfield s.n. (HAVO).

Hookeria acutifolia W. J. Hooker & Greville, 1825

Indigenous. O, L, Ma, H.

Common. On deeply shaded soil in wet forests.

Specimens examined: Weber & Bujakiewicz B-81996; Cuddihy s.n.; Waite s.n. (HAVO).

Hyophila involuta (W. J. Hooker) Jaeger, 1873

Hyophila dozy-molkenboeri Fleischer, 1900-1902

Indigenous. K, O, Mo, Ma, H.

Uncommon. Rock walls and trails.

Specimens examined: Waite 040720-04-03, 040722-B-04 (HAVO).

Hypnum plumaeforme Wilson, 1848

Alien. O (recent coll. Waite), Mo(recent coll. Stone), Ma, H.

Abundant. Invasive along roads, trails, and lawns in wet to mesic areas. Potentially invasive in other open canopy vegetation.

Representative specimens examined: Cuddihy s.n.; Weber & Bujakiewicz B-81912; Waite 040702-01a, 040702-02-02, 040717-03, 040718-03-02 (HAVO).

Isopterygium albescens (W. J. Hooker in Schwägrichen) Jaeger, 1878

Indigenous. K, O, Mo, L, Ma, H.

Abundant. In wet microhabitats.

Representative specimens examined: Cuddihy 1612; Higashino 9897; Smathers s.n.; Waite 040715-03-05, 040717-02, 040718-07c-05 (HAVO).

Isopterygium vineale E. B. Bartram, 1933

Endemic. K, O, Mo, Ma, H.

Unknown abundance. Only one record from the park.

Specimens examined: Waite 040620-06-01 (HAVO).

Leptobryum pyriforme (Hedwig) Wilson, 1855

Indigenous. Ma, H.

Unknown abundance. This species is probably present in the park based on its presence just outside the park. Skottsberg also collected it once from the vicinity of Kilauea (Bartram 1933).

Specimens examined: Waite 040606-01 from residence in Volcano near park (HAVO).

Leptodontium flexifolium (Dickson) Hampe in Lindberg, 1864

Leptodontium brevicaule E. B. Bartram, 1933

Indigenous. M, H.

Abundant. On exposed ash soil at higher elevations.

Representative specimens examined: Winona Char s.n.; Cuddihy s.n.; Waite 040617-05-01, 040619-01-03, 040619-05-06, 040702-07d (HAVO).

Leucobryum gracile Sullivant, 1874

Endemic. K, O, Mo, L, Ma, H.

Abundant. On humus and tree trunks in mesic to wet forests

Representative specimens examined: Cuddihy 1633; Weber & Bujakiewicz B-81904;

Higashino 9908; Waite 040608-02b-1, 040620-06-02, 040718-07c-04 (HAVO).

Leucobryum seemannii Mitten in Seemann, 1873

Leucobryum hawaiiense (Reichardt) E.B. Bartram, 1933

Endemic. K, O, Mo, L, Ma, H.

Common. On humus and tree trunks in mesic to wet forests.

Representative specimens examined: Cooper s.n.; Cuddihy 1461; Hoe 1265; Higashino, Cuddihy, Weber, & Bujakiewicz 9875 (HAVO).

Macrocoma tenue* ssp. *sullivantii (Mull. Hal.) Vitt

Macromitrium intricatum C. Müller, 1896

Indigenous. K, O, Mo, Ma, H.

Unknown abundance. Epiphytic on small trees at the end of Mauna Loa Strip Road.

Specimens examined: Cuddihy s.n.; Waite 040619-a-01 (HAVO).

Macromitrium brevisetum Mitten in Seemann, 1873

Endemic. K, O, Mo, L, Ma, H.

Unknown abundance. Collected from Kipuka Puaulu and Kipuka Ki in 1966 by Hoe.

Specimens examined: None.

Macromitrium emersulum C. Müller, 1896

Endemic. K, O, Mo, L, Ma, H.

Probably present. This species was collected in 1983 from Kalapana outside the park (HAVO) growing epiphytically on a mango tree trunk.

Specimens examined: Weber & A. Bujakiewicz B-82000 (HAVO).

Macromitrium microstomum (W. J. Hooker & Greville) Schwägrichen, 1827

Macromitrium reinwardtii

Macromitrium owahiense C. Müller, 1864

Indigenous. K, O, Mo, L, Ma, H.

Abundant. On trees in wet forests.

Specimens examined: L.W. Cuddihy 1601; Hoe 1245; Smathers s.n.; Waite 040612-04-02 (HAVO).

Macromitrium piliferum Schwägrichen, 1826

Endemic. K, O, Mo, L, Ma, H.

Abundant. On trees in wet forests.

Representative specimens examined: Cuddihy 1570, 1431; Hoe 1258; Waite 040608-02d (HAVO).

Orthotrichum diaphanum Schrader ex Bridel, 1801

Indigenous. M, H.

Unknown abundance. Epiphytic on trees and shrubs.

Specimens examined: Hoe 981.0 (BISH).

Orthotrichum hawaïicum C. Müller, 1896

Endemic. Ma, H.

Unknown abundance. Epiphytic on trees and shrubs.

Specimens examined: Hoe 828.1, 836.0 (BISH); Vitt 14955, 14956 (BISH).

Orthotrichum rupestre Schleicher x Schwägrichen, 1816

Orthotrichum hillebrandi C. Müller, 1896

Indigenous. O, Ma, H.

Unknown abundance. Epiphytic on trees and shrubs.

Specimens examined: Hoe 828.0 (BISH).

Palamocladium wilkesianum (Sullivant) C. Müller, 1896

Pleuropus wilkesianum (Sullivant) Brotherus, 1908

Endemic. K, O, Mo, L, Ma, H.

Common. In damp, shaded places on humus, tree trunks, and rock. Variable in size and in degree of pitting in the leaf cells. Smaller sized plants with little or no pitting of the leaf cells were once recognized as the distinct variety *P. w. sciuroides*. This form is especially common at Kipuka Puauulu on *Sapindus* trunks.

Representative specimens examined: Char s.n.; Cuddihy 1728; Weber & Bujakiewicz B-81960; Waite 040607-16, 040607-33, 040619-04-02, 040718-02-02 (HAVO).

Pelekiium versicolor (Hornsch. Ex Mull.Hal.) Touw, 2001

Thuidium crenulatum Mitten, 1873

Thuidium nanophyllum

Indigenous. O, Ma, H.

Unknown abundance. Very similar in appearance to the abundant *Thuidium cymbifolium*.

Specimens examined: Char s.n.; Weber & Bujakiewicz B-81961 (HAVO).

Philonotis falcata (W. J. Hooker) Mitten, 1859

Indigenous. K, O, Mo, Ma.

Unknown abundance.

Specimens examined: Cuddihy 1701; Waite s.n. (HAVO).

Philonotis hawaica (C. Müller) Brotherus, 1904

Endemic. K, O, Mo, L, Ma, H.

Unknown abundance.

Specimens examined: Waite (HAVO).

Philonotis turneriana* var. *sullivantii (C. Müller) Bartram, 1933

Bartramia sullivantii C. Muller, 1896

Endemic. O, Ma, H.

Unknown abundance.

Specimens examined: Cuddihy 1608 (HAVO).

Philonotis turneriana* var. *turneriana (Schwägrichen) Mitten, 1859

Indigenous. K, O, Mo, L, Ma, H.

Common. On damp soil and humus.

Specimens examined: Waite 040718-03-01(HAVO).

Phyllocladon lingulatus (Cardot) W.R. Buck, 1987

Glossadelphus baldwinii Brotherus, 1927

Glossadelphus laevifolius (Mitt.) Bartr.

Taxiphyllum laevifolium (Mitten) W. R. Buck, 1987 misapplied

Indigenous. K, O, Mo, Ma, H.

Unknown abundance. On wet soil or rock in shaded places.

Specimens examined: Higashino & Katahira 9952 (HAVO).

Plagiomnium rhynchophorum (W. J. Hooker) T. Koponen, 1971

Plagiomnium rostratum (Schrader) T. Koponen, 1968 misapplied

Mnium rostratum Schwägrichen, 1816 misapplied

Indigenous. K, O, Mo, Ma, H.

Common. On deeply shaded wet soil, humus, or rock.

Specimens examined: Cuddihy 1552; Weber & Bujakiewicz B-81995; Higashino, Cuddihy, Weber, & Bujakiewicz 9877 (HAVO).

Pogonatum tahitense W. P. Schimper in Bescherelle, 1894

Pogonatum baldwinii (C. Müller) Paris, 1898

Indigenous. K, O, Mo, L, Ma, H.

Common. On wet soil banks.

Specimens examined: Higashino & Katahira 9979; Higashino & Muller 9869; Higashino, Cuddihy, Weber, & Bujakiewicz 9874; Cuddihy s.n.; Waite 040702-02-08 (HAVO).

Pohlia flexuosa W.J. Hooker 1836

Pohlia leucostoma (Bosch & Sande Lacoste) Fleischer, 1904

Webera leucostomoides Brotherus, 1927

Webera gracilescens E.B. Bartram, 1933

Indigenous. K, O, Mo, Ma, H.

Unknown abundance.

Specimens examined: Weber & Bujakiewicz B-81905; Waite 040617-03g (HAVO).

Polytrichum commune Hedwig, 1801

Alien. H.

Common. On exposed soil along roadsides and in the shrub lands between Kilauea Military Camp and the Hawaiian Volcano Observatory. Extremely abundant outside the park along Highway 11 in Glenwood.

Specimens examined: Waite 040605-12b, 040624-08-04 (HAVO).

Polytrichum piliferum Hedwig, 1801

Indigenous. Ma, H.

Unknown abundance. On exposed soil.

Specimens examined: Waite 040702-07e (HAVO).

Pseudoscleropodium purum (Hedwig) Fleischer in Brotherus, 1925

Scleropodium purum (Hedwig)

Alien. H.

Common. Locally abundant along roadsides and lawns and in the Kipuka Puauulu forest.

Representative specimens examined: Weber & Bujakiewicz B-81962, B-81924 (HAVO); Vitt 15087 (BISH); Waite 040605-05, 040605-11, 040620-01-01 (HAVO).

Pseudosymblepharis angustata (Mitten) Hilpert, 1933

Pseudosymblepharis mauiensis (C. Müller) Brotherus, 1927

Indigenous. K, O, Mo, Ma, H.

Uncommon. Locally common to abundant on the wet cliff walls of Olaa Trench.

Specimens examined: Jacobi s.n.; Waite 040710-y-02 (HAVO).

Pyrrhobryum pungens (Sullivant) Mitten, 1868

Rhizogonium pungens Sullivant, 1854

Endemic. K, O, Mo, L, Ma, H.

Unknown abundance. This is an uncertain species for the park because specimens identified as this species in the past are not typical *P. pungens* and instead intermediate in form between *P. spiniforme* and *P. pungens*. The leaf blades of typical *P. pungens* end more or less abruptly near the base of the leaf while the blades of typical *P. spiniforme* are relatively broad from the base all the way to the tip of the leaf. *P. pungens* is also usually larger than *P. spiniforme*. The *P. pungens* identified from the park are large but have leaf blades that, although very narrow, extend all the way to the tip of the leaf.

Specimens examined: Fagerlund, G.O. & A.L. Mitchell 189, 255 (BISH); Higashino, Cuddihy, Weber, & Bujakiewicz 9876; P.K. Higashino 9890, 9909 (HAVO).

Pyrrhobryum spiniforme (Hedwig) Mitten, 1868

Rhizogonium spiniforme (Hedwig) Bruch, 1846

Indigenous. K, O, Mo, L, Ma, H.

Abundant. Widespread on humus and tree trunks in wet forests.

Representative specimens examined: Weber & Bujakiewicz B-81935; Higashino & Muller 9847; Waite 040607-06 (HAVO).

Racomitrium crispulum (J. D. Hooker & Wilson) J. D. Hooker & Wilson, 1854

Indigenous. K, Ma, H.

Unknown abundance. Reported from the vicinity of Kilauea, Hawaii Island, based on one specimen collected by Lieutenant Hinds (Bartram, 1933).

Specimens examined: None.

Racomitrium lanuginosum var. *lanuginosum* (Hedwig) Bridel, 1819 [1818]

Racomitrium lanuginosum var. *pruinsum* misapplied

Indigenous. K, O, Mo, Ma, H.

Abundant. Abundant on lava rock especially at higher elevations above 1500 m (5000 ft.)

Note: Vitt & Marsh (1988) revised *Racomitrium lanuginosum* and *R. pruinsum* and determined that all *R. lanuginosum* and *R. pruinsum* in Hawaii were *R.*

lanuginosum var. *lanuginosum*, that specimens previously identified as *R. pruinsum* were in fact misidentified variable *R. lanuginosum*.

Representative specimens examined: Cuddihy 1602, Higashino & Katahira 9976; Fagerlund & Mitchell 70; Waite 040607-14, 040624-08-01, 040702-04a, 040713-05-01 (HAVO).

Racopilum cuspidigerum (Schwägrichen in Gaudichaud in Freycinet) Ångström, 1872

Racopilum cuspidigerum (Schwägrichen in Gaudichaud in Freycinet) Ångström, 1872

Indigenous. K, O, Mo, L, Ma, H.

Abundant. On soil, rock, or bark in mesic to wet forest.

Representative specimens examined: Cuddihy 1609; Higashino & Katahira 9973; Belfield/LG 32; Waite 040607-32b, 040718-02-03 (HAVO).

Radulina hamata (Dozy & Molkenboer) W. R. Buck & B. C. Tan, 1989 [1990]

Trichosteleum hamatum (Dozy & Molkenboer) Jaeger, 1876-1877

Indigenous. K, O, Mo, L, Ma, H.

Common. On humus and tree trunks in wet forests.

Specimens examined: Cuddihy 1565; Higashino & Katahira 9948; Waite 040616-01 (HAVO).

Rhynchostegium celebicum (Sande Lacoste) Jaeger, 1878

Eurhynchium celebicum (Lacoste) E.B. Bartram, 1933

Indigenous. K, O, Mo, Ma, H (this study).

Unknown abundance. In wet forest.

Specimens examined: Weber & Bujakiewicz B-81908 (HAVO).

Rhynchostegium sellaginellifolium C. Müller, 1896

Eurhynchium sellaginellifolium (C. Müller) E.B. Bartram, 1933

Endemic. K, O, Mo, Ma, H.

Unknown abundance. In wet forest.

Specimens examined: Cuddihy s.n. (HAVO).

Rosulabryum billarderi (Schwägrichen) Spence, 1996

Bryum billardieri Schwägrichen, 1816

Bryum decaisnei Dozy & Molkenboery, 1845

Indigenous. O, Ma, H.

Unknown abundance. Collected twice in 1966 by Bill Hoe from the Mauna Loa Trail.

Specimens examined: None.

Rosulabryum capillare (Hedwig) Spence, 1996

Bryum capillare Hedwig, 1801

Bryum vino-viride E. B. Bartram, 1933

Indigenous. K, O, Ma, H.

Uncommon. On soil and rock at higher elevations especially in lava tube entrances.

Representative specimens examined: Waite 040607-38, 040619-04-03, 040703-05-02, 040715-02-01 (HAVO).

Schizymenium pulvinatum (C. Müller) A. J. Shaw, 1985

Mielichhoferia pulvinata C. Mull. 1896

Endemic. Ma, H.

Uncommon. On soil at higher elevations including in lava tube entrances.

Representative specimens examined: MacDonald s.n.; Waite 040702-04h, 040703-05-05, 040703-07-02, 040714-05b-09 (HAVO).

Scopelophila infericola Hoe, 1973

Endemic. H.

Rare. Sulphur Banks on rock and ash substrate is the only locality known to date.

Specimens examined: Siegel s.n. (BISH); Hoe 4852.0 (BISH); Waite 040620-09-01, 040624-10-01, 040624-12-03, 040624-13-07 (HAVO).

Sematophyllum hawaiiense (Brotherus) Brotherus, 1925

Indigenous. K, O, L, Ma, H.

Common. Widespread from low to high elevations on shaded soil, rock or bark in mesic to wet vegetation.

Representative specimens examined: Waite 040612-04-01, 040619-03-03, 040717-01, 040722-A-01 (HAVO).

Sematophyllum subpinnatum (Brid.) E. Britton

Acroporium caespitosum (Hedwig) W. R. Buck, 1983 misapplied

Sematophyllum caespitosum (Hedwig.) Mitt. 1869 misapplied

Alien. O, H.

Probably present. On trees and rocks in wet forests

Not collected in the park but abundant in lower elevation wet forests and probably present in the lower elevation forest kipukas in the Kalapana section of the park.

Specimens examined: Waite 040612-07 from Waiakea Forest Reserve, Road B off Stainback Hwy (HAVO).

Sphagnum palustre Linnaeus, 1753

Sphagnum henryense misapplied

Indigenous. O, H.

Unknown abundance. Recently found in the park's Kahuku Unit by Thomas Belfield. Also known from two locations near the park in Volcano Village. On humus in wet forest.

Specimens examined: Will Haines s.n. from Hawaiian Orchid Island Estates; Waite 040722-E-01 from near the Volcano Village Post Office (HAVO).

Syrrhopodon armatus Mitten, 1864

Syrrhopodon oahuense Brotherus, 1927

Indigenous. O, Ma, H.

Unknown abundance. On *Pritchardia beccariana* trunks in Olaa Tract.

Specimens examined: Waite s.n. (HAVO).

Syrrhopodon hawaiiicus C. Müller, 1896

Endemic. K, O, Mo, Ma, H.

Unknown abundance. On tree trunks in wet forest.

Specimens examined: Weber & Bujakiewicz B-81940, B-81941; Waite s.n. (HAVO).

Syrrhopodon prolifer Schwägrichen, 1827

Syrrhopodon kilaueae C. Müller, 1900

Indigenous. O, Mo, Ma, H.

Unknown abundance. Specimens from Kilauea, Island of Hawaii were originally described as an endemic species in 1900.

Specimens examined: None.

Taxithelium mundulum (Sullivant) E. B. Bartram, 1933

Indigenous. K, O, Mo, L, Ma, H.

Common. On rock and bark in wet to mesic forests.

Specimens examined: Cuddihy 1727, Cuddihy 1702; Waite 040612-04-03, 040718-01-03 (HAVO).

Thuidium cymbifolium (Dozy & Molkenboer) Dozy & Molkenboer, 1865

Thuidium hawaiiense Reichardt, 1877

Thuidium plicatum Mitten in Seemann, 1873

Indigenous. K, O, Mo, L, Ma, H.

Abundant. On humus, rock, and tree trunks in shaded, wet microhabitats from forest to lava tube entrances.

Representative specimens examined: Cuddihy 1481; Higashino & Katahira 9972; Hoe 1255; Waite 040607-18b, 040702-02-03, 040702-04d (HAVO).

Tortella humilis (Hedwig) Jennings, 1913

Tortella caespitosa (Schwaegrichen) Limpricht, 1888

Indigenous. K, O, L, Ma, H.

Unknown abundance. On exposed soil or rock.

Specimens examined: Cuddihy s.n.; Waite 040617-05-05 (HAVO).

Trematodon latinervis C. Müller, 1896

Indigenous. K, O, Mo, Ma, H.

Common on damp, partially shaded soil.

Specimens examined: Higashio & Muller 9870 (HAVO).

Trichostomum crispulum Bruch

Trichostomum bartramii Mill. 1967

Trichostomum mauiense Brotherus, 1927

Indigenous. K, O, Mo, L, Ma, H.

Abundant. On soil, humus, and rock in dry to mesic areas especially on the west side of Kahuku unit.

Representative specimens examined: Weber & Bujakiewicz B-81915; Hoe s.n., Hoe 1578; Waite 040607-12a, 040607-15, 040607-29b, 040608-05, 040609-01a (HAVO).

Vesicularia perviridis (Ångström) C. Müller, 1896

Vesicularia graminicolor (Ångström) Brotherus, 1927

Hookeria sandvicensis Reichardt, 1877

Endemic. K, O, Mo, L, Ma, H.

Common. On soil and humus in shaded wet microhabitats

Specimens examined: Higashino & Cuddihy 9873; Waite 040722-D-02, 040725-08a-01, 040725-09-01, 040725-11-01 (HAVO).

Weissia controversa Hedwig, 1801

Weissia viridula Hedwig, 1801

Indigenous. Ni, K, O, H.

Unknown abundance. On soil. Difficult to distinguish from the following *Weissia* species.

Specimens examined: None identified to species.

Weissia ovalis (Williams) E.B. Bartram, 1933

Endemic. K, O, Mo, L, Ma, H.

Unknown abundance. On soil. Difficult to distinguish from *W. controversa*.

Specimens examined: Waite 040608-06a (HAVO).

Zygodon tetragonostomus A. Braun ex B.S.G., 1838

Indigenous. K, O, Ma, H.

Common. On trees and shrubs and occasionally on shaded rock or soil in mesic to dry vegetation above 1200 m (4000ft).

Representative specimens examined: Char s.n.; Weber & Bujakiewicz B-81898; Waite 040608-19, 040619-03-01, 040619-05-01, 040718-02-01 (HAVO).