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EPIPHYTES AND THE NATIONAL WETLAND PLANT LIST

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ABSTRACT

The National Wetland Plant List (NWPL) is a list of species that occur in wetlands in the United States. It is a product of a collaborative effort of four Federal agencies: the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the Natural Resources Conservation Service. The NWPL has many uses, but it is specifically designed for use in wetland delineation for establishing the extent of Federal jurisdictional of wetland boundaries. To be listed in the NWPL, a plant must be rooted in soil, so there is a direct relationship between a plant's occurrence and its preference for hydric soils. This relationship, coupled with the plant's frequency of occurrence in wetlands, is used to place it in one of five categories representing the probability that the plant occurs in a wetland. Many species are considered to be epiphytes, but they represent various life forms, ranging from purely epiphytic to frequently occurring on the ground. Based on a literature review of 192 species across the United States and its territories, we determined which species fell into four categories of epiphytic life forms or are terrestrial and should not be considered epiphytes. Of the 192 species reported as epiphytes, 33 were determined to be terrestrial and 107 can grow on the ground for at least part of their life forms. Only these 140 species will be retained in the NWPL. This review documents the process of evaluating which epiphytes qualify for being retained on the NWPL. Documentation includes the literature and its review to support retaining the species on the NWPL. The reasoning behind removing *Cuscuta* from the list is also documented.

KEY WORDS: wetlands, wetland plants, epiphytes, National Wetland Plant List, wetland delineation

The National Wetland Plant List (NWPL) is used in wetland delineation and restoration of wetlands, as well as providing a resource of botanical information about wetland plants. Each species determined to be a wetland plant has been placed in one of five rating categories representing the estimated probability, or frequency, with which it is thought to occur in wetlands, as opposed to nonwetlands, across its entire range (Table 1). These category assignments were developed through a thorough review of the botanical literature and the best professional judgment of national and regional experts.

Currently the NWPL is being revised under the administrative direction of the U.S. Army Corps of Engineers with cooperation from the U.S. Fish and Wildlife Service (USFWS), the U.S. Environmental Protection Agency, and the Natural Resources Conservation Service. The designated list for wetland delineation under Section 404 of the Clean Water Act is the 1988 list (referred to here as the "88 list") (Reed 1988). The NWPL was updated in 1996 (referred to here as the "96 list," as posted in a USFWS draft web publication) (Reed 1998), but the update was never officially finalized.

The current revision of the NWPL will be based on more precise scientific criteria than for previous lists, it will reflect changes in botanical nomenclature, and it will be divided into new geographic regions based on ecological rather than political boundaries. Proposed changes in wetland ratings will be vetted by botanists and wetland ecologists on regional and national panels, states, academics, and the public using a national database with a web interface. The revision of the NWPL includes an ongoing effort to assess the entire flora of the United States and its territories to ensure that the list is comprehensive and complete.

Epiphytes — plants that grow on or are attached to other living plants (Schimper 1888) — are a complication for the NWPL. In preparing previous wetlands lists, the USFWS applied an unpublished rule that no epiphytes were to be included because they are not rooted in the soil (Reed, USFWS, pers. comm.). The U.S. Army Corps of Engineers (Environmental Laboratory 1987) defined the hydrophytic vegetation community for wetland delineation purposes as "the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present." Under this definition, plants not rooted in the soil, which the USFWS assumed to include epiphytes, cannot be considered hydrophytes.

Epiphytes are a diverse taxonomic group, with species in at least 33 families and over 230 genera worldwide. When hemi-epiphytic plants are included — species that can be both epiphytic and occur on the ground — the number of families increases to 83 and the number of genera to over 875 (Gentry & Dodson 1987). About 80% of all vascular epiphytes are monocotyledons (Kress 1989).

A review of the literature quickly reveals that epiphyte species have a variety of life forms and occur in a variety of habitats (Gentry & Dodson 1987, Wagner et al. 1999, Acevedo-Rodriguez 2005), bringing the simplistic no-epiphyte wetland rule into question. One life form that may violate the logic behind the no-epiphyte rule is that of hemi-epiphytes. This group contains two forms with different life forms, sometimes described as primary and secondary epiphytes. Primary hemi-epiphytes begin their life form as epiphytes and later become rooted in the ground. Secondary hemi-epiphytes begin life rooted in soil and later assume an epiphytic life form and are no longer rooted in the soil (Putz & Holbrook 1989). Some species in both these hemi-epiphytes groups may warrant consideration as wetland species, and it is possible that epiphytes with other life forms should be considered as well.

The current efforts to update the NWPL includes 192 epiphytes or hemi-epiphytes, primarily because earlier wetland plant lists by the USFWS had assigned wetland ratings to 122 epiphytic species, even though this was in opposition to their own basic rule not to include any epiphytes. The discovery of these epiphytes on the list prompted further investigation to see if any epiphytes met the rule of needing to be rooted in the ground.

To support the scientific quality of the NWPL, we compiled a draft list of various categories of epiphytes, evaluated the literature to develop ecological profiles of their life forms, and compiled literature references to support the groupings of epiphytes for further consideration as wetland species. The information presented here will support the updating of the NWPL for epiphytes and will provide background for those species that could considered to be wetland plants and that should be evaluated for a wetland rating.

Methods.

A list of potential epiphytes that may warrant further consideration as wetland plants was obtained as a collaborative effort with BONAP (Biota of North America Program). Kartesz (in press) tracks the flora of North America and maintains an extensive database of distribution and biological attributes based on a national inventory of herbaria, scientific literature, and information from recognized specialists in many groups of plants. The BONAP database already contains a list of epiphytes known within the United States and its territories, but the list is limited to a general category identified only as epiphytes.

To identify whether some part of an epiphyte's life form includes being rooted on the ground, we sorted the epiphyte list into five categories. We reviewed 59 literature sources to determine the life form of each of the potential epiphyte species and to place each species into one of the categories.

1. **Obligate epiphytes on trees**. These are true epiphytes, i.e., non-parasitic plants anchored to the stems or trunks of trees or shrubs or occasionally on moss mats but never found growing on the ground.

2. **Obligate epiphytes on rocks**. These epipetric plants are anchored to rocks, boulders, or cliffs rather than to other plants but are never found on the ground.

3. **Facultative epiphytes of trees and terrestrial sites**. These plants can occur either on tree trunks or stems or on the ground in soil (but not on rocky cliffs or boulders). They are never restricted to a true epiphytic life form. This group includes both categories of hemi-epiphytes.

4. **Facultative epiphytes of rock and terrestrial sites**. These plants can be either epipetric or they can grow in soil on the ground, but they are never true epiphytes on tree trunks or branches.

5. **Not epiphytic**. These plants are primarily terrestrial or at least rooted in soil on the ground. This group includes climbers with adventitious roots, lianas, and species that lean on other plants for support at maturity but are not rooted to the host plant.

Additionally, the genus *Cuscuta* (dodder) was evaluated as a possible epiphtye. This genus was not on the 88 and 96 lists. However, during the current update process, many people have submitted the suggestion that this genus and some of its species deserve wetland ratings. This genus is scattered throughout most of North America and is frequently found in wetlands.

Results.

Within the continental USA, Puerto Rico, Hawaii, and the Marianas in the south Pacific (Figure 1), the area covered by the NWPL, there are 192 species reported to be epiphytes by BONAP (Table 1). Of these, 52 are obligate epiphytes of trees or rocky cliffs and do not qualify as potential wetland plants. Thirty-three species are primarily terrestrial and rarely (if ever) have a true epiphytic or epipetric life form. It is possible that some of these species may be wetland plants, but they need to be assessed during the updating process of the NWPL. A total of 107 species were found to be facultative epiphytes (or epipetric species) that also occur in various terrestrial environments and are rooted in soil during part of their life form. These species need to be evaluated as part of the updating process of the NWPL to determine if their frequency of occurrence in wetlands meets wetland indicator standards.

Of the 122 species of epiphytes that had been assigned wetland indicator ratings on the 88 and 96 lists, 91 were categorized as facultative epiphytes in our review and 31 were categorized as obligate epiphytes that did not occur on the ground (Table 2). Of the remaining 70 species that are reported here as epiphytes, the USFWS had assigned many of these species into two other categories; these categories were "No Occurrence (NO) in any USFWS region," which had 15 species, and "Not

enough Information to make a determination (NI)," which had 55 species. Voucher specimens now exist to verify the occurrence of the species in the NO group in various locations of the U.S.

***Cuscuta* (dodder).**

Cuscuta, in the Convolvulaceae family, is a genus of annual parasitic plants with a worldwide distribution. In the USA they occur in every state except Alaska (BONAP 2010). *Cuscuta* spp. are considered holoparasites — they depend entirely on their hosts for water and nutrients (Albert et al. 2008). Most species lack chlorophyll, and for those that do have chlorophyll, photosynthesis provides for only a small amount of the plant's needs. *Cuscuta* spp. are considered pests on a wide variety of plants, many of agricultural significance.

Cuscuta seeds germinate on or near the soil surface in a variety of habitats. As the rootless, leafless stem grows, it rotates and coils around any vertical object. If the object is a suitable host, the *Cuscuta* stem secretes an adhesive substance and induces the host to do the same. Then *Cuscuta* grows haustoria, which are root tips that penetrate the host tissue and provide a pathway for water, nutrients, and other compounds. At this point, the *Cuscuta* plant becomes detached from the soil and has no more contact with the ground throughout the rest of its life. Once established on a host, *Cuscuta* grows rapidly and can spread easily to nearby hosts. *Cuscuta* plants flower from late spring to fall, and each plant can produce thousands of small seeds, which can remain viable in the soil for 10 years or more.

Cuscuta's life form as a holoparasite and its ability to break connection from the soil shortly after germination when it begins its parasitic phase supports its elimination from the NWPL as previously interpreted in the unpublished rule of the USFWS that wetland plants need to be rooted in soil.

Discussion.

During the process of updating the NWPL over the past three years, all 192 species of epiphytes evaluated in this review were included on the update list, since over half of them had a previous wetland ratings in 88 and 96 lists. Some species had already been rated as wetland plants but had not been vetted for their life form to determine if they frequently occur on the ground, so we retained all 192 reported epiphytes on the NWPL until the public input phase is over. After the updating is complete but before the list is finalized, those species determined to be obligate epiphytes (including epipetric species) will be dropped from the NWPL. The remaining facultative epiphytes, including those that are epiphytic on trees and shrubs and on rocks, will be retained. All species retained, based on this review of their life form, that received a wetland indicator status during the review process will be included on the final NWPL.

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Table 1. Wetland Indicator Status Ratings and their cardinal rating categories, as described in the National List of Plant Species that Occur in Wetlands (Reed 1988).

Indicator Status (abbreviation)	% Occurrence in Wetlands
Obligate (OBL)	99
Facultative Wetland (FACW)	67–99
Facultative (FAC)	34–66
Facultative Upland (FACU)	1–33
Upland (UPL)	1

Table 2. Epiphytes in the United States and its territories.

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Araceae								
Anthurium crenatum	Scalloped laceleaf	Puerto Rico			X			Terrestrial or epiphytic herb in shaded moist forests and scrub forests, according to Acevedo-Rodriguez and Strong (2005)
Anthurium dominicense	Lengua de vaca	Puerto Rico			X			Terrestrial understory herb or epiphyte in moist forests (Acevedo-Rodriguez & Strong 2005)
Epipremnum pinnatum	Devil's ivy	Florida, Hawaii, Puerto Rico					X	Root-climbing vine, non-native and escaping in Florida, persisting in hammocks and on roadside trees (Thompson 2000); cultivated and escaping in Puerto Rico (Acevedo-Rodriguez &Strong 2005).
Monstera deliciosa	Tarovine	Florida, Puerto Rico, Virgin Islands					X	Scandent (climbing) or decumbent shrub; cultivated in Puerto Rico but not thought to be established in the wild (Acevedo-Rodriguez & Strong 2005)
Philodendron consanguineum	Rascagargant a	Puerto Rico, Virgin Islands					X	Root-climbing herb in moist and wet forests (Acevedo-Rodriguez & Strong 2005)
Philodendron erubescens	Blushing philodendron	Hawaii					X	"Erect, scrambling climber" rooting at nodes and in soil; native to Colombia, not considered naturalized in Hawaii, though grown there as an ornamental (Hogan 2003)
Philodendron giganteum	Giant philodendron	Puerto Rico, Virgin Islands			X			Terrestrial or epiphytic herb of moist forests in Puerto Rico (Acevedo-Rodriguez & Strong 2005)
Philodendron hederaceum	Vilevine	Puerto Rico, Virgin Islands					X	Vine, rooting at nodes in moist forests of low and middle elevations of Puerto Rico and the Virgin Islands (Acevedo-Rodriguez & Strong 2005)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Philodendron hederaceum var. *oxycardium*	Heartleaf philodendron	Puerto Rico, Virgin Islands					X	Included as a synonym of *P. hederaceum* by Acevedo-Rodriguez and Strong (2005); vine, rooting at nodes.
Philodendron lingulatum	Treelover	Puerto Rico, Virgin Islands					X	Root-climbing herb in moist and rain forests in Puerto Rico and the Virgin Islands (Acevedo-Rodriguez & Strong 2005)
Araliaceae								
Schefflera actinophylla	Octopus tree	Hawaii, Florida, Puerto Rico, Virgin Islands			X			Grows as a tree but can occasionally be epiphytic (Lowry 1999); native to Australia and New Guinea but widely cultivated outdoors in tropical climates or indoors as a houseplant
Schefflera arboricola	Dwarf umbrella tree	Taiwan					X	Cultivated house plant native to Taiwan; typically grows as a shrub (Hogan 2003); questionably epiphytic
Aspleniaceae								
Asplenium cirrhatum	Chestnut-scale spleenwort	Puerto Rico	X	X				Synonym = *A. radicans* var. *cirrhatum*; on mossy boulders and tree trunks (Proctor 1989) in wet forests (Liogier & Martorell 2000)
Asplenium erosum	Eared spleenwort	Florida, Puerto Rico	X					Synonym = *A. auritum*; cited as epiphytic on trunks of mature trees, especially on old live oaks (*Quercus virginiana*) with leaning trunks, or on the base of pop ash (*Fraxinus caroliniana*) and pond apple (*Annona glabra*) trees by Nelson (2000); also cited as epiphytic in the *Asplenium* key of Wagner et al. (1993, p. 231)
Asplenium formosum	Showy spleenwort	Puerto Rico			X	X		Occasionally epiphytic on mossy tree trunks on shaded boulders and ledges beside streams and on non-calcic banks (Proctor 1989)
Asplenium insiticium	Royal spleenwort	Hawaii					X	Terrestrial in mesic to wet forests (Palmer 2003)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Asplenium juglandifolium	Walnut spleenwort	Puerto Rico			X			Cited as "epiphytic on tree trunks or in humus in wet forests at middle to higher elevations" in Puerto Rico (Liogier & Martorell 2000)
Asplenium nidus	Hawaii birdnest spleenwort	Hawaii			X			Epiphytic in trees or terrestrial in mesic to dry forests (Palmer 2003)
Asplenium pteropus	West Indian spleenwort	Puerto Rico			X			Epiphyte of lower montane wet forest (Croat 1978) or terrestrial in shaded humus (Proctor 1989)
Asplenium rhomboidale	Caribbean spleenwort	Puerto Rico		X				Shaded mossy boulders and ledges (Proctor 1989)
Asplenium serratum	Wild birdnest fern	Florida, Puerto Rico, Virgin Islands		X				Epiphytic on base of trees and on fallen logs and stumps (Lellinger 1985); other references cite as growing on rotten logs and stumps (Wagner et al. 1993)
Asplenium sphenotomum	Royal spleenwort	Hawaii			X			Synonym = *Asplenium insiticium*; terrestrial or occurs on low, mossy logs in mesic to wet forests (Palmer 2003)
Asplenium viride	Bright-green spleenwort	w and ne North America		X				Synonym = *Asplenium trichomanes-ramosum*; grows mostly on calcareous cliffs and rock (Lellinger 1985, Wagner et al. 1993).
Asteraceae								
Bidens discoidea	Small beggarticks	e North America					X	Questionably an epiphyte at all, though clearly a wetland species; cited as an annual forb of "ponds, swamps, other relatively wet sites" (Strother & Weedon 2006)
Blechnaceae								
Blechnum divergens	Ravine mid-sorus fern	Puerto Rico			X			Terrestrial or occasionally hemi-epiphytic (Moran 1995a); found in "wet montane forests, at higher elevations" in Puerto Rico (Liogier & Martorell 2000)
Blechnum insularum	Graceful mid-sorus fern	Puerto Rico	X					Mossy tree trunks and limbs in wet montane forests (Proctor 1989)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Bromeliaceae								
Ananas comosus	Pineapple	Florida, Puerto Rico					X	Terrestrial plant, not cited in the literature as being an epiphyte (Acevedo-Rodriguez & Strong 2005, Hogan 2003)
Hohenbergia antillana	Antilles lacebark	Puerto Rico			X	X		Epiphytic, terrestrial, or lithophytic herbs forming large colonies in thickets, woodlands, and moist forests in Puerto Rico and the Virgin Islands (Acevedo-Rodriguez & Strong 2005)
Pitcairnia angustifolia	Pina cortadora	Puerto Rico, Virgin Islands				X		Lithophytic or terrestrial herb in moist and wet forests from sea level to above 1000 m (var. *angustifolia*) or on ridges, slopes, streams, banks, and edges of forest in rocky wet montane forests (var. *simplicior*) (Acevedo-Rodriguez & Strong 2005)
Cactaceae								
Hylocereus costaricensis	Costa Rican night-blooming cactus	Hawaii					X	Stout climbers or vines native to Central America and introduced in Hawaii; mature plants may be supported by other vegetation but not cited as epiphytes per se (Anderson et al. 2001)
Hylocereus undatus	Night-blooming cactus	Hawaii, Florida, Puerto Rico, Virgin Islands			X			Hawkes (2003) describes growth habit as “sprawling or clambering over rocks, shrubs, and trees.” Solomon (1999) describes the species as a sprawling terrestrial or epiphytic vine in Hawaii
Selenicereus grandiflorus	Queen of the night	Hawaii, Puerto Rico, Virgin Islands					X	Vine-like or rope-like cactus with clambering or trailing stems and with aerial roots (Benson 1982)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Campanulaceae								
Clermontia arborescens	Oha wai nui	Hawaii			X			Terrestrial or epiphytic trees or shrubs in mesic to wet forest (Lammers 1999)
Clermontia arborescens ssp. *arborescens*	Oha wai nui	Hawaii			X			Terrestrial or epiphytic trees or shrubs in mesic to wet forest (Lammers 1999)
Clermontia arborescens ssp. *waihiae*	Oha wai nui	Hawaii			X			Terrestrial or epiphytic trees or shrubs in mesic to wet forest (Lammers 1999)
Clermontia arborescens ssp. *waikoluensis*	Oha wai nui	Hawaii			X			Treated as a synonym of *C. arborescens* ssp. *waihiae* by Lammers (1999); terrestrial or epiphytic trees or shrubs of wet forests
Clermontia clermontioides	Kauai clermontia	Hawaii			X			Terrestrial or epiphytic shrubs or trees in mesic to wet forest (Lammers 1999)
Clermontia clermontioides ssp. *clermontioides*	Kauai clermontia	Hawaii			X			Terrestrial or epiphytic shrubs or trees in mesic to wet forest (Lammers 1999)
Clermontia clermontioides ssp. *rockiana*	Kauai clermontia	Hawaii			X			Terrestrial or epiphytic shrubs or trees in mesic to wet forest (Lammers 1999)
Clermontia drepanomorpha	Kohala mountain clermontia	Hawaii			X			Terrestrial or epiphytic trees in wet and low boggy forest (Lammers 1999)
Clermontia fauriei	Haha'aiakamanu	Hawaii			X			Terrestrial or epiphytic shrubs or trees in mesic to wet forest (Lammers 1999)
Clermontia grandiflora	Bog clermontia	Hawaii			X			Terrestrial or rarely epiphytic shrubs or trees of wet forest and margins of bogs (Lammers 1999)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Clermontia grandiflora ssp. *grandiflora*	Bog clermontia	Hawaii			X			Terrestrial or rarely epiphytic shrubs or trees of wet forest and margins of bogs (Lammers 1999)
Clermontia grandiflora ssp. *maxima*	Bog clermontia	Hawaii			X			Terrestrial or rarely epiphytic tree or shrub from streambanks in wet forest (Lammers 1991)
Clermontia grandiflora ssp. *munroi*	Bog clermontia	Hawaii			X			Terrestrial or rarely epiphytic shrubs or trees of wet forest and margins of bogs (Lammers 1999)
Clermontia hawaiiensis	Oha kepau	Hawaii			X			Terrestrial or epiphytic trees or shrubs of mesic to wet forest (Lammers 1999)
Clermontia kohalae	Waipio Valley clermontia	Hawaii			X			Terrestrial or epiphytic trees 2–6 m tall (Lammers 1999)
Clermontia montis-loa	Mauna Loa clermontia	Hawaii			X			Terrestrial or epiphytic trees or shrubs of wet forest (Lammers 1999)
Clermontia pallida	Wailai Pali Clermontia	Hawaii			X			Terrestrial or rarely epiphytic shrubs of wet forests (Lammers 1999)
Clermontia parviflora	Small-flower clermontia	Hawaii			X			Terrestrial or epiphytic shrubs of wet forests (Lammers 1999)
Clermontia persicifolia	Waioiani clermontia	Hawaii			X			Terrestrial or epiphytic shrubs or trees of wet forests (Lammers 1999)
Clermontia waimeae	Swamp-forest clermontia	Hawaii			X			Terrestrial or epiphytic shrubs or trees of bogs and wet forests (Lammers 1999)
Clusiaceae								
Clusia gundlachii	Gundlach's attorney	Puerto Rico					X	Clambering shrub, not specifically epiphytic, from moist forests along the Cordillera Central and Sierra de Luquillo in Puerto Rico (Acevedo-Rodriguez 2005)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Clusia minor	Cupey de monte	Puerto Rico					X	Erect shrubs, similar to *C. gundlachii*; not epiphytic (Acevedo-Rodriguez 2005)
Clusia rosea	Scotch attorney	Hawaii, Florida, Puerto Rico, Virgin Islands			X			Hemi-epiphytic tree, epiphytic as a seedling, becoming a strangler as the plant matures and ultimately a free-standing, rooted tree at full maturity (Luttge 2007)
Commelinaceae								
Murdannia nudiflora	Naked-stem dewflower	Hawaii, Puerto Rico, s USA					X	Prostrate or decumbent sub-succulent annual herb of weedy habitats in wet, open or disturbed sites from low to upper elevations (Acevedo-Rodriguez & Strong 2005, Fadden 2000). Apparently rarely, if ever, an epiphyte
Cyperaceae								
Carex decomposita	Cypress-knee sedge	se USA			X			Grows in "marshes, swamp forests, usually on rotten stumps, floating logs, or bases of trees (often *Taxodium*) or shrubs (*Cephalanthus*) on lake, pond, and slough margins" (Cochrane 2002)
Dryopteridaceae								
Dryopteris carthusiana	Spinulose wood fern	Canada, USA (except SW)				X		Questionably epiphytic; "terrestrial in moist to wet woods and swamps" (Lellinger 1985). Montgomery and Wagner (1993) note all *Dryopteris* taxa in North America as being terrestrial, rarely growing on rock
Dryopteris marginalis	Marginal wood fern	Greenland, Canada, e USA				X		Questionably epiphytic; "epipetric or terrestrial on rock ledges, talus slopes, and on soil in shade and exposed places" (Lellinger 1985). Montgomery and Wagner (1993) note all *Dryopteris* taxa in North America as being terrestrial, rarely growing on rock
Elaphoglossum aemulum	Creeping tongue fern	Hawaii			X			Terrestrial or occasionally epiphytic in closed-canopy mesic to wet forests in Hawaii (Palmer 2003)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Elaphoglossum alatum	Tall tongue fern	Hawaii			X			Terrestrial or occasionally epiphytic in closed-canopy mesic to wet forests on Oahu (Palmer 2003)
Elaphoglossum crassicaule	Tall tongue fern	Hawaii			X			Synonym = *Elaphoglossum alatum* var. *crassicaule*; terrestrial or occasionally epiphytic in closed-canopy mesic to wet forests of Kauai, Hawaii (Palmer 2003)
Elaphoglossum crassifolium	Royal tongue fern	Hawaii			X			Terrestrial or epiphytic in a variety of habitats, ranging from open mesic woods to wet forests and dense rain forests (Palmer 2003)
Elaphoglossum decoratum	Showy tongue fern	Puerto Rico			X			Epiphyte, rarely terrestrial (Moran 1995c); wet montane forests at high elevation in Puerto Rico
Elaphoglossum fauriei	Tall tongue fern	Hawaii			X			Synonym = *Elaphoglossum alatum* var. *fauriei*; terrestrial or epiphytic fern of mesic to wet forests of Oahu and Molokai (Palmer 2003)
Elaphoglossum paleaceum	Ekaha	Hawaii			X	X		Terrestrial, epipetric, or epiphytic fern in various habitats from mesic open woods to wet forests (Palmer 2003)
Elaphoglossum parvisquamaeum	Tall tongue fern	Hawaii			X			Synonym = *Elaphoglossum alatum* var. *parvisquamaeum*; terrestrial or epiphytic fern growing on moss in moist forests (Palmer 2003)
Elaphoglossum pellucidum	Jeweled tongue fern	Hawaii			X	X		Terrestrial, epipetric, or epiphytic vine-like fern of moist forests (Palmer 2003)
Elaphoglossum peltatum	Peltate tongue fern	Puerto Rico	X					Synonym = *Peltapteris peltata*; epiphytic (Moran 1995c)
Elaphoglossum wawrae	Island tongue fern	Hawaii			X			Epiphytic or terrestrial Hawaiian fern of mesic to wet forests (Palmer 2003)
Lomariopsis amydrophlebia	Royal fringed fern	Puerto Rico					X	Terrestrial fern with climbing rhizomes from moist forests of Puerto Rico (Acevedo-Rodriguez 2005)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Lomariopsis kunzeana	Holly-leaf fringed fern	Florida, Puerto Rico				X		Unlike all other species in the genus, *Lomariopsis kunzeana* rarely climbs trees and usually occurs in hammocks or limestone sinkholes (Moran 1993); Lellinger (1985) considers the species epipetric in limestone sinkholes
Nephrolepis brownii	Asian sword fern	Hawaii, Florida, Puerto Rico, Virgin Islands			X			Synonym = *Nephrolepis multiflora*; terrestrial or epiphytic (Nauman 1993b); *N. multifllora* considered naturalized from Asia (Lellinger 1985)
Nephrolepis cordifolia	Narrow sword fern	Hawaii, se USA, Puerto Rico, Virgin Islands			X	X		Terrestrial, epiphytic on palmetto, or epipetric on old walls (Lellinger 1985); can be terrestrial, epiphytic, or on old limestone walls and is probably not native in North America (Nauman 1993b)
Nephrolepis exaltata	Boston sword fern	Hawaii, se USA, Puerto Rico, Virgin Islands			X	X		Terrestrial or usually epiphytic in forested to open habitat (Nauman 1993b); may be terrestrial, epiphytic, or epipetric (Lellinger 1985)
Nephrolepis falcata	Fish-tail sword fern	Hawaii, Florida					X	Naturalized in Hawaii; terrestrial fern of mesic to wet forests at low elevation (Palmer 2003)
Nephrolepis rivularis	Streamside sword fern	Puerto Rico, Virgin Islands					X	Terrestrial fern of mesic habitats (Moran 1995b)
Nephrolepis × *copelandii*	Copeland's sword fern	Hawaii					X	Hybrid of *Nephrolepis cordifolia* × *N. multiflora*, considered naturalized in Hawaii; Palmer (2003) describes the parent species *N. multiflora* (native to India and tropical Asia) as terrestrial; hybrid found along trails

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Nephrolepis × *medlerae*	Medler sword fern	Hawaii					X	Hybrid of *Nephrolepis exaltata* ssp. *hawaiiensis* × *N. multiflora*; Palmer (2003) describes the parent species *N. multiflora* (native to India and tropical Asia) as terrestrial; hybrid found along trails at two sites on Oahu
Oleandra articulata	Oleander fern	Puerto Rico			X			Epiphytic or climbing by adventitious roots in moist forests at middle to upper elevations (Acevedo-Rodriguez 2005)
Ericaceae								
Symphysia racemosa	Leather-leaf eelvine	Puerto Rico					X	Synonym = *Vaccinium racemosum*; scandent or clambering shrubs from moist areas (Acevedo-Rodriguez 2005)
Fabaceae								
Arachis hypogaea	Peanut	se USA, Puerto Rico					X	Cultivated peanut is native to South America but is grown in the southeastern U.S. and may occasionally escape and become established; typically has decumbent stems but is scarcely an epiphyte or epipetric (Gleason & Cronquist 1991)
Gesneriaceae								
Columnea ambigua	Tibey de cresta	Puerto Rico	X					Epiphytic in trees in wet or moist forests and wooded hills in Puerto Rico (Liogier & Martorell 2000)
Grammitidaceae								
Adenophorus epigaeus	Kauai kihi fern	Hawaii	X					Epiphytic or epigeous (growing in moss mats at tree bases but above the ground surface); found in wet forests and bogs on Kauai only (Palmer 2003)
Adenophorus pinnatifidus var. *pinnatifidus*	Graceful kihi fern	Hawaii	X	X				Epiphytic or epipetric fern of mesic to wet forests and along shaded streambeds (Palmer 2003)
Adenophorus pinnatifidus var. *rockii*	Rock's graceful kihi fern	Hawaii	X	X				Epiphytic or epipetric fern of mesic to wet forests and along shaded streambeds (Palmer 2003)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Adenophorus tamariscinus	Wahini noho mauna	Hawaii	X					Epiphytic fern of wet-mesic to rain forests in Hawaii (Palmer 2003)
Adenophorus tamariscinus var. *montanus*	Maui kihi fern	Hawaii	X					Epiphyte found in or near bogs or near ground level in moss mats (Palmer 2003)
Adenophorus tamariscinus var. *tamariscinus*	Wahini noho mauna	Hawaii	X					Epiphytic fern of wet-mesic to rain forests in Hawaii (Palmer 2003)
Adenophorus tripinnatifidus	Royal kihi fern	Hawaii	X					Epiphytic fern of rain forests (Palmer 2003)
Cochlidium jungens	Mountain snail fern	Puerto Rico	X					Synonym = *Grammitis jungens*; epiphyte in montane scrub (Liogier & Martorell 2000, Smith 1995)
Cochlidium serrulatum	Toothed snail fern	Puerto Rico	X					Synonym = *Grammitis serrulata*; epiphyte in moist places at lower middle to high elevations (Liogier & Martorell 2000, Smith 1995)
Enterosora trifurcata	Three-fork polypody	Puerto Rico	X					Synonym = *Grammitis trifurcata*; epiphyte in wet montane forests (Liogier & Martorell 2000, Smith 1995)
Lellingeria myosuroides	Narrow dainty polypody	Puerto Rico	X					Synonym = *Grammitis myosuroides*; epiphyte in wet forests (Lellinger 1989, Liogier & Martorell 2000)
Terpsichore taxifolia	Yew-leaf dwarf polypody	Puerto Rico	X					Synonym = *Grammitis taxifolia*; epiphyte in forests of Central America (Lellinger 1989)
Hymenophyllaceae								
Callistopteris baldwinii	Baldwin's false filmy fern	Hawaii					X	Synonym = *Trichomanes bauerianum*; terrestrial fern "on wet banks or on soil in wet, mossy forests and along stream banks in mesic forests" (Palmer 2003)
Hymenophyllum microcarpum	Creeping filmy fern	Puerto Rico	X	X				Epiphytic on trunks or rarely epipetric (Lellinger 1989)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Hymenophyllum polyanthos	Smooth filmy fern	Puerto Rico, Virgin Islands	X					Epiphytic on trunks and branches (Lellinger 1989)
Hymenophyllum wrightii	Wright's filmy fern	Alaska, British Columbia			X	X		Epiphyte on the bark of old Sitka spruce trees, as well as being terrestrial and epipetric (Lellinger 1985)
Mecodium recurvum	Ohi'a ku	Hawaii			X	X		Synonym = *Hymenophyllum recurvum*; delicate, epiphytic, epipetric, or occasionally terrestrial fern found in colonies on trees and old logs in wet, mossy forests (Palmer 2003)
Trichomanes alatum	Winged bristle fern	Puerto Rico	X	X				Shaded mossy trunks of tree ferns or moist rocks (Proctor 1989)
Trichomanes crispum	Crisped bristle fern	Puerto Rico			X			Epiphytic on trunks or rarely terrestrial (Lellinger 1989); widely scattered in wet situations at lower to rather high elevations in Puerto Rico (Liogier & Martorell 2000)
Trichomanes hymenophylloides	Thin-leaf bristle fern	Puerto Rico	X					Epiphytic on trunks and branches (Lellinger 1989)
Trichomanes krausii	Tree-moss bristle fern	Florida, Puerto Rico	X	X				"Epiphytic on tree trunks and roots, rarely on fallen trees or epipetric in limestone sinks" (Lellinger 1985)
Trichomanes lineolatum	Lined bristle fern	Florida, Puerto Rico		X				Farrar (1993a) reports this species from rock in limestone sinks; not considered established in North America according to Lellinger (1985)
Trichomanes membranaceum	Scale-edge bristle fern	Mississippi, Puerto Rico			X	X		Can be epiphytic, terrestrial, or grow on rocks (Farrar 1993a)
Trichomanes polypodioides	Jeweled bristle fern	Puerto Rico	X					Epiphytic on trunks, often of tree ferns (Lellinger 1989)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Trichomanes punctatum	Dotted bristle fern	Florida, Puerto Rico, Virgin Islands	X	X				Epiphytic on trunks and roots of trees in limestone sinks or epipetric on limestone sink walls (Farrar 1993a)
Trichomanes radicans	Aerial-root bristle fern	Puerto Rico	X					Epiphyte on trunks of trees (Lellinger 1989)
Trichomanes rigidum	Stiff bristle fern	Puerto Rico					X	Terrestrial; not epiphytic (Lellinger 1989, Pacheco 1995)
Trichomanes robustum	Robust bristle fern	Puerto Rico			X			Mossy logs, tree trunks and deep humus on forest floor in wet montane forests (Proctor 1989)
Trichomanes scandens	Climbing bristle fern	Puerto Rico	X					Epiphyte on tree fern trunks in wet forest (Proctor 1989)
Liliaceae								
Astelia menziesiana	Pua'akuhinia	Hawaii			X			Terrestrial or epiphytic perennial herbs of mesic to wet forests and bogs (Wagner et al. 1999)
Loganiaceae								
Labordia hedyosmifolia	Bog labordia	Hawaii			X			Terrestrial of sometimes epiphytic woody vine-like shrubs of wet forests and bog margins (Wagner et al. 1999)
Lycopodiaceae								
Huperzia lucidula	Shining fir-moss	e USA				X		Synonym = *Lycopodium lucidulum*; Wagner and Beitel (1993) cite habitat as "terrestrial in shaded conifer forests and mixed hardwoods, rarely on rock on shady mossy acidic sandstone;" Lellinger (1985) describes as being terrestrial or epipetric

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Marantaceae								
Calathea lutea	Pampano	Puerto Rico					X	Acevedo-Rodriguez and Strong (2005) cite this species as being a “stout caulescent herb”; they do not consider the genus epiphytic; Croat (1978) cites as rarely in forests “except for tree-fall areas, occasional on creek beds and shoreline soil deposits” in Panama
Marcgraviaceae								
Marcgravia rectiflora	Bejuco de lira	Puerto Rico, Virgin Islands					X	Lianas with two morphological phases; juvenile plants climbing by adventitious roots; adult plants to 10 m long with scandent or pendulous branches; occurs in forests at low to moderate elevations (Acevedo-Rodriguez 2005)
Marcgravia sintenisii	Shingleplant	Puerto Rico					X	Juvenile plants climbing by adventitious roots; mature plants woody vines with scandent and pendulous branches; found in moist and wet forests at upper elevations (Acevedo-Rodriguez 2005)
Melastomataceae								
Medinilla cummingii	Chandelier tree	Hawaii	X					Exotic in Hawaii, native to the Philipines; grows as a scandent epiphytic shrub 1–2 (3) m high in mossy forests (Regalado 1995)
Medinilla venosa	Holdtight	Hawaii			X			Native to the Philippines, where it is cited as an epiphyte; introduced populations in Hawaii are shrubs or trees and not epiphytic (Wagner et al. 1999)
Moraceae								
Ficus aurea	Florida strangler fig	Florida			X			Hemi-epiphyte (germinates as an epiphyte, eventually becomes rooted and free-living, e.g. stranglers) (Holbrook and Putz 1996, Wunderlin 1997)
Ficus benghalensis	Indian banyan	Florida			X			Hemi-epiphyte; epiphytic as seedling and young plant, but ultimately descending to ground level and becoming rooted (Wunderlin 1997)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Ficus benjamina	Weeping fig	Florida, Puerto Rico			X			Hemi-epiphytic tree that grows as an epiphyte as a seedling/sapling but eventually strangles the host plant to become rooted as an adult; native to tropical Asia (Harrison et al. 2003)
Ficus carica	Common fig	e and s USA, California, Puerto Rico					X	Shrub or small tree without adventitious roots; not hemi-epiphytic (Wunderlin 1997)
Ficus citrifolia	Wild banyantree	Florida, Puerto Rico, Virgin Islands			X			Terrestrial or strangling (epiphytic) tree or occasionally a liana (Acevedo-Rodriguez 2005)
Ficus elastica	Indian rubbertree	Florida, Puerto Rico			X			Epiphytic when young, becoming rooted in ground at maturity (Wunderlin 1997)
Ficus macrophylla	Moreton Bay fig	Australia			X			Cultivated in warm climates, native to eastern Australia; strangler species starting as an epiphyte when a seedling/sapling but becoming rooted with a banyan growth form at maturity (Hogan 2003)
Ficus microcarpa	Chinese banyan	Hawaii, Florida, Puerto Rico			X			Hemi-epiphytic, shrubby when young, becoming a tree at maturity (Wagner et al. 1999)
Ficus nota	Tibig	Hawaii					X	Cultivated and potentially invasive in Hawaii [though not cited as established by Wagner et al. (1999)]; native to the Philippines; Condit (1969) indicates that species is a tree or shrub without aerial roots (suggesting it is not hemi-epiphytic like many tropical *Ficus*) and grows along banks of streams and in forests; grows in variety of soils in areas with high humidity
Ficus platypoda	Australian fig	Australia		X				Native to Australia; described as lithophytic deciduous vines by Dixon (2003)

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			Tree	Rock	Tree/ terr.	Rock/ terr.		
Ficus religiosa	Botree	Florida, Puerto Rico			X			Epiphytic as a seedling/sapling, with roots eventually penetrating inside the stem of its host tree and ultimately splitting the host's stem before the fig's own roots reach the ground (Galil 1984)
Ficus rubiginosa	Port Jackson fig	California, Hawaii			X			Native to Australia; hemi-epiphyte or terrestrial, becoming a tree at maturity (Gardner & Early 1996)
Ficus trigonata	Jaguey blanco	Puerto Rico, Virgin Islands			X			Hemi-ephiphyte that begins life as an epiphyte but eventually becomes rooted in ground as a mature tree (Holbrook & Putz 1996)
Ophioglossaceae								
Cheiroglossa palmata	Hand fern	Florida, Puerto Rico	X					Epiphyte among leaf bases on palmetto (*Serenoa repens*) trunks (Wagner & Wagner 1993)
Orchidaceae								
Anoectochilus sandvicensis	Hawaii jeweled orchid	Hawaii			X			Terrestrial, creeping, or decumbent forb "usually occurring in dense shade on wet, bryophyte-covered ground or on the lower parts of tree trunks, rarely epiphytic on tree ferns, in wet forest" (Wagner et al. 1999)
Bletia purpurea	Pine-pink	Florida			X	X		Typically terrestrial but can grow in humus over limestone or in swamps on logs, stumps, or the base of cypress trees (Ackerman 2002)
Dilomilis montana	Parrot-beak orchid	Puerto Rico			X			"Terrestrial or epiphytic orchid … commonly seen at high elevations. Plants thrive in virgin cloud and dwarf forests as well as in disturbed, open areas along trails and roadsides" (Ackerman et al. 1992)
Epidendrum secundum	Lopsided star orchid	Puerto Rico	X					"Grows epiphytically at middle to high elevations in moist and wet forest regions" (Ackerman et al. 1992)
Epidendrum x obrienianum	O'Brien's star orchid	Hawaii			X	X		Terrestrial or lithophytic perennial orchid or rarely at the base of trees or shrubs, usually on steep, rocky slopes or in dry habitats (Wagner et al. 1999)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Liparis hawaiensis	Hawaii wide-lip orchid	Hawaii			X			"Occurring on bryophyte-covered trees, under bushes, and on wet or sometimes seasonally wet, bare ground, in bogs, and mesic to wet forest" (Wagner et al. 1999)
Maxillaria crassifolia	Hidden orchid	Florida	X					Epiphytic on trees in Big Cypress Swamp in Florida (Rickett 1967)
Oncidium floridanum	Florida orchid	Florida			X			Chase (2002) considers *O. floridanum* to be a synonym of *Oncidium ensatum*; mostly epiphytic on bases and knees of cypress, but sometimes terrestrial in rich humus of hammocks (Chase 2002)
Scaphyglottis modesta	Malaysian orchid	Puerto Rico	X					Synonym = *Tetragamestus modestus*; epiphytic on trees (Moreira & dos Santos Isaias 2008)
Vanilla barbellata	Wormvine orchid	Florida, Puerto Rico, Virgin Islands					X	Herbaceous vine climbing by aerial roots from dry forests and coastal thickets (Acevedo-Rodriguez 2005)
Piperaceae								
Peperomia alternifolia	Molokai peperomia	Hawaii	X	X				Occurs on rocks or epiphytic on tree trunks in mesic valleys (Wagner et al. 1999)
Peperomia cogniauxii	Yerba de guava falso	Puerto Rico	X					Occurs on trees and logs in mountain forests (Liogier and Martorell 2000)
Peperomia cookiana	Weak-stem peperomia	Hawaii			X	X		Epiphytic in trees, terrestrial on wet banks, or on rocks in wet forest to mesic shrubland (Wagner et al. 1999)
Peperomia degeneri	Kaluaaha Valley peperomia	Hawaii		X				Found in shaded cliffs, apparently known only from the type collection in Molokai (Wagner et al. 1999)
Peperomia distachya	Montane peperomia	Puerto Rico			X	X		On trees, rocks, and logs in mountain forests (Liogier and Martorell 2000)
Peperomia eekana	Mt. Eke peperomia	Hawaii			X			Epiphytic or occasionally terrestrial in wet forests (Wagner et al. 1999)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Peperomia ellipticibacca	Koolau Range peperomia	Hawaii			X			Epiphytic on trees or terrestrial in wet forests (Wagner et al. 1999)
Peperomia emarginella	Guadeloupe peperomia	Puerto Rico			X	X		On trees, rocks, and logs in wet mountain forests (Liogier & Martorell 2000)
Peperomia expallescens	Swamp peperomia	Hawaii			X			Epiphytic or terrestrial in wet forests (Wagner et al. 1999)
Peperomia glabella	Cypress peperomia	Florida, Puerto Rico			X			Epiphytic or terrestrial (Boufford 1997)
Peperomia globulanthera	Puu kuhui	Hawaii			X			Epiphytic on trees or terrestrial in wet forests (Wagner et al. 1999)
Peperomia hesperomannii	Single-nerve peperomia	Hawaii			X			Mostly terrestrial but occasionally epiphytic in wet forests in Hawaii (Wagner et al. 1999)
Peperomia hypoleuca	Thick-leaf peperomia	Hawaii			X			Terrestrial or epiphytic herb on trees in wet to rarely mesic forest (Wagner et al. 1999)
Peperomia kipahuluensis	Royal peperomia	Hawaii			X			Usually epiphytic in trees or in bryophyte mats, or sometimes terrestrial in wet forests and the edges of bogs (Wagner et al. 1999)
Peperomia latifolia	Hawaii peperomia	Hawaii				X		Grows on rocks or terrestrial in mesic valleys and mesic to wet forest (Wagner et al. 1999)
Peperomia macraeana	Pinni-nerve peperomia	Hawaii			X			Terrestrial or rarely epiphytic in wet forests of Hawaii (Wagner et al. 1999)
Peperomia magnoliifolia	Spoon-leaf peperomia	Florida, Puerto Rico, Virgin Islands			X			Terrestrial or epiphytic in hammock habitats (Boufford 1997)
Peperomia mauiensis	Maui peperomia	Hawaii	X	X				Found on moss-covered rocks or epiphytic on trees in mesic valleys (Wagner et al. 1999)

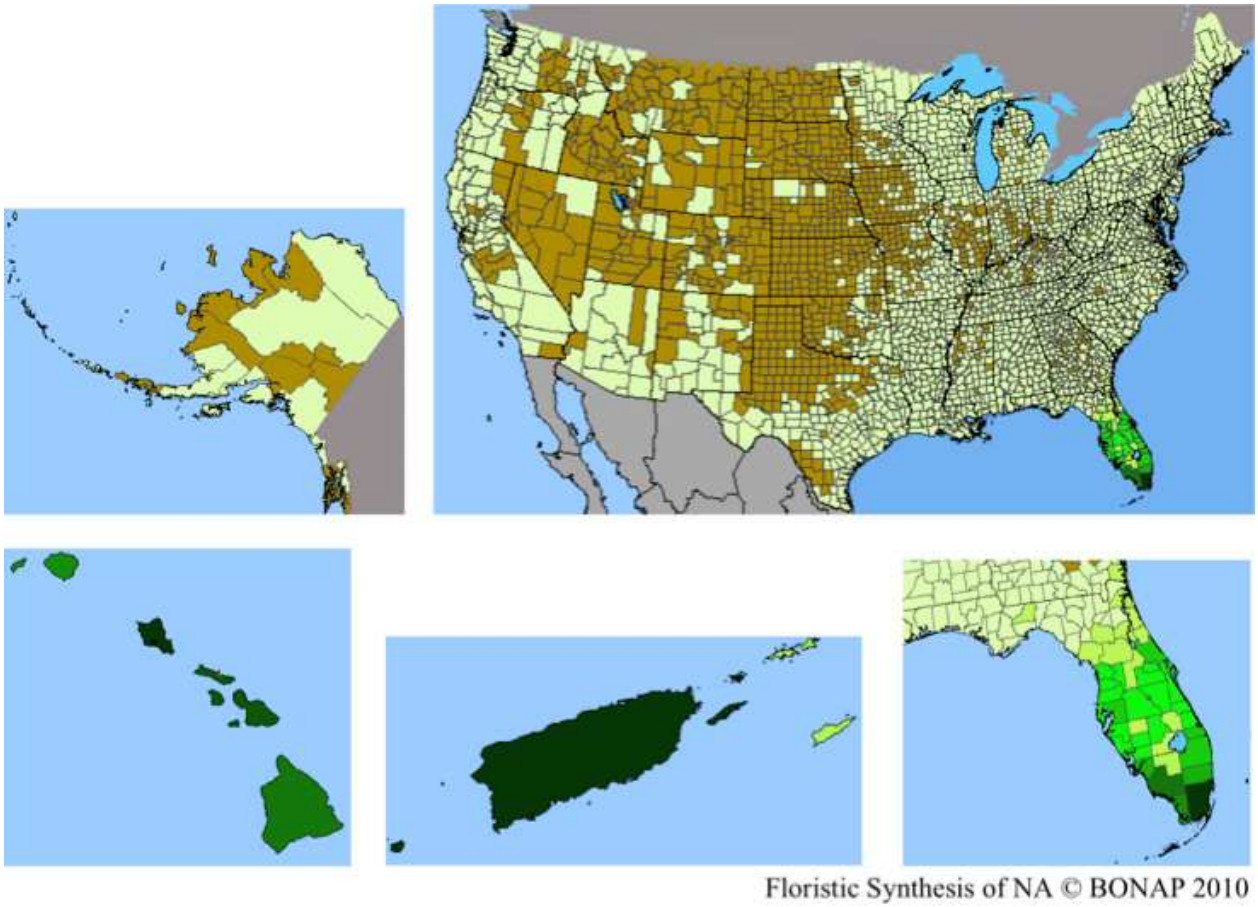
Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Peperomia membranacea	Woodland peperomia	Hawaii			X	X		Epiphytic on trees and rocks or terrestrial in mesic to wet forests (Wagner et al. 1999)
Peperomia oahuensis	Oahu peperomia	Hawaii	X					"Usually epiphytic" in mesic valleys (Wagner et al. 1999)
Peperomia obovatilimba	Graceful peperomia	Hawaii			X			Epiphytic or terrestrial on rotting logs or wet ground in wet forest (Wagner et al. 1999)
Peperomia quadrifolia	Four-leaf peperomia	Puerto Rico, Virgin Islands	X					On trees in woodlands of the western mountains of Puerto Rico (Liogier and Martorell 2000)
Peperomia remyi	Valley peperomia	Hawaii				X		Epiphytic on rocks or terrestrial in mesic valleys and mesic to wet forest (Wagner et al. 1999)
Peperomia robustior	Grand peperomia	Puerto Rico			X			Creeping on trees and logs in high-elevation forests in Puerto Rico (Liogier & Martorell 2000)
Peperomia sandwicensis	Single-spike peperomia	Hawaii				X		Epiphytic on moss-covered rocks or terrestrial in mesic valleys and wet forest (Wagner et al. 1999)
Peperomia tenella	Jayuya	Puerto Rico	X					On mossy trees in wet forests (Liogier & Martorell 2000)
Peperomia tetraphylla	Acorn peperomia	Hawaii, Puerto Rico			X	X		Grows on rocks, occasionally as an epiphyte on moss-covered trees, or in terrestrial habitats in shaded or open mesioc to wet forests, subalpine forests, and alpine desert (Wagner et al. 1999)
Polypodiaceae								
Campyloneurum angustifolium	Narrow strap fern	Florida, Puerto Rico	X					Epiphytic on oaks, pond apples, magnolias, and other rough-barked trees in hammocks and swamps in the everglades (Nauman 1993a)
Campyloneurum latum	Bird-wing fern	Florida, Puerto Rico	X					Epiphytic in tropical hammocks; apparently extirpated in Florida (Nauman 1993a)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Campyloneurum phyllitidis	Long strap fern	Florida, Puerto Rico	X	X				Epiphytic in hammocks, sometimes on walls in limestone sinkholes (Nauman 1993a)
Lepisorus thunbergianus	Weeping fern	Hawaii			X	X		Epiphytic, epipetric, or terrestrial fern of dry to mesic or wet forests; native to eastern Asia, introduced in Hawaii (Palmer 2003)
Pecluma pectinata	Comb-leaf rockcap fern	Puerto Rico	X					Epiphytic in forests (Lellinger 1989)
Phlebodium aureum	Golden polypody	se USA, Hawaii, Puerto Rico, Virgin Islands	X					Epiphytic on variety of trees or on logs, dense piles of humus, or commonly among old leaf bases of Sabal palmetto (Nauman 1993c)
Phymatosorus grossus	Musk fern	Hawaii			X	X		Terrestrial or epipetric, or occasionally epiphytic, in disturbed areas and low-elevation forests (Palmer 2003)
Polypodium loriceum	Clambering polypody	Puerto Rico					X	Terrestrial fern with scandent rhizomes by aerial roots found in moist cordilleran forests (Acevedo-Rodriguez 2005)
Psilotaceae								
Psilotum complanatum	Flat fork fern	Hawaii			X			Epiphytic or terrestrial in rain forests (Lellinger 1989)
Psilotum nudum	Whisk fern	se North America, Arizona, Hawaii, Puerto Rico, Virgin Islands			X			Found “on trees and stumps, on humus hummocks, and palmetto root mounds in damp woods and swamps” (Lellinger 1985); considered ephiphytic or terrestrial (Thieret 1993)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Pteridaceae								
Pteris vittata	Ladder brake	Hawaii, California, se USA, Puerto Rico, Virgin Islands				X		Occurs on calcareous substrates, including buildings, sidewalks, and limestone ledges (Nauman 1993d); terrestrial or epipetric on limestone (Lellinger 1985)
Rubiaceae								
Schradera exotica	Yellowshrub	Puerto Rico			X			Hemi-epiphyte with juvenile phase attached to a host plant by adventitious roots, followed by an adult phase that develops into a woody vine with scandent and pendulous branches; found in moist and wet forests (Acevedo-Rodriguez 2005)
Schizaeaceae								
Schizaea poeppigiana	Epiphytic curly-grass fern	Puerto Rico				X		Grows in shade on serpentine (Liogier & Martorell 2000)
Selaginellaceae								
Selaginella krugii	Krug's spike-moss	Puerto Rico	X					Epiphyte endemic to Puerto Rico (Gould et al. 2006)
Selaginella tenella	Delicate spike-moss	Puerto Rico			X	X		Moist shaded mossy boulders or earthen banks and ledges near streams, or rarely an epiphyte on mossy tree trunks (Proctor 1989)
Solanaceae								
Solandra grandiflora	Showy chalicevine	ConnecticutPuerto Rico, Virgin Islands					X	Climbing vines native to Mexico and tropical America, often growing up trees near waterways (Hogan 2003)

Scientific name	Common name	Distribution	Obligate epiphyte		Facultative epiphyte		Not epi.	Comments
			Tree	Rock	Tree/ terr.	Rock/ terr.		
Thelypteridaceae								
Thelypteris deltoidea	Deltoid maiden fern	Puerto Rico, Virgin Islands			X			Terrestrial or rarely epiphytic on tree trunks on moist hillsides (Proctor 1989)
Violaceae								
Viola wailenalenae	Alakai swamp violet	Hawaii			X			Terrestrial or epiphytic subshrubs in wet forests and bog hummocks (Wagner et al. 1999)
Vittariaceae								
Anetium citrifolium	Tree-trunk fern	Puerto Rico	X					Epiphyte on tree trunks very near the ground or on stilt roots of the palm Scheelea zonensis (Croat 1978)
Antrophyum lanceolatum	Straight linear-leaf fern	Puerto Rico	X	X				Synonym = *Polytaenium feei*; epiphyte in dense, wet forests of tropical America (Gomez 1973); usually epiphytic but also sometimes on rocks (Nonato & Windisch 2004)
Vittaria lineata	Dixie shoestring fern	Florida, Georgia, Puerto Rico	X					Epiphytic on trunks of sabal palm (Sabal palmetto) in moist woods along streams (Farrar 1993b, Lellinger 1985)

Figure 1. Density gradient map of occurrences of epiphytes in the United States and its territories, according to BONAP (2010). The figure shows the richness coefficient of epiphytes. Darker colors indicate greater richness. Puerto Rico, Hawaii, Florida, and Alaska are not drawn to scale so that differences in richness will be more apparent.



Legend	
Grey = outside study area	Lime green = 21–30 species
Dark tan = no species reported	Kelly green = 31–60 species
Light tan = 1–10 species	Dark green = 71–80 species
Chartreuse = 11–20 species	Black = 81–100 species