PLANTS OF CONCERN

IN AMERICAN SAMOA

by

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PURPOSE OF THE PRESENT STUDY

There are currently no federally listed "threatened or endangered" plant species in American Samoa. This does not mean no plants are threatened or endangered in the Territory, it simply means that none have been put through the laborious listing process. Indeed, there are a number of plant species among the approximately 343 native plant species recorded in the Territory so far whose existence there, or even in the world as a whole, is precarious. A previous study of the plants rare in American Samoa was prepared several years ago (Whistler 1998), but since that time virtually no work has been done on these species or on the preparation of any listing of threatened or endangered plant species for the Territory.

The purpose of the following study, entitled "Plants of Concern in American Samoa," is to determine which plant species may in the future need some kind of protection in the Territory. It is intended to be a follow-up to the 1998 work, primarily to enter the records (i.e., collection data) of the plants considered to be "of concern" in the Territory of American Samoa into a GIS data base, and map these collection records. Because of field work done in the last five years (only a small portion of which was done for this survey), the list of "Plants of Concern," as they are referred to here, has been updated to reflect changes of status of the species (e.g., new rare species being found, other species determined not to be as rare as previously thought). From the 109 Plants of Concern included on this list (Appendix A), 21 (Table 4) have been recommended for the next step, the listing process to determine if these plants meet criteria that would allow them to become federally listed threatened or endangered plant species.

INTRODUCTION

American Samoa

Samoa is a volcanic archipelago running in a north-northwest direction east of Fiji, north of Tonga, and east of the Cook Islands and Tahiti. It is divided politically into Samoa (referred to here as "independent Samoa" to avoid confusion with the term Samoa, which refers to the geographical entity, the archipelago), which is an independent country, and American Samoa, which is an unincorporated territory of the United States. The archipelago, lying at a longitude of 168–173° W and a latitude of 11–15° S, comprises nine inhabited volcanic islands, plus Swains Island and uninhabited Rose Atoll, with a total area of just over 3100 km^2. The main islands of independent Samoa, which comprise the western portion of the archipelago, are Savai'i (1820 km^2 area, 1860 m elevation) and 'Upolu (1110 km^2, 1100 m). These two islands represent about 94% of the total area of the island chain.

American Samoa, which comprises the eastern end of the archipelago, consists of five volcanic islands (Tutuila, 'Aunu'u, Ofu, Olosega, and Ta'u) and two atolls (Rose and Swains). Tutuila is the westernmost and by far the largest of the islands of American Samoa. It has an area of approximately 142 km^2 (55 mi^2) and a maximum elevation of 653 m (2140 ft) at the summit of Matafao. Lying off its southeastern end is the small tuff cone island of 'Aunu'u that has an area of less than 2 km^2 (ca. 0.6 mi^2). Approximately 100 km (62 miles) to the east lie the three islands, Ofu, Olosega, and Ta'u, that comprise the group known as Manu'a. Ta'u, which is the easternmost of the volcanic islands, has an area of 39 km^2 (15 mi^2), and a maximum elevation of ca. 960 m (3150 ft) at the summit of Mt. Lata. The much smaller islands of Ofu and Olosega, with areas of 5 km^2 (2 mi^2) and 4 km^2 (1.6 mi^2) and elevations of 495 m (1625 ft) and

640 m (2100 ft), respectively, lie together within a common reef about 10 km (6 miles) to the west of Ta‘u. East of Manu‘a about 140 km (84 mi) lies uninhabited Rose Atoll, and 320 km (192 mi) north lies Swains Island, which is home to a small population. The current population of American Samoa is over 60,000.

Previous Botanical Work

The first collection of the flora of American Samoa was made during the ill-fated La Pérouse expedition that landed on the north coast of Tutuila in 1787, but the specimens were later lost when the ships, along with everyone on board, subsequently disappeared in Melanesia. A second collection was made in 1838 by another French expedition, this one under the command of Dumont D'Urville, but little is known about the specimens, which are deposited in the Paris Museum. The first significant collections were made in 1839 during the visit of the United States Exploring Expedition (USEE) to Samoa. Unfortunately, the specimens were poorly curated, and mistakes in locality are not uncommon. In fact, some specimens of endemic Samoan plant species were incorrectly labeled as having been collected in Tahiti. Even the correctly labeled USEE specimens cite only "Samoa" as the locality, so it is not certain on which islands of the archipelago they were collected—although there is some indication from the published list of specimens of Pickering (1876) and the work of Gray (1854).

The next plant collector to visit Tutuila was apparently the Rev. T. Powell, an amateur English botanist employed as a missionary by the London Missionary Society in ca. 1850–1885. Unfortunately, most of his specimens also lack localities, so it is impossible to determine which ones were collected on Tutuila and Manu‘a and which ones on the other islands (he is known to have collected on Savai‘i and ‘Upolu as well). The only relevant publication by Powell was a list of Samoan plant names (Powell 1868). Another amateur botanist, Dr. E. Graeffe, a Swiss physician who traveled extensively in the region in the 1860s and 1870s, is known to have collected specimens in American Samoa (Tutuila) at about the same time. Unfortunately, many of his specimens, like those of the earlier collectors, lack specific localities and some are apparently mislabeled (i.e., some specimens apparently collected in Fiji are labeled as coming from Samoa).

The last botanist in the 19th century to work in Samoa was F. Reinecke, who wrote the first flora of Samoa (1896, 1898). Unfortunately, a number of Reinecke's specimens cited from American Samoa may be incorrectly labeled, since he collected some species that no one else has collected there (but which are found in independent Samoa). Several other collectors visited Tutuila before 1920, but their contributions to the flora of American Samoa are minor. The best known of these was K. Rechinger, who visited a decade after Reinecke (in 1905) and collected a few specimens on Tutuila, but the bulk of his collections were made in independent Samoa. He published his information several years later (Rechinger 1907–1915). Another botanist visited American Samoa in 1905, C. Lloyd, but the report on his work (Lloyd and Aiken 1934) does not cite any specimen numbers and it is not clear how much of the work applies to American Samoa rather than independent Samoa.

The first major collector in American Samoa since the USEE was W. A. Setchell, who visited Tutuila in 1920 and published a flora of the island (Setchell 1924). His collection includes about 580 numbers, which makes it larger than the one collected in the whole archipelago during the USEE. He was soon followed by D. W. Garber, who collected about 578 numbers on Tutuila and in Manu‘a between 1921 and 1925. Garber never published any of this

Samoan work, but most of his collections were listed by Christophersen (1935, 1938) and/or Yuncker (1945). Other minor collections in American Samoa from that decade were those made by Eames in 1921 with about 30 specimens, Bryan in 1924 with about 68, and Diefenderfer in 1929 and 1930 with about 48. These minor collections were included in Christophersen's publications.

The next major collection in American Samoa after the one of Setchell was made by E. Christophersen in 1929 and 1931 (about 407 specimens from Tutuila), and were included in his two publications on the flora of Samoa, which still form the most complete published account of the flora of the archipelago. Later collections were made by W. and A. Harris (with about 350 specimens from Manu'a, mostly weeds) in 1938 and T. Yuncker (with about 444 specimens from Tutuila and Manu'a) in 1939. Both of these collections (except for Yuncker's Tutuila specimens) were listed by Yuncker (1945) in his flora of Manu'a. Other minor collections from Ta'u were made by Judd, McMullin, Swezey, and Schultz, but only a few specimens are known from each.

More recent collections have been made on Tutuila, including those of A. Wisner in 1955 (about 163 specimens, only 2/3 of which have been accounted for), C. Lamoureux (about 80 specimens) in 1965, and C. Long (about 200 specimens) also in 1965. The original botanist on the study of American Samoa by Amerson et al. (1982), J. Kuruc, collected a number of specimens from American Samoa in 1975, but most of his collections were lost or are without any data. Another collection of undetermined size was made by P. Cox from Manu'a in 1987, but no record of these has been published other than those in the genus *Meryta* (Cox 1985). The largest collection from American Samoa, with nearly 2050 numbers, was made by the present author from 1972 to 2003. Little of this work has heretofore been published other than in revisions of two genera (Whistler 1986, 1988a). Additionally, specimen numbers with little collection data are included in two National Park studies of American Samoa (Whistler 1992b, 1994).

The Flora

The angiosperm flora of the Samoan archipelago is about one third as large as that of Fiji, which lies just 1140 km (700 mi) to the west, but it is larger than that of any other tropical Polynesian archipelago or island except Hawai'i, which has more species but fewer genera. The flora is estimated to comprise about 540 native species of flowering plants (Whistler 1992a), two thirds of them dicots. These are included in about 283 genera in 95 plant families. The level of endemism of the angiosperms is estimated to be about 30% at the species level, but only one genus, *Sarcopygme* of the Rubiaceae family, is endemic to the archipelago. An additional 250 or so species are naturalized or adventive (Whistler 1988b). The fern flora is estimated to comprise 230 species, with a much lower rate of endemism. The only comprehensive publication on the ferns of Samoa was done by Christensen (1943), who never himself collected in Samoa.

The most extensive work on the flora, until recently, was done by Christophersen, who collected in Samoa in 1929 and 1931, but his work (Christophersen 1935, 1938) is not an actual flora since it lacks taxonomic keys, descriptions, and specimen citations other than those of his own collections. Some of the knowledge of the flora has been filled in by more recent monographs and revisions of Pacific genera and families. The three largest genera, *Psychotria*, *Syzygium*, and *Cyrtandra*, have recently been revised for Samoa (Whistler 1986; Whistler 1988a; Gillett 1973, respectively). Many other genera and families in Samoa have also been revised,

including Araliaceae (Smith & Stone 1968), *Ascarina* (Smith 1976), Clusiaceae (Smith & Darwin 1974), Cunoniaceae (Smith 1952c; Bernardi 1964; Hoogland 1979), *Diospyros* (Smith 1971b), *Elaeocarpus* (Smith 1953), *Geniostoma* (Smith & Stone 1962; Conn 1980), *Macropiper* (Smith 1975), Meliaceae (Smith 1952b), *Metrosideros* (Smith 1973b), Myrsinaceae (Smith 1973a), Orchidaceae (Cribb & Whistler 1996), Rutaceae (Smith 1952a), and *Terminalia* (Smith 1971a). However, many of these revisions are now out-of-date because of more recent collections, and since they are widely scattered through the literature, most are relatively inaccessible, except for those included in Smith's flora of Fiji (1979–1996).

The native vascular flora of American Samoa, based upon Whistler 1980, 1992b, 1994, 1998, and the present work, is now estimated to be about 343 flowering plants, 135 ferns, and 9 fern allies. These are listed in Appendix A of the Whistler 1998 report, except for a few additions collected since then. The largest flowering plant families represented in the flora are Orchidaceae (65 native species), Rubiaceae (19), Fabaceae (18), Cyperaceae (17), Poaceae (15), Euphorbiaceae (12), and Urticaceae (10). As noted earlier, the rate of endemism in Samoa is about 30%, but the local endemism for American Samoa is only about 1%, i.e., only about 1% (seven or eight species) of the flora of American Samoa is endemic to the Territory (see Table 1). Another 200 or so species of vascular plants (all angiosperms) have been introduced and naturalized in American Samoa. Some of these were brought in by Polynesians ("Polynesian introductions") prior to the European Era, but most were brought in during recent times ("modern introductions") after about 1830. Some of these were "intentional introductions" brought in with a purpose in mind (e.g., food plants, like breadfruit and taro), while others were "unintentional introductions" that were inadvertently brought in stuck to the clothing or livestock of the Polynesian voyagers (and which have since become "weeds").

METHODOLOGY

The present project is built upon a baseline botanical study previously prepared by the author (Whistler 1998) for the U.S. Fish and Wildlife Service. That earlier project included an annotated checklist of the naturalized and native flora of American Samoa, a list of plant species endemic to the Territory, and a list of 111 Plants of Concern (rare plant species that may be threatened or endangered). The work for the present project included three tasks: (1) modifying the flora, based on work subsequent to 1998, which included a revision of the list of Territory endemics and list of Plants of Concern; (2) compiling collection data (e.g. data on where the plant was collected) for the 109 Plants of Concern for American Samoa; and (3) entering this collection data into a Microsoft Access database linked to a geospatial data layer in ArcView 3.3 GIS that eventually produced a map American Samoa showing the distribution of Plants of Concern in American Samoa. With this map and the accompanying data, scientists, government officials, land owners, and even developers can see which areas are most sensitive to harmful disturbance, i.e., which areas should not be developed without proper biological surveys, if at all.

Modifications to the Flora

This was only a minor part of the project, since the checklist of the vascular flora had been prepared during the 1998 project and the present project involved very little field work. However, three new native species that were collected in the interim by the author have been added to the flora of American Samoa (see the Discussion section). The list of endemic species

Table 1. Endemic plant species in American Samoa.

SPECIES	FAMILY	STATUS
Cyrtandra geminata Reinecke	Gesneriaceae	Endemic to Tutuila
Elatostema scabriusculum Setchell	Urticaceae	Endemic to American Samoa
Elatostema tutuilense Whistler	Urticaceae	Endemic to Tutuila
Liparis alavaensis Cribb	Orchidaceae	Endemic to Tutuila
Melicope richii A. Gray	Rutaceae	Endemic to Tutuila
Pandanus sp. nova?	Pandanaceae	Endemic to Ta‘u?
Psychotria garberiana Christoph.	Rubiaceae	Endemic to Manu‘a
Taeniophyllum whistleri Cribb	Orchidaceae	Endemic to American Samoa

was also modified, because one of the three new species recorded since 1998 is endemic, and one plant species previously thought to have been endemic to American Samoa has since been collected in independent Samoa (see Table 1).

Compilation of Data

The location data for the 109 Plants of Concern is found on 405 herbarium specimens and visual records (the latter lack voucher specimens). The location data for many of the herbarium specimens is found in the publications of Christophersen (1936, 1938), Reinecke (1896, 1898), and Setchell (1924). Specimens not cited in those publications can be found in various herbaria, particularly the Bishop Museum herbarium in Honolulu. That institution houses the first set of specimens of Christophersen, Yuncker, Garber, Wilder, Harris, Bryan, Wisner, Spence, Diefenderfer, Guest, Mitchell, and Meebold. Second in importance is the herbarium of the Botany Department of the University of Hawai‘i, which is the main depository for the specimens of Whistler (his personal collection), Lamoureux, Long, Solek, Lualua, and Kuruc. The last three collectors have only a few specimens total. Several of the specimens are housed only in herbarium cases located at the Department of Marine and Wildlife Resources in Pago Pago, principally the collections of Trail, Webb, and Bartley (together totaling only a few). The specimens of Reinecke were originally housed in the Berlin Herbarium, but were destroyed during World War II, with some duplicates scattered in different herbaria. Those of Powell and Sledge are at the Royal Botanic Gardens, Kew, those of Setchell are at the University of California, Berkeley, and those of the United States Exploring Expedition (which lack collection data) are at the Smithsonian Institution. It is unclear where the specimens of Tetens, Graeffe, and Uhe are located, but they represent only a few of the specimens of the Plants of Concern. The author has seen nearly all of these specimens at their respective herbaria. The most difficult specimens to deal with are those of Powell, since he rarely even recorded from which island his specimens were collected.

All of this collection data, gleaned from the publications and the author’s examination of the herbarium specimens, was added to each of the 109 Plants of Concern, and is shown in Appendix A. Once this compilation stage was completed, the data was ready for entry into the GIS data base in the form of points on a map of American Samoa.

Entering the Data

The locations of the specimens and associated information shown in Appendix A were entered in a Microsoft Access database developed by Ron Salz of the U.S. Fish and Wildlife Service. Each specimen was given a unique identifier, beginning at record 1 and finishing at record 405. Known locations for specimens were mapped in an ArcView 3.3 geospatial data layer (shapefile) and linked to the Microsoft Access database based on each specimen's unique identifier. Each specimen was given an "accuracy estimate" to indicate how accurately the location was mapped. The accuracy estimates are based on those used by the Hawai'i Natural Heritage program. The accuracy estimates used were 15 m, 50 m, 100 m, 250 m, 500 m, and 1000 m, and are recorded in the specimen database. Some of these estimates are quite accurate, especially when they occurred on a point of land or islet. Three were mapped using a GPS unit carried by Dr. Eric Hansen of the Land Grant College of American Samoa (see Appendix B for an aerial photo prepared by Dr. Hansen). These records, which include *Xylocarpus moluccensis*, *Scirpodendron ghaeri*, and *Ximenia americana*, are situated at Nu'uuli on Tutuila. Some of the records in Appendix A were not given accuracy estimates, principally because the only data recorded on these specimens was the island where the collection was made (as in the case of some of the Reinecke and Powell specimens). In Appendix A, "location not mapped" was noted for these records.

DISCUSSION

Based on new work done since 1998, the checklist of the native vascular plant flora of American Samoa has modified to add three newly found native species, *Liparis alavaensis* (Orchidaceae), *Luisia teretetifolia* (Orchidaceae), and *Cymbopogon refractus* (Poaceae). This increases the number of native flowering plants from 340 to 343 species. The number of endemics (Table 1) remains the same, seven or eight (depending upon the ultimate disposition of the *Pandanus* sp.), as one new species (*Liparis alavaensis*) was added and one (*Melicope vatiana*) was removed (because it has since been found in independent Samoa). Several new weed species have been added to the list of native and naturalized species in American Samoa from work done over the last five years, including *Ipomoea triloba* (Convolvulaceae), *Hyptis rhomboidea* (Lamiaceae), and *Solanum torvum* (Solanaceae). Another probable weed, now possibly no longer found in the Archipelago, was also added to the list, *Sigesbeckia orientalis* (Asteraceae), since it was omitted from the 1998 list.

From the native species, 109 species have been selected as Plants of Concern that should merit further attention. The 1998 list included 111, but several have been added in the present report, and several others have been removed for various reasons. The criteria for inclusion into this category are several, but it is difficult to produce any hard and fast definition. However, the following factors were considered during the selection:

(1) Being endemic to the Territory. Species that fit into this category are found nowhere else in the world. If they are only indigenous, they are also naturally found elsewhere. Species endemic to the Territory and threatened there are thus threatened in the world. Being in this category, i.e., being endemic, does not bring automatic status as a Plant of Concern, since the species may be common in the Territory. In fact, only 3 of the 7 or 8

species endemic to American Samoa are included on the recommended list of threatened or endangered species in American Samoa (see Table 4).

(2) Being rare in the territory. Species that fit into this category have only been collected a few times, and special emphasis was placed on ones that have not been collected in many years (e.g., before 1970). About half of all plant collections known from American Samoa (i.e., specimens now stored in major herbaria) have been collected since that date, and the collector of the vast majority of these post 1970 collections (the present author) has particularly looked for rarely collected species. In fact, of the 109 species on the list of Plants of Concern, only 15 have not been collected by him (and only one of those 15 has been collected by anyone else since 1932). Consequently, species not seen by the author are very likely to be rare in the Territory. Being rare in the Territory does not mean that the plant is necessarily rare over the rest of its range, but the status of Plant of Concern is only a local category.

(3) Being restricted to a single habitat. Plants that occur in only one habitat, e.g., littoral forest, are more likely to be threatened when that habitat is disturbed. This is particularly the case for montane scrub, where seven of the species on the list of Plants of Concern are found (see Table 2). The most threatened habitats, however, are those found near the coast, where most of the present and future development has occurred and will occur. Plants occurring in habitats that are unlikely to be undisturbed in the future, e.g., summit scrub (on Ta‘u), are unlikely to be threatened by human disturbance.

(4) How conspicuous the species are. Some plants are not easily spotted, e.g., tiny epiphytic ferns, and these may sometimes be found only by an expert. The fern *Trichomanes taeniatum* fits in this category, since its one collection in the Territory was made by a fern expert (Sledge). The ferns of American Samoa are not well studied, and for this reason none were included among the plants recommended for inclusion on the Federal list of threatened or endangered plant species (see Table 4). Also fitting into this category of inconspicuous plants are orchids, especially epiphytic ones that cannot be seen from the ground. In fact, 21 of the 65 native or naturalized orchids now known in American Samoa were not recorded there before 1970, and additional native orchid species are likely to be discovered in the future.

Combining all of these factors, the present list of the 109 Plants of Concern was compiled. It may be too late for some of these—several species are thought to have been extirpated (driven to extinction in a certain area) from the Territory (Table 3). These species have been included with the Plants of Concern, nevertheless, in hopes that they may one day be found again and saved. One species is apparently endemic to American Samoa, *Elatostema tutuilense*, and was collected somewhere behind Faga‘alu in 1894. If it is truly extirpated from the Territory, it is extinct as well, since its only known location is Tutuila.

One group of plants that has fared especially badly in modern times is the category of “Polynesian introduction,” including both unintentional and intentional introduced species. Several Polynesian weeds have disappeared or nearly so in the Territory because of the introduction of more aggressive weeds, many of them from tropical America, and these early species are now at a competitive disadvantage in their struggle for survival. Two Polynesian

Table 2. Plant Species of Restricted Geographic Distribution in American Samoa.

Species	Family	Status[1]	Island/Times[2]	Last Date Collected
Restricted to Montane Scrub				
Cymbopogon refractus	Poaceae	I	TU1	2002
Cyrtandra geminata	Gesneriaceae	E	TU7	1992
Dioclea wilsonii	Fabaceae	I	TU3	2001
Ischaemum stokesii	Poaceae	I	TU5	1998
Melicope richii	Rutaceae	E	TU8	1998
Macharina falcata	Cyperaceae	I	TU8	1998
Mapania parvibracteata	Cyperaceae	I	TU3	1998
Restricted to Summit Scrub				
Alpinia samoensis	Zingiberaceae	S	TA1	*ca. 1998
Gahnia vitiensis	Cyperaceae	I	TA3	1998
Joinvillea plicata	Joinvilleaceae	I	TA1	1998
Restricted to Wetlands				
Erythrina fusca	Fabaceae	I?	TU3	2002
Limnophila fragrans	Scrophulariaceae	I	TU5/OF1/TA3	1998
Scirpodendron ghaeri	Cyperaceae	I	TU3	1992
Xylocarpus moluccensis	Meliaceae	I	TU8/AU3	2000
Restricted to One to Three Localities				
Aidia racemosa	Rubiaceae	I	TU4/AU1	2002
Boerhavia albiflora	Nyctaginaceae	I	TU2	1992
Caesalpinia bonduc	Fabaceae	I	AU3	1998
Canavalia sericea	Fabaceae	I	OL4	1997
Crateva religiosa	Capparidaceae	I	OF5/OL1	2001
Cymbopogon refractus	Poaceae	I	TU1	2002
Dendrocnide harveyi	Urticaceae	I	TU4/TA3	2001[3]
Gossypium hirsutum	Malvaceae	I	TU1/AU5/OF	1998
Korthalsella horneana	Loranthaceae	I	TA2	1976
Lepturopetium kuniense	Poaceae	I	TU5	2001
Luisia teretifolia	Orchidaceae	I	TU1	2002
Manilkara dissecta	Sapotaceae	I	TU7	2002
Milletia pinnata	Fabaceae	I	TU2/TA3	1998
Plumbago zeylanica	Plumbaginaceae	I	OF1/OL3	1998
Sophora tomentosa	Fabaceae	I	TU2/AU4	1998
Ximenia americana	Olacaceae	I	TU3	1998

[1] S=Samoan endemic; E=Territory endemic; I=Indigenous.
[2] TU=Tutuila; AU=‘Aunu‘u; OF=Ofu; OL=Olosega; TA=Ta‘u.
[3] Seen but not collected in that year.

Table 3. Plant Species Possibly Extinct in or Extirpated from American Samoa.

Species	Family	Status[1]	TU[2]	AU	OF	OL	TA	Last Collection
Elatostema tutuilense	Urticaceae	E	1	--	--	--	--	1894
Habenaria monogyne	Orchidaceae	S	1	--	--	--	--	1920
Euphorbia reineckei	Euphorbiaceae	S	1	--	--	--	--	1976
Blumea milnei	Asteraceae	I	--	--	1	1	--	1895
Cenchrus calyculatus	Poaceae	I	1	--	--	--	--	ca. 1840
Gyrocarpus americanus	Gyrocarpaceae	I	--	1	1	--	--	1925
Liparis caespitosa	Orchidaceae	I	2	--	--	--	--	1929
Psilotum nudum	Psilotaceae	I	--	--	1	--	--	ca. 1840
Parinari insularum	Chrysobalanaceae	P	1	--	1	?	?	1920
Syzygium neurocalyx	Myrtaceae	P	4	--	--	--	?	1932
Senna sophera	Fabaceae	P	1	--	--	--	--	1920
Sigesbeckia orientalis	Asteraceae	P	--	--	--	--	1	1921

[1] S=Samoan endemic; E=Territory endemic; I=Indigenous.
[2] TU=Tutuila; AU=‘Aunu‘u; OF=Ofu; OL=Olosega; TA=Ta‘u.

“weedy” species are thought to have been extirpated from the Territory (Table 3), *Senna sophera* (Fabaceae) and *Sigesbeckia orientalis* (Asteraceae). Several others, including *Cyathula prostrata* Amaranthaceae), *Laportea interrupta* (Urticaceae), *Leucas decemdentata* (Lamiaceae), *Portulaca quadrifida* (Portulacaceae), *Sida samoensis* (Malvaceae), *Uraria lagopodoides* (Fabaceae), and *Urena lobata* (Malvaceae), are now uncommon or rare. Several intentional Polynesian introductions have apparently disappeared from the Territory, mostly because they are no longer cultivated, and this includes *Parinari insularum* (Chrysobalanaceae) and *Syzygium neurocalyx* (Myrtaceae), as shown in Table 3. Several others are rare to uncommon for the same reason, including *Benincasa hispida* (Cucurbitaceae), *Atuna racemosa* (Chrysobalanaceae), *Cordia aspera* (Boraginaceae), *Cucumis melo* (Cucurbitaceae), *Phaleria disperma* (Thymelaeaceae), *Solanum viride* (Solanaceae), and *Tephrosia purpurea* (Fabaceae). The fact that some of these species are “weeds” is not important to whether they should be considered Plants of Concern, since they may now be in peril over their whole range.

RECOMMENDATIONS

From the list of 109 vascular plant Species of Concern recognized here for American Samoa, 21 have been selected for recommendation as federally listed “threatened or endangered” plant species (Table 4). With such an official listing, these species will be accorded some of the protection of which they are greatly in need (since there are no plants in American Samoa that are officially recognized as being in peril). The next recommended step is to have the species evaluated by sources other than the author to determine if they would qualify for nomination as threatened or endangered species, and if so, to determine in which of the two categories they belong. Most U.S. states also have their own list of threatened or endangered species, so it is also important that the Government of American Samoa take some action on its own to protect

Table 4. Plant species recommended as threatened or endangered in American Samoa.

Species	Family	Status[1]	TU[2]	AU	OF	OL	TA	Last Found
Blumea milnei	Asteraceae	I	--	--	1	1	--	1895
Cenchrus calyculatus	Poaceae	I	1	--	--	--	--	ca. 1850
Cordia aspera	Boraginaceae	I?	4	--	1	--	1	1997
Crateva religiosa	Capparidaceae	I	--	--	5	1	--	2001
Cucumis melo	Cucurbitaceae	P	2	--	1	--	4	2002
Cyrtandra geminata	Gesneriaceae	E	7	--	--	--	--	1992
Dioclea wilsonii	Fabaceae	I	3	--	--	--	--	2001
Elatostema tutuilense	Urticaceae	E	1	--	--	--	--	1895
Gossypium hirsutum	Malvaceae	I	1	5	(1)	--	--	1998
Gyrocarpus americanus	Gyrocarpaceae	I	--	1	1	--	--	1925
Habenaria monogyne	Orchidaceae	S	1	--	--	--	--	1920
Ischaemum stokesii	Poaceae	I	5	--	--	--	--	1998
Lepturopetium kuniense	Poaceae	I	5	--	--	--	--	2001
Limnophila fragrans	Scrophulariaceae	I	5	--	1	--	5	1998
Liparis alavaensis	Orchidaceae	E	1	--	--	--	--	2003[3]
Manilkara dissecta	Sapotaceae	I	7	--	--	--	--	2003
Mapania parvibracteata	Cyperaceae	I	3	--	--	--	--	1997
Parinari insularum	Chrysobalanaceae	P	1	--	1	?	?	1920
Solanum viride	Solanaceae	P?	4	--	1	--	1	2003[3]
Syzygium neurocalyx	Myrtaceae	P	4	--	--	--	?	1932

[1] E=American Samoan endemic; S=Samoan endemic; I=Indigenous; P=Polynesian Introduction.
[2] TU=Tutuila; AU=‘Aunu‘u; OF=Ofu; OL=Olosega; TA=Ta‘u.
[3] Seen but not collected in that year.

the Territory’s flora. This list of recommended species will serve both interests. Once the process is started, each of the species can be evaluated on its own by federal or local criteria. The listing process may be long, but a journey of a thousand miles begins with the first step.

REFERENCES CITED

Anon. 1998. Pacific islands (excluding Hawai‘i) plants and animals: updated November 5, 1998: listed, proposed, or candidate species, as designated under the U.S. Endangered Species Act. USFWS, Hawai‘i, document.

Amerson, A. B. Jr., W. A. Whistler, & T. D. Schwaner. 1982. Wildlife and wildlife habitat of American Samoa. I. Environment and ecology; II. Accounts of flora and fauna. U. S. Dept. Interior. 2 Vols.

Bernardi, L. 1964. Revisio generis *Weinmanniae*. Bot. Jahrb. Syst. 83 (2): 126–186.

Brownlie, G. 1977. *The pteridophyte flora of Fiji*. J. Cramer, Vaduz, Germany. 397 pp.

Christophersen, E. 1935, 1938. Flowering plants of Samoa. Bernice P. Bishop Mus. Bull. 128: 1–221. II. Bernice P. Bishop Mus. Bull. 154: 1–77.

Christensen, C. 1943. A revision of the Pteridophyta of Samoa. Bernice P. Bishop Mus. Bull. 177: 1–138.

Conn, B. J. 1980. Revision of *Geniostoma* subg. *Geniostoma*. Blumea 26 (2): 245–364.

Cox, P. A. 1985. The genus *Meryta* (Araliaceae) in Samoa. Jour. Arnold Arbor. 66 (1): 113–121.

Cribb, P. J. and W. A. Whistler. 1996. The Orchids of Samoa. Kew Gardens, London. 141 pp.

Gillett, G. W. 1973. The genus *Cyrtandra* (Gesneriaceae) in the South Pacific. Univ. Calif. Pub. Bot. 66: 1–59.

Gray, A. 1854. Botany. Phanerogamia. U. S. Explor. Exped. 15 (1): 1–177.

Hoogland, R. D. 1979. Studies in the Cunoniaceae II. Blumea 25 (2): 321–478.

Lloyd, C. G. & W. H. Aiken. 1934. Flora of Samoa. Bull. Lloyd Libr. Bot. 33: 1–116.

Pickering, C. 1876. The geographical distribution of animals and plants in their wild state. (From USEE, Vol. 19, pt. 2: 276–311). Naturalist’s agency, Salem, Mass.

Powell, T. 1868. On various Samoan plants and their vernacular names. Jour. Bot. 6: 278–285, 342–347, 355–370.

Rechinger, K. 1907–1915. Botanische und Zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoa-Inseln... Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 81: 197–317. 1907; 84: 385–562. 1908; 85: 175–432. 1910; 88: 1–65. 1911; 89: 443–708. 1913; 91: 139–213. 1915.

Reinecke, F. 1896, 1898. Die Flora der Samoa-Inseln. Bot. Jahrb. Syst. 23: 237–368; 25: 578–708.

Setchell, W. A. 1924. American Samoa. Part I. Vegetation of Tutuila Island. Publ. Carnegie Inst. Wash. 341: 1–175.

Smith, A. C. 1952a. Studies of Pacific Island plants, 9. Notes on the Rutaceae of Fiji, Samoa, and Tonga. Jour Arnold Arbor. 32: 226–255.

----------. 1952b. Studies of Pacific Island plants, 10. The Meliaceae of Fiji, Samoa, and Tonga. Contr. U. S. Natl. Herb. 30 (4): 469–522.

----------. 1952c. Studies of Pacific Island plants, 12. The Cunoniaceae of Fiji and Samoa. Jour. Arnold Arbor. 33: 119–149.

----------. 1953. Studies of Pacific Island plants, 15. The genus *Elaeocarpus* in the New Hebrides, Fiji, Samoa, and Tonga. Contr. U. S. Natl. Herb. 30 (5): 523–573.

----------. 1971a. Studies of Pacific Island plants, 24. The genus *Terminalia* (Combretaceae) in Fiji, Samoa, and Tonga. Brittonia 23 (4): 394–412.

----------. 1971b. Studies of Pacific Island plants, 23. The genus *Diospyros* (Ebenaceae) in Fiji, Samoa, and Tonga. Jour. Arnold Arbor. 52 (3): 369–403.
----------. 1973a. Studies of Pacific Island plants, 25. Myrsinaceae of the Fijian Region. Jour. Arnold Arbor. 54 (1): 1–41, (2): 228–292.
----------. 1973b. Studies of Pacific Island plants, 26. *Metrosideros collina* (Myrtaceae) and its relatives in the southern Pacific. Amer. Jour. Bot. 60 (5): 479–490.
----------. 1975. The genus *Macropiper* (Piperaceae). Jour. Linn. Soc., Bot. 71 (1): 1–38.
----------. 1976. Studies of Pacific Island plants, 33. The genus *Ascarina* (Chloranthaceae) in the southern Pacific. Jour. Arnold Arbor. 57 (4): 405–425.
----------. 1979–1996. Flora vitiensis nova: a new flora of Fiji. Vol. 1: 1–495 (1979); II: 1–810 (1981): III: 1–758 (1985); IV: 1–377 (1988); V: 1–626 (1991); VI: 1–125 (1996). National Trop. Bot. Gard., Kaua‘i, Hawai‘i.
Smith, A. C. and S. P. Darwin. 1974. Studies of Pacific Island plants, 28. The Guttiferae of the Fijian Region. Jour. Arnold Arbor. 55 (2): 215–263.
Smith, A. C. and B. C. Stone. 1962. Studies of Pacific Island plants, 17. The genus *Geniostoma* (Loganiaceae) in the New Hebrides, Fiji, Samoa, and Tonga. Contrib. U. S. Natl. Herb. 37 (1): 1–41.
----------. 1968. Studies of Pacific Island plants, 19. The Araliaceae of the New Hebrides, Fiji, Samoa, and Tonga. Jour. Arnold Arbor. 49 (4): 431–501.
Stearns, H. T. 1944. Geology of the Samoan Islands. Bull. Geolog. Soc. Amer. 55: 1279–1332.
Sykes, W. R. 1970. Contributions to the flora of Niue. N. Z. Dept. Sci. and Indust. Res. Bull. 200: 1–321.
Whistler, W. A. 1980. The vegetation of Eastern Samoa. Allertonia 2 (2): 45–190.
----------. 1986. A revision of *Psychotria* (Rubiaceae) in Samoa. Jour. Arnold Arbor. 67: 341–370.
----------. 1988a. A revision of *Syzygium* (Myrtaceae) in Samoa. Jour. Arnold Arbor. 69: 167–192.
----------. 1988b. Checklist of the weed flora of Western Polynesia. South Pacific Commission Technical Paper 194. Noumea, New Caledonia. 69 pp.
----------. 1992a. Vegetation of Samoa and Tonga. Pac. Sci. 46 (2): 159–178.
----------. 1992b. Botanical inventory of the proposed Ta‘u unit of the National Park of American Samoa. Techn. Rept. 83. Cooperative National Park Resources Study Unit, Honolulu. 85 pp. (Mimeograph)
----------. 1994. Botanical inventory of the proposed Tutuila and Ofu units of the National Park of American Samoa. Techn. Rept. 87. Cooperative National Park Resources Study Unit, Honolulu. 85 pp. (Mimeograph)
----------. 1998. A study of the rare plants of American Samoa. Report prepared for the U.S. Fish and Wildlife Service, Honolulu. Mimeo. 118 pp.
----------. 2001. Plants in Samoan culture: the ethnobotany of Samoa. Isle Botanica, Honolulu. 234 pp.
Yuncker, T. G. 1945. Plants of the Manua Islands. Bernice P. Bishop Mus. Bull. 184: 1–73.