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Technical Report 87

BOTANICAL INVENTORY OF THE PROPOSED TUTUILA AND OFU UNITS OF THE NATIONAL PARK OF AMERICAN SAMOA

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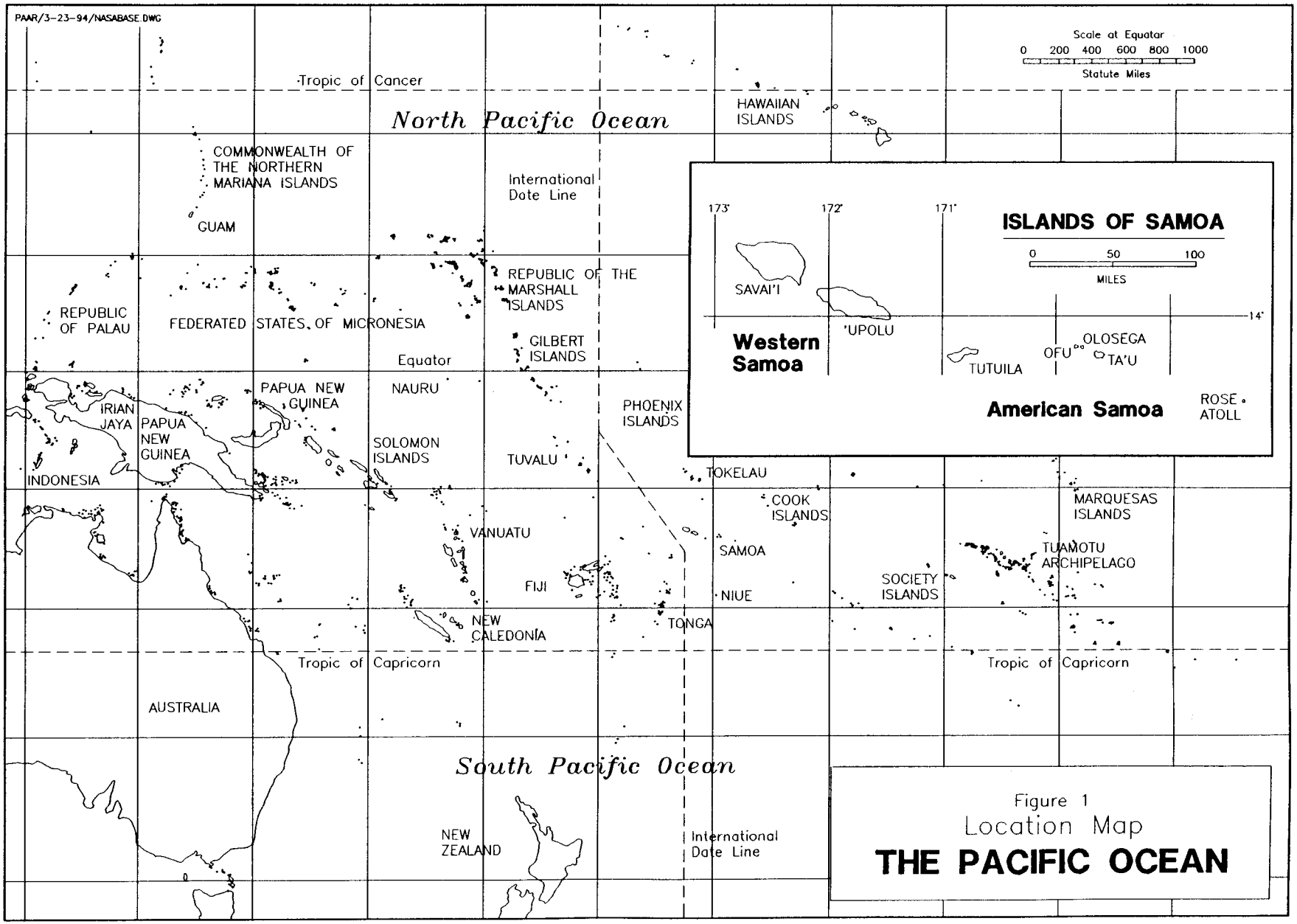

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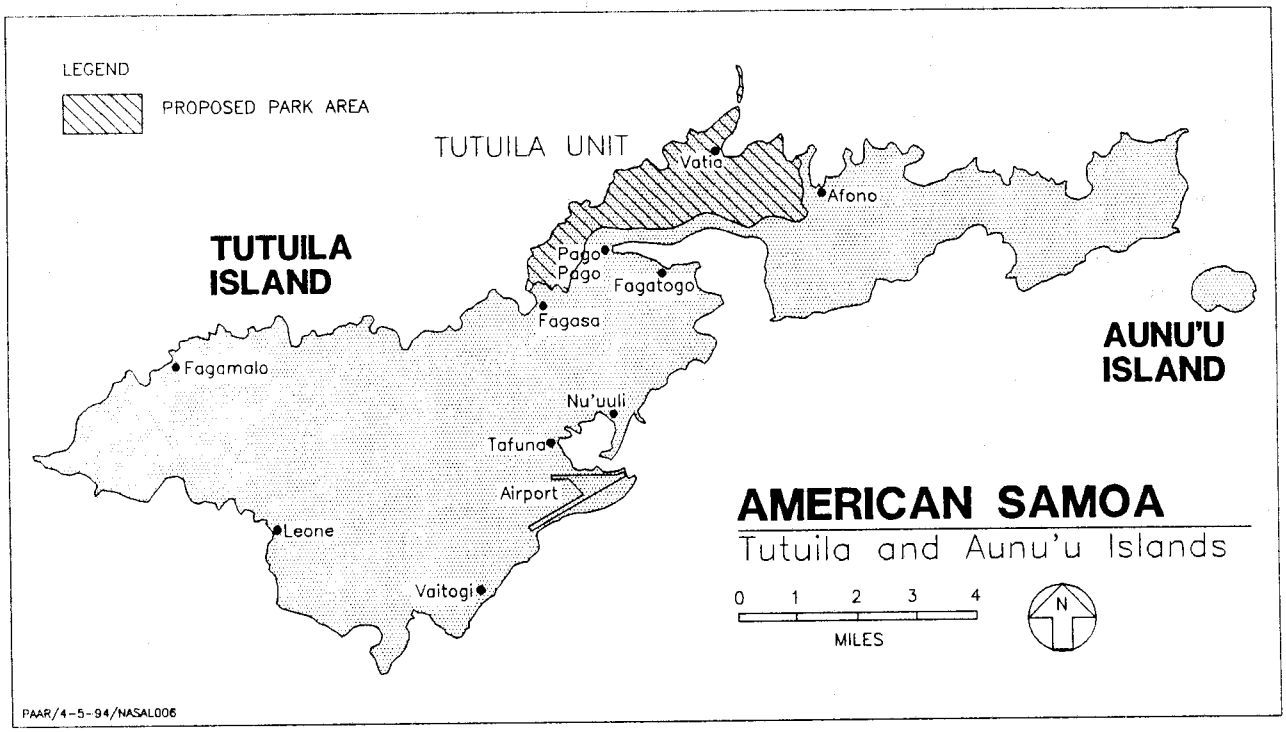


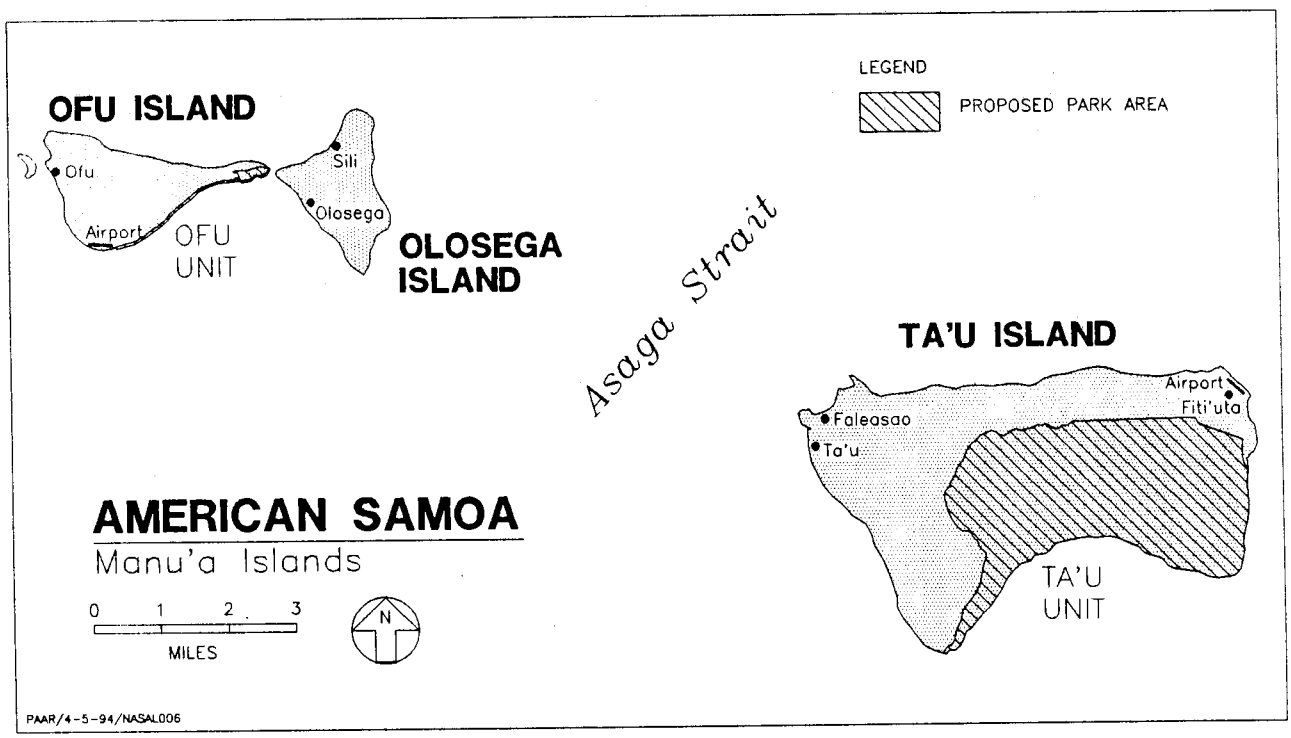


Figure 2. Major islands of American Samoa and proposed park units.

I. INTRODUCTION

The Geography

Samoa is a volcanic archipelago situated in the south Pacific Ocean at a latitude of 13 – 15° south and a longitude of 168 – 173° west, and runs in a west-northwest direction east of Fiji, north of Tonga, south of Tokelau, and west of Niue and the Cook Islands (Fig. 1). It comprises nine inhabited volcanic islands and two distant atolls, and has a total area of *ca.* 3100 km^2. The archipelago is divided politically into Western Samoa, which is an independent country, and American Samoa, which is an unincorporated territory of the United States.

American Samoa, which comprises the east end of the archipelago, consists of five main volcanic islands (Tutuila, 'Aunu'u, Ofu, Olosega, and Ta'u) and two atolls (Rose and Swains). Tutuila, on which this unit of the new proposed park is located (other units are on Ofu and Ta'u), is the westernmost and by far the largest of the islands of American Samoa. It has an area of approximately 142 km^2 and a maximum elevation of 653 m on top of Matafao (Amerson *et al.* 1982).

The proposed Tutuila unit of the National Park of American Samoa is located on the north central part of the island, between the villages of Fagasa on the west and Afono on the east (Fig. 2 & 3). The village of Vatia is situated in the center of the park, and the boundaries around it begin at about the 200 ft elevational line. The northern boundary is the Pacific Ocean, and the southern boundary is the slope leading from Pago Pago Harbor up to Alava Ridge. The highest elevation in the Tutuila unit of the park is Mt. Alava at 490 m (1610 ft), where a TV tower is located, and the total area of the park is 2,770 acres (National Park Service 1988). The Ofu unit is discussed in Appendix D.

The Climate

Since American Samoa comprises small islands situated between the Tropic of Capricorn and the Equator, its climate is maritime and tropical. It belongs to Koeppen's "tropical climate zone" characterized by average monthly temperatures of more than 18°C, no winter season, and abundant annual rainfall that exceeds annual evaporation. The mean daily temperature for Tutuila is 26.7°C (80°F), with an average maximum daily of 29.7°C (85.4°F) and an average minimum daily of 23.6°C (74.6°F). There is not much seasonal variation, with the warmest month being March (27.2°C, 80.9°F) and the coolest being August (25.9°C, 78.7°F) (Nakamura 1984).

The rainfall at the airport at Tafuna on the south-central coast of Tutuila averages about 3200 mm (124 in) per year (Nakamura 1984). The monthly average there from October to May is 300 mm (12 in), while in the dry season from June to September it is 180 mm (7 in). This variation is strongly affected by the tradewinds, which blow regularly from the southeast from about April to December. The months when they are absent are characterized by storms coming in from other directions.

Topographic features strongly effect these totals in some places. For example, Pago Pago, which lies just to the west of "Rainmaker" (Matafao) mountain, averages nearly 5000 mm (200 in) a year. There is probably not too much of a rainshadow effect, since the island is not very high in elevation, but more rain would be expected to fall on the south and east coasts than on the north and west coasts, as in Western Samoa (Wright 1963).

The relative humidity is constantly high, ranging between 82 and 86% (at 5 p.m.) throughout the year (Amerson *et al.* 1982). Droughts of varying duration occasionally occur, but these do not have much permanent effect on the vegetation. Hurricanes, the most recent of which were in 1987 (known as Tusi), 1990 (Ofa), and 1991 (Val), periodically hit the islands, but the occurrence of three strong hurricanes in such close proximity is unusual.

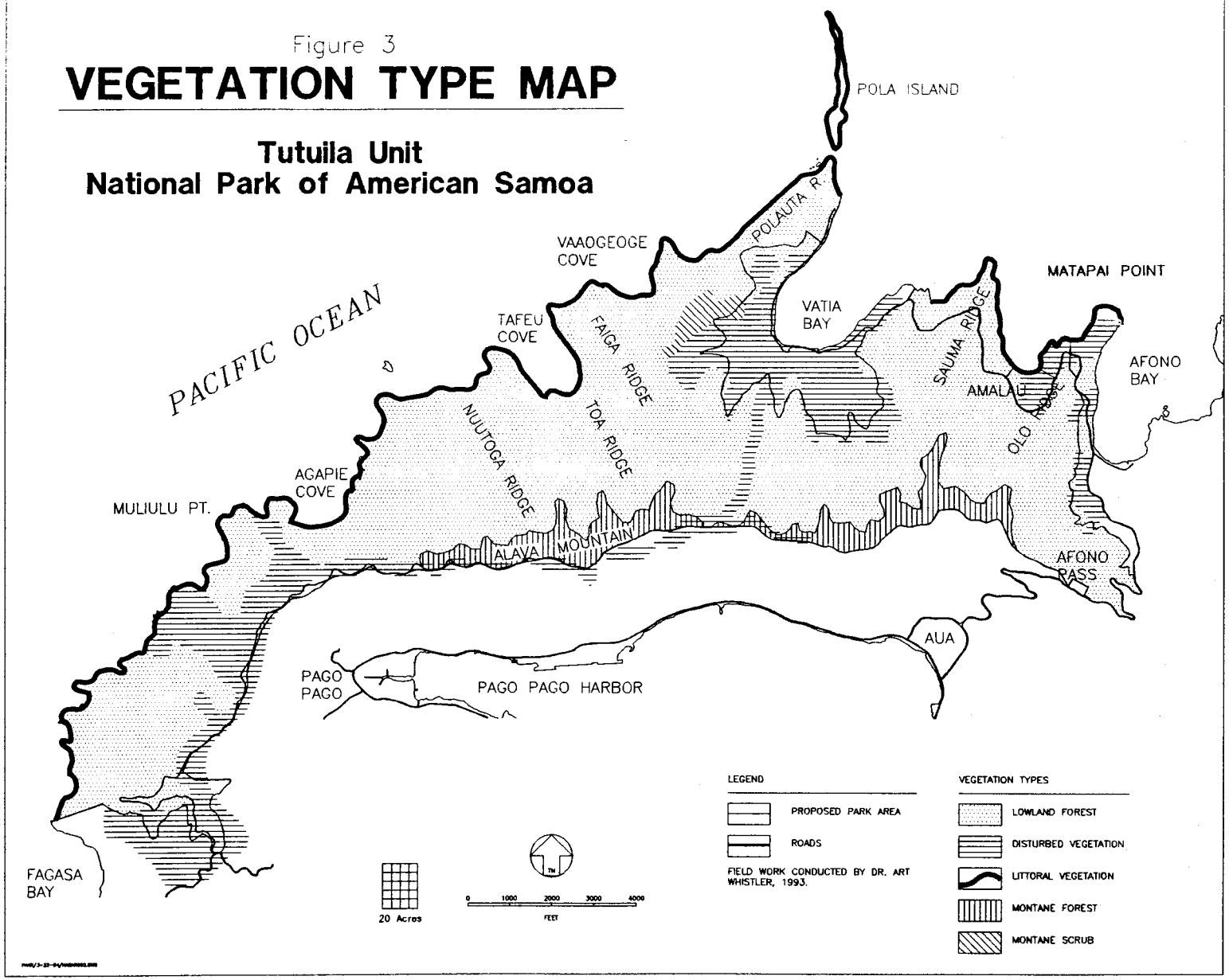
The Geology

Samoa is a volcanic archipelago that is "oceanic" in origin, i.e., it was formed from basalt rising from a "hot spot" on the ocean floor of the Pacific plate beyond the continental islands to the west. The archipelago was born in isolation, and has never had a connection to any other land area. The islands originated in the Pliocene Epoch (over two million years ago), and were formed generally in a westerly direction, with the youngest on the west end of the chain (Savai'i in Western Samoa) and the oldest on the east end (Rose Atoll). The most recent volcanic activity in American Samoa was a submarine eruption between Ta'u and Olosega in 1866. The only signs of geologically recent volcanism on Tutuila are the Tafuna Plain, and several adjacent

Figure 3

VEGETATION TYPE MAP

Tutuila Unit
National Park of American Samoa



tuff and cinder cones, including the island of 'Aunu'u, but these eruptions are thousands of years old. There are no signs of recent volcanism within the boundaries of the proposed Tutuila park unit.

Tutuila was created in a series of volcanic eruptions forming an island elongated in a east- west direction. This was followed by stream erosion and submergence, which has resulted in a rugged terrain and deeply embayed coastline. The most salient features of the island are the well-sheltered Pago Pago Bay (Fig. 4), the mountain peaks, such as Pioa (Fig. 5), otherwise known as "Rainmaker Mountain," and Matafao (see Fig. 4), the steep ridges ascending into the interior of the island, and the cliff-bound Tafuna plain and its associated craters.

Pago Pago Harbor, which nearly bisects the island and lies just beyond the southern edge of the park, was formed in an ancient caldera that was bounded on the east by Pioa, on the north by Alava Ridge, on the west by Matafao, and on the south by a now non-existent wall outside the mouth of the present day harbor. After the volcanic series ended, erosion of the center of the caldera and drowning of the valley produced the spectacular present day harbor that parallels the southern slope of Alava Ridge (maximum elevation 490 m) which marks the southern boundary of the proposed park.

Between the east and west ends of the park, which are marked by Afono and Fagasa villages, respectively, are a series of steep-sided ridges and stream valleys that radiate out from Alava Ridge and extend down to the north coast of the island. The most spectacular of these is the one at Vatia that extends out to a steep-sided peninsula (Polauta) and Pola Islet (Fig. 6). With the exception of Vatia village, the north coast of the park is rugged and uninhabited. Most of these stream valleys are narrow and steep-sided, but Amalau Valley, with its scenic cliffs and waterfalls, is a short, amphitheater valley (Fig. 7). The whole coastline of the park is steep and rugged, and the only sandy beaches are found in Vatia village, Amalau Bay, and on the west side of Polauta. The park, consequently, is formed mostly by the caldera north wall and the eroded northern slopes of the ancient volcano.

South of both ends and beyond the boundaries of the park are the two previously noted peaks, Pioa and Matafao, which are classified as trachyte plugs–cores of ancient volcanoes that remain after the crater rims have eroded away. Eight of these trachyte plugs are found on Tutuila (Stearns 1944), the largest two of which are Pioa and Matafao. These plugs are comprised of a fine-grained, highly eroded, cream-colored trachyte rock that is characterized by a predominance of potassium feldspar. The light color of the soil is evident in the cliffs of Pioa (see Fig. 5). This soil is generally low in important minerals, which results in a stunted, scrubby vegetation called montane scrub (see the discussion on plant communties below) on the slopes and summits of these trachyte plugs. Although these two peaks are outside the park boundaries, a trachyte plug ridge of equal size but lower elevation, forms the spectacular Pola Islet and Polauta Ridge just north of Vatia village.

Floristic Studies on Tutuila

The first collections of plant specimens from Tutuila were made during the visit of the United States Exploring Expedition (USEE) to Samoa in 1839. The specimens, collected by W. Brackenridge, W. Rich, and C. Pickering, are now stored at the Smithsonian Institution and the Gray Herbarium, with some duplicates at other institutions such as Kew. Unfortunately, the specimens were poorly curated, and mistakes in locality are not uncommon. In fact, some specimens of endemic Samoan plants 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 which ones were collected from Tutuila –although there is some indication from the published list of USEE specimens (Pickering 1876).

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 Samoa (*ca.* 1862–1885). Powell collected about 630 numbered specimens in Samoa, and many others that are unnumbered. Unfortunately, most of the specimens lack localities, so it is impossible to determine which ones were collected on Tutuila and which ones on the other islands (he is known to have collected on Savai'i,

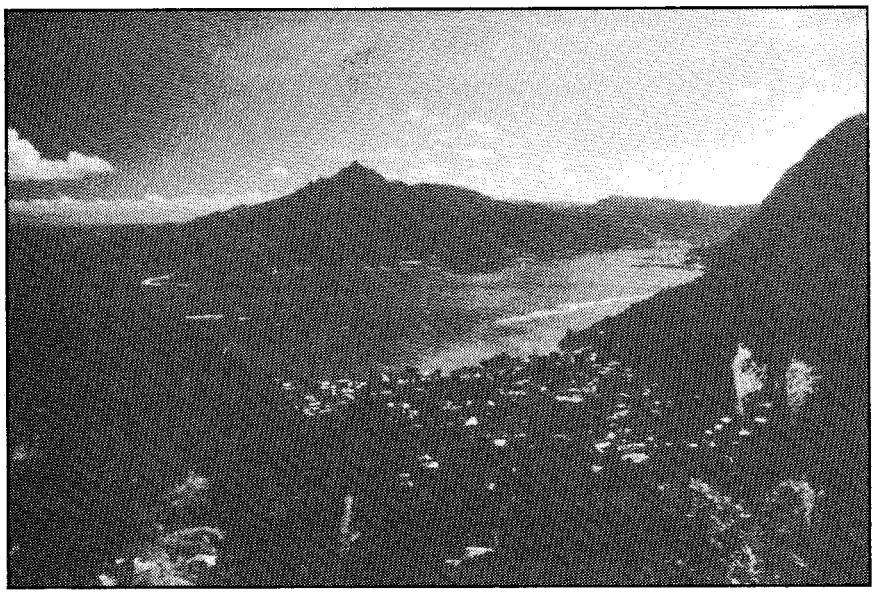


Figure 4. Pago Pago Bay, with Mt. Matafao in the distance.

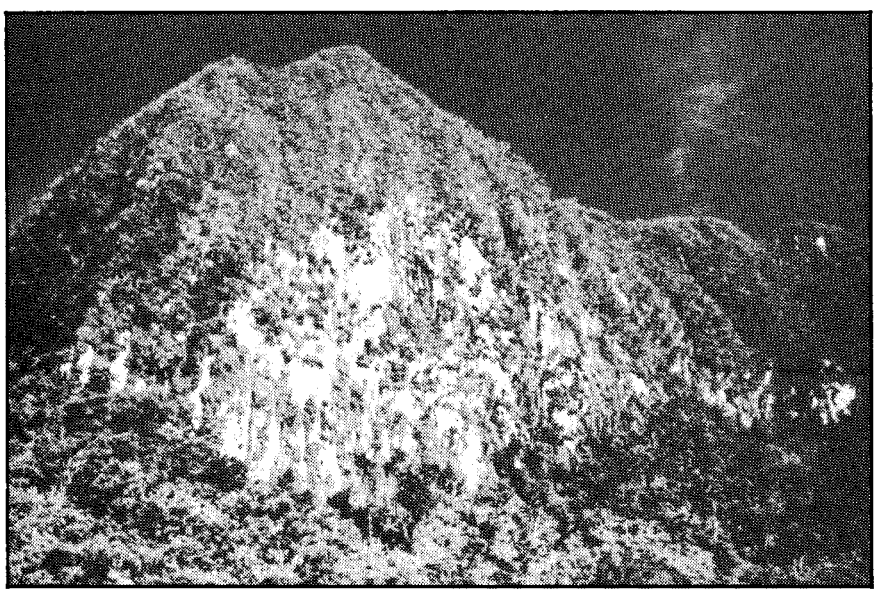


Figure 5. Mt. Pioa, a trachyte plug.

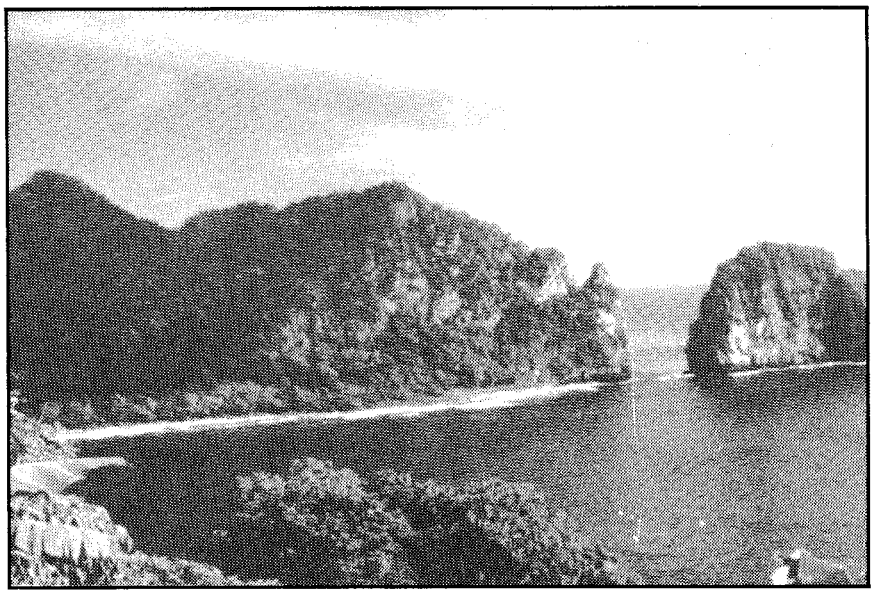


Figure 6. Polauta Ridge and Pola Islet, Vatia.

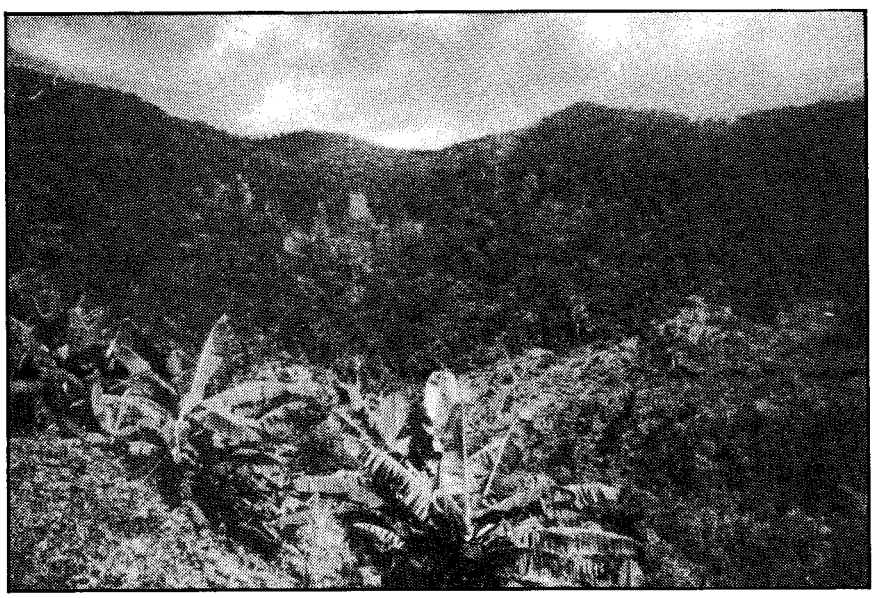


Figure 7. Amalau Valley.

'Upolu, and Ta'u as well). The only relevant publication by Powell was a list of Samoan plant names (Powell 1868), but there is hardly any mention of Tutuila in this publication. Pickering (1876) often noted island localities in his descriptions of the USEE collections, but many of the listed specimens are unidentified and it is usually impossible to correlate the specimens with an island. Powell's specimens are stored at Kew in London, where they were sought and listed during an extensive herbarium search by the author (October 1992).

Another collector is known to have gathered specimens on Tutuila at about the time–Dr. E. Graeffe, a Swiss physician who traveled extensively in the region in the 1860s and 1870s. Unfortunately, many of his specimens, which are stored principally at Hamburg, with duplicates at many herbaria, lack specific localities. Several other collectors visited Tutuila during the last half of the 19th century, but their contributions to the flora of Tutuila are minor.

The last collector of the century to visit and botanize in Samoa was F. Reinecke, who published the first flora of Samoa (1896, 1898). Most of his collection is from Western Samoa, and many of his Tutuila specimens are unnumbered and lack critical data. His collection, stored in Berlin, was destroyed during World War II, but duplicates are found at Kew and some other herbaria. Another botanist, K. Rechinger, visited the island a decade later (in 1905) and collected a few specimens, but the bulk of his collections, which are stored at Vienna, were made in Western Samoa (Rechinger 1907–1915).

The next significant collector in Samoa was W. A. Setchell, who visited Tutuila in 1920 and published a flora of the island (Setchell 1924). His collection, with about 580 numbers, is deposited at the University of California, Berkeley. He was followed by D. W. Garber, who collected about 190 specimens (nos. 783–973) from the island in 1924. Other minor collections from that decade are those by Eames (1921) with about 30 specimens (nos. T1–T30), Bryan (1924) with about 68 specimens (nos. 956–1018, 1375–1379), and Diefenderfer (1929 and 1930) with about 48 specimens (nos. 1–29, 1–19). Their collections are principally stored at the Bishop Museum.

The next major collection from Tutuila was made by E. Christophersen in 1929 and 1931, and were included in his two publications on the flora of Samoa (Christophersen 1935, 1938). Christophersen collected about 407 specimens on Tutuila (nos. 980–1231, 1252–1266, 1807–1830, 3478–3593). His publications still form the most complete account of the flora of Samoa. Christophersen was followed by T. G. Yuncker who worked on Tutuila in 1939. Although Yuncker published his results from Manu'a (Yuncker 1945), his Tutuila collection, numbering about 144 specimens (nos. 9300–9443) has not been published. The Christophersen and Yuncker collections are stored at the Bishop Museum.

The next collections were made during the 1950s and 1960s, but this information has never been published. In 1959 A. Wisner collected on the island, and his unstudied specimens are stored at the Bishop Museum. In 1965, C. H. Lamoureux and C. R. Long collected on Tutuila, and their specimens are stored at the University of Hawai'i. Lamoureux's collection has about 80 specimens (nos. 3000–3029, 3051–3099) and Long's about 200 (nos. 1892–1997, 2595–2609, 3045–3120).

The original botanist on the study of American Samoa by Amerson *et al.* (1982), J. Kuruc, collected a number of specimens on Tutuila in 1975, but except for a few, these are without any data and most are not even mounted. The largest collection of Tutuila specimens was made by the present author from 1972 to 1993. The collection numbers about 1311 specimens (nos. 300-331, 1286–1289, 1419–1486, 2689–2986, 3109–3124, 3343–3353, 3531–3551, 3601–3673, 3745–3763, 3775–3778, 3836–3857, 8031–8036, 8044–8074, 8393–8524, 8526–8748, 8895–9201, 9329–9381). These specimens are in the author's personal collection, with many duplicates at the Bishop Museum, National Tropical Botanical Garden, Kew Garden, British Museum, and Berlin. Also, a duplicate set of the collections made during the present study has been turned over to the National Park Service in Honolulu. Little of this work has heretofore been published, other than revisions of two genera (Whistler 1986, 1988a).

A checklist of the flora of American Samoa, island by island, was published as an appendix in a

vegetation study (Whistler 1980), based on the work up to that time, principally during the Amerson *et al.* study.

Compared to the "continental" islands of Melanesia to the west, the Samoan archipelago has a highly attenuated flora--perhaps only a third as large as that of Fiji, which lies just 700 miles to the west. However, this is larger than that of any other tropical Polynesian archipelago except Hawai'i, which has fewer genera but more species. The Samoan flora is estimated to consist of about 540 native species of flowering plants (two thirds of them in the Dicotyledonae). These are included in about 282 genera in 95 plant families. There are also about 230 species of ferns and fern allies, most of which are listed in Christensen (1943). The level of endemism of the angiosperms is estimated to be about 30% (Whistler 1992a) at the species level, but only one genus, *Sarcopygme* of the Rubiaceae family, is endemic to Samoa. Another 250 or so plants, most of them introduced species, are classified as weeds or adventive species (Whistler 1988b).

Based on the recent field work carried out by the author up to May 1993, and on a review of the previous literature and collections from the island, the native flora of Tutuila is estimated to consist of approximately 417 native species of vascular plants (see Appendix A for a complete listing of species). This total comprises about 301 flowering plants (angiosperms), 109 ferns, and 7 fern allies. This compares with Ta'u, which has about 329 native species, comprising 222 angiosperms, 104 ferns, and 7 fern allies. An additional 179 species of vascular plants (all angiosperms) have been introduced and naturalized (most of them as "weeds") on Tutuila; some of these were brought in by Polynesians ("Polynesian introductions") prior to the European Era, but most were introduced during recent times ("modern introductions") after about 1800.

The largest plant families represented in the Tutuila flora are Orchidaceae (49 native species), Rubiaceae (17), Cyperaceae (15), Fabaceae (14), Poaceae (13), Euphorbiaceae (12), Urticaceae (11), and Myrtaceae (9). As noted earlier, the rate of endemism in Samoa is about 30%, but the local island endemism for Tutuila is only about 1%; the only species reported to be endemic to the island are *Cyrtandra* sp. nova (Gesneriaceae), *Cyrtandra geminata*, and *Elatostema tutuilense* (Urticaceae). The unidentified *Ischaemum* (Poaceae) may represent an additional endemic species.

Most of the plants found on the island are not rare (although they may be hard to find), and of the 424 native species of vascular plants, all but about 44 of them have been collected in the last 20 years. Most of the species present on the island are present in the park; those that have not been reported from the park are marked by asterisks in the checklist of the flora (Appendix A).

Vegetation Studies on Tutuila

The study of the vegetation of Samoa in general, and Tutuila specifically, has lagged far behind the study of the flora, and prior to 1976, very little had been published on it. The first known description of the island was made during the USEE visit in 1839. Pickering (1876) made several general observations of the whole archipelago, but under the heading "Mountain- crests," he noted the following description for what is now called montane scrub in Samoa:

"The only mountain-ridges I had the opportunity of visiting, were on Tutuila; the highest peak there being only 'twenty-three hundred and twenty-seven feet' above the sea. On one of my excursions, I approached within a fourth of a mile, and three hundred feet vertically, of this highest point; and much to my surprise, found the surface occupied in great part by a *Pandanus*, perhaps a peculiar species [*Pandanus reineckei*]; a decumbent *Frecinetia* also abounded; two plants greatly impeding progress, and as evening was approaching, I decided to proceed no farther. All the way to the summit, the vegetable growth continuing in sight was clearly the same with that around me: the matted bed of *Pandanus* and *Freycinetia* covering the exposed crest; while on the descending slopes, shrubs and low trees were intermingled, many of them species not growing in the country below: as, a scarlet-flowered *Metrosideros* [*Metrosideros collina*], a spreading tree, thirty feet high; a *Myrtus*? [*Syzygium brevifolium*?] with sessile, cherry-like fruit; an Ilex-like *Acronychia* [*Acronychia richii*]?; a *Melastomac.* [*Astronidium pickeringii*] with white and singularly wax-like petals; an *Alstonia* [*Alsto-*

nia pacifica]; an *Eurya*? [*Eurya pickeringii*], a shrub with inconspicuous flowers; a *Weinmannia* [*Weinmannia affinis*]; a peculiar species of *Geniostoma* [*Geniostoma rupestre*]; a Myrica-like *Myrsine* [*Rapanea myricifolia*]; the *Grossostylis* [*Crossostylis biflora*], having much of the aspect of Philadelphus; and a large flowered *Cyrtandra* [*Cyrtandra geminata*]: also peculiar *epidendric Orchidaceae*; the resemblance to the Tahitian mountain-ridges being further kept up by a few beds of *Gleichenia* [*Dicranopteris linearis*], the only ones I met with on the Samoan Islands."

The first known ecological research in Samoa was done on wetlands of American Samoa (Whistler 1976), but the only relevant wetland noted is the one at Vatia, which lies outside, but adjacent to, the park. Another study was carried out on the wetlands of Tutuila (Biosystems Analysis Inc. 1992), which also mentioned the Vatia marsh.

The most comprehensive study to date of the vegetation of the island was carried out during a survey of the wildlife and vegetation of American Samoa (Amerson *et al.* 1982). The botanical portion of that study (Whistler 1980) included a description of the vegetation of Tutuila and the other islands of American Samoa. Although a number of study plots were established at that time, only one is within the park boundaries. Because the terminology in that study is now somewhat out of date, the vegetation units recognized in the present report are based on more recent and more comprehensive studies (Whistler 1992a).

A more recent study of the vegetation was carried out by the U. S. Forest Service (Cole *et al.* 1988) in 1986, but the work was oriented towards making vegetation maps from aerial photographs and ground truthing the results. One further ecological study was carried out by the author on the coastal vegetation, which included areas within the park, but this report has not been published yet by the Sea Grant program of the University of Hawai'i.

II. METHODOLOGY

A detailed checklist of the flora of Tutuila was prepared before the field work began; it was extracted from an unpublished checklist of the flora of Samoa prepared by the author. This checklist is based on the work of the U.S. Exploring Expedition (Pickering 1876), the flora of Reinecke (1896, 1898), the publications of Rechinger (1907–1915), the flora of Setchell (1924), and the floristic work of Christophersen (1935, 1938). The only recent and up-to-date published checklist of the flora of the island is found in *The vegetation of Eastern Samoa* (Whistler 1980). In addition to these published works, specimens from the Kew Garden and Bishop Museums were extensively searched for specimens collected from the island. The collections of the author made on the island from 1972 to the present were added to this; these are in his personal collection, with duplicates scattered at various herbaria. The flora comprises Appendix A at the end of this report.

The actual field work for this project was carried out on the island from 27 May to 16 June 1992, with a follow-up period from 17 December 1992 to 5 January 1993. The field team consisted of the author with several other people, principally Natasha Bartley whose help was graciously provided by the Department of Marine and Wildlife Resources (for the May to June field work). During the field work the most interesting places were selected from aerial photographs and from 1:200 topographic maps supplied by the Pago Pago office of the National Park Service. Further sites were visited based on field observations and information supplied by people familiar with the park area, particularly Rory West of Vatia village, who served as guide on several of the trips.

Most of the field study was concentrated in the eastern half of the park, because the vegetation there is in much better condition than in the western half. This is probably due partly to the spate of recent hurricanes that seem to have taken a greater toll in the western half, but also partly to disturbance caused by recent agriculture adjacent and north of the Alava Ridge road in the western half and by the road itself.

Field trips were made to most of the places named on Fig. 2. The coastline of the park from Afono to Tafeu Cove was viewed by boat during an aborted trip to Tafeu Cove (rough seas precluded a landing).

Eleven sites (plus one on Ofu) were selected during the field work for vegetation sampling; at these sites approximately 100 trees picked at random

were measured for dbh to determine relative dominance of the species. It was deemed too time-consuming to actually set up measured boundaries for these plots, but the only data not obtained by using the quicker method is total dbh per unit of land area. On all the walks qualitative and quantitative notes were taken on the vegetation and flora. The plot data is shown in the tables in Appendix B. A single plot sampled in 1976 is within the park boundaries, and this is included in the appendix (as is the one from Ofu); however, the 1976 plot was not relocated during the current field study, and was probably destroyed in the construction of the Alava Ridge road.

The parameter used to determine "dominance" is basal stem area (cross-section). The dominant tree species of a plot was the one that had the greatest total stem area in the sample of trees. The term "relative dominance," expressed as a percentage, is determined by dividing the total basal stem area of a species by the total for all the species in the sample. The tables also show the number of trees above 6 inches dbh, in order to give some indication of the typical sizes of the trees.

A trip was also made to Ofu from 13–16 June and similar field methods were employed. Because most of the park area on Ofu is either steep cliff or disturbed coastal vegetation, little undisturbed vegetation was available for sampling. Consequently, only a single plot was sampled there (Appendix B), although another one from the 1976 was included after modification of the data to correspond to the present field methods.

During the field work voucher specimens were collected, and were prepared using a plant dryer set up at the Department of Marine and Wildlife Resources (DMWR) at 'Utulei. As noted earlier, a set of these voucher specimens was given to the National Park Service, and duplicates were distributed to various herbaria. The vegetation map was made based upon the recent field observations and upon the vegetation map of Cole *et al.* (1988). This map is very detailed (588 "polygons" are recognized on Tutuila), and most of the native vegetation units recognized on the map are difficult to distinguish in the field. A further complication was the spate of hurricanes (Tusi, Ofa, and Val) that hit the island since the aerial photographs, upon which the maps were based, were taken (1984). Some of the vegetation, particularly in the western half of the park, was severely damaged. However, the maps are useful for determining the area of native and non-native vegetation, and were used to prepare the vegetation map shown in Fig. 3.

III. VEGETATION OF THE PARK

The vegetation of the park is divided into two categories, primary vegetation and secondary vegetation, and these are further divided into several subcategories and again into "plant communities" that share a common flora and structure.

Primary Vegetation

Primary vegetation includes all those plant communities that are in a relatively stable condition–i.e., the structure and flora of the community change little over time. It may also be called native vegetation, since nearly all the species found here are native (indigenous or endemic). However, the secondary forests in Samoa are also comprised mostly of native species, unlike some other Pacific islands (e.g., Hawai'i), so this term is a little ambiguous. Being labeled as primary does not mean that the vegetation has never been disturbed (naturally or by man), only that it is composed of a combination of tree species that remains fairly constant until the next disturbance (i.e., "climax vegetation").

The primary vegetation within the park on Tutuila is divided here into three categories–littoral vegetation, rainforest, and summit vegetation. Another category, wetlands, comprises swamps (freshwater and mangrove), which are dominated by woody species, and marshes, which are dominated by herbaceous species. There are no wetlands within the park boundaries, but since the best remaining marsh on Tutuila is located within Vatia village, the community is included in the discussion here and the marsh is described.

A. Littoral Vegetation

The term "littoral" refers to something occurring on or near the seashore (*litor-* is Latin for seashore). Littoral vegetation comprises the native plant cover occurring on undisturbed seashores, and is the same

category recognized in the report on the Ta'u unit of the National Park of Samoa (Whistler 1992b). Even when the area is disturbed, the plants found on the shore are often still littoral species, because non-littoral species are not adapted to the harsh conditions present.

Littoral vegetation typically has a zone of herbaceous species that covers the foreshore. A zone of shrubby vegetation is often found inland from this, and farther inland a zone of littoral forest is usually present. These three plant zones or communities recognized here–herbaceous strand, littoral shrubland, and littoral forest–are the same ones recognized in the Ta'u report (Whistler 1992b).

Littoral communities differ from other plant communities in their narrow extent–they are restricted seaward by the hightide mark of the ocean and inland by lowland forest. Because of this, some authors may regard the three types of vegetation recognized here as zones of a littoral community rather than communities themselves. This is supported by the tendency of some of these vegetation types to be indistinct and to blend into each other with no sign of a clear boundary. Also, littoral vegetation sometimes lacks one or more of the zones all together. However, because of distinct differences in structure and flora, the three are recognized here as communities.

Littoral vegetation may occur on sandy, rocky, talus, or coral rubble shores, but there are no sandy shores within the park boundaries on Tutuila. Most of the park's shoreline has a solid rock substrate in the form of sea cliffs and windswept headlands. The only coral rubble beaches are found in Amalau Valley (Fig. 8), Vatia north of the village where the park boundary begins (Fig. 9), and Tuafanua west of Polauta Ridge (Fig. 10). There is also a very small coral rubble beach at Tafeu Cove (Fig. 11), but because of high waves, landing there was not possible during the field study.

Environmental conditions found in areas of littoral vegetation are harsher than in any other plant community on Tutuila. Although the annual rainfall in all areas of the island probably exceeds 2500 mm (100 in), the rocky surface retains little water for growth, and often the water that is present is brackish. This results in species on the exposed coasts (particularly the herbaceous ones) being xerophytic, i.e., adapted to dry conditions. The substrate itself is also a limiting factor; sometimes the plants present can survive only by clinging tenaciously to cracks in the rocks. Littoral species are also adapted to bright light conditions, i.e., they are heliophytes (light-loving species). Because of this, littoral herbs and shrubs are generally absent from the littoral forest floor. This may also explain why littoral trees typically do not extend very far inland–they may be shaded out by the taller inland forest species that are, however, precluded from dominating the shore itself by their intolerance to the harsh environmental conditions. Temperature is also an important factor for littoral species, particularly the herbaceous plants. While the mean daytime temperature is 26.7°C (80°F) on most of the island, the exposed rock heats up to higher temperatures from the relentless sun.

The most critical environmental factor, however, is the sea. Salty sea air, brackish ground water, and occasional high waves make the habitat inhospitable to most other species. Plants present must be somewhat halophytic (salt tolerant) to survive. Occasional high waves, some with destructive force, may sweep the shore, ripping out poorly rooted plants and leaving behind puddles of sea water.

Another characteristic shared by most littoral plants is their method of dispersal–most have seawater-dispersed seeds that can survive long periods of seawater immersion before washing up on a distant beach and germinating. Because of this adaptation for long-distance dispersal, very few littoral species are restricted in distribution; none of the Samoan littoral species is endemic to the archipelago. A few littoral species have seeds dispersed by adhering to seabird feathers (e.g., *Pisonia grandis*), and a few have colorful fruits that are eaten and transported internally by birds that frequent the shore. The three littoral communities are discussed below.

1. Herbaceous Strand

This community comprises the herbaceous vegetation occurring on the immediate seashore, and is the same community recognized on Ta'u (Whistler 1992b). It is sometimes further divided into "rock strand" and "sand strand", but since the two habitats are not always distinct (there are intermediate types–coral rubble and talus) and the species that dominate the two types often cross over to the other habitat, this distinction is not retained here.

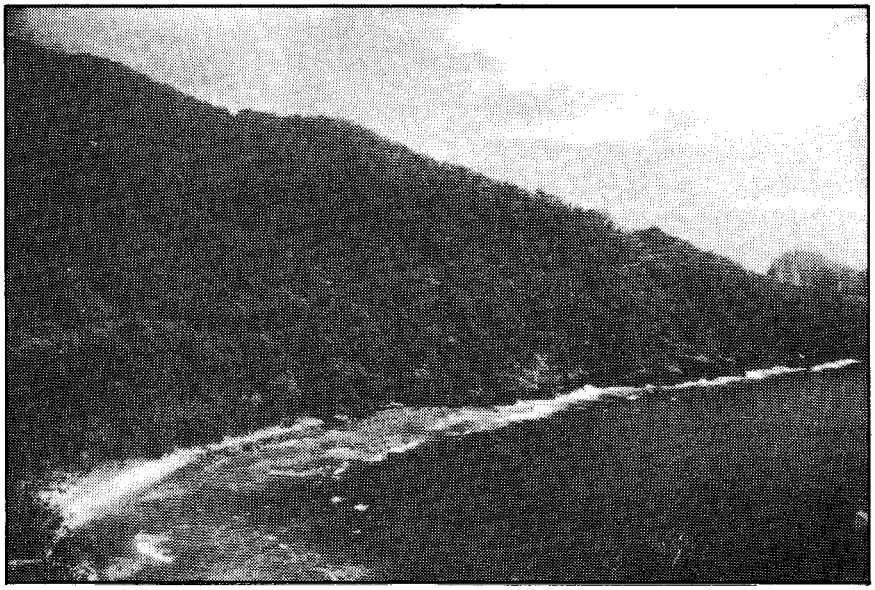


Figure 8. Amalau beach.

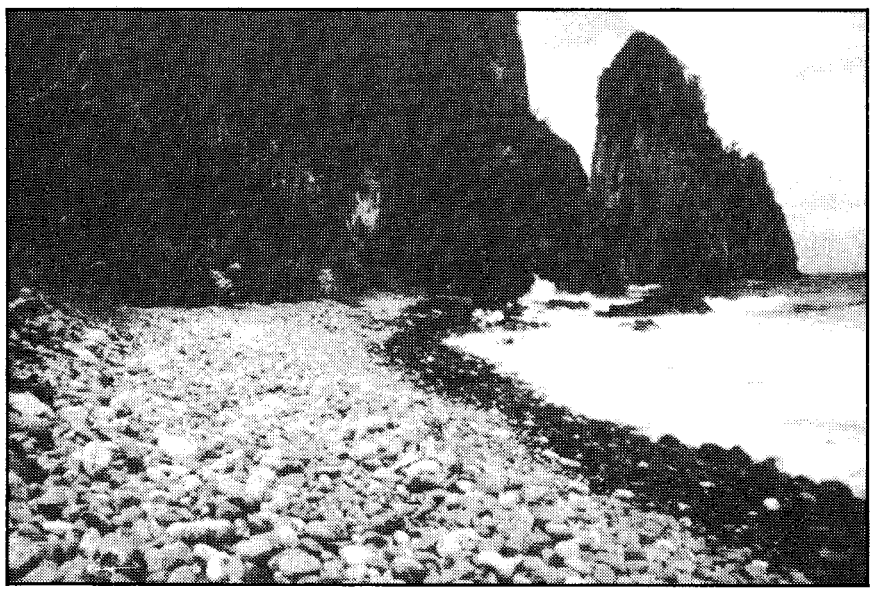


Figure 9. Coral rubble beach north of Vatia; Pola Islet in the distance.

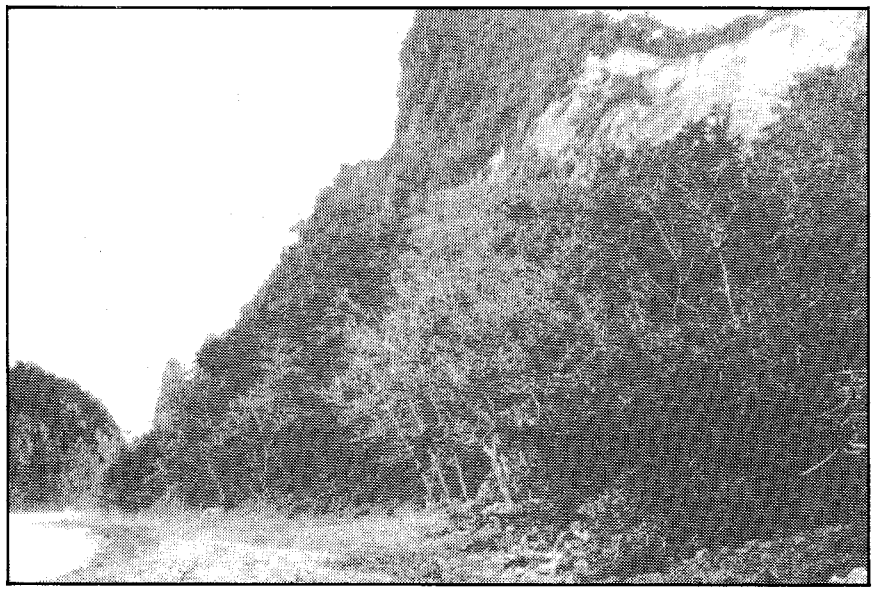


Figure 10. Tuafanua Beach west of Vatia.

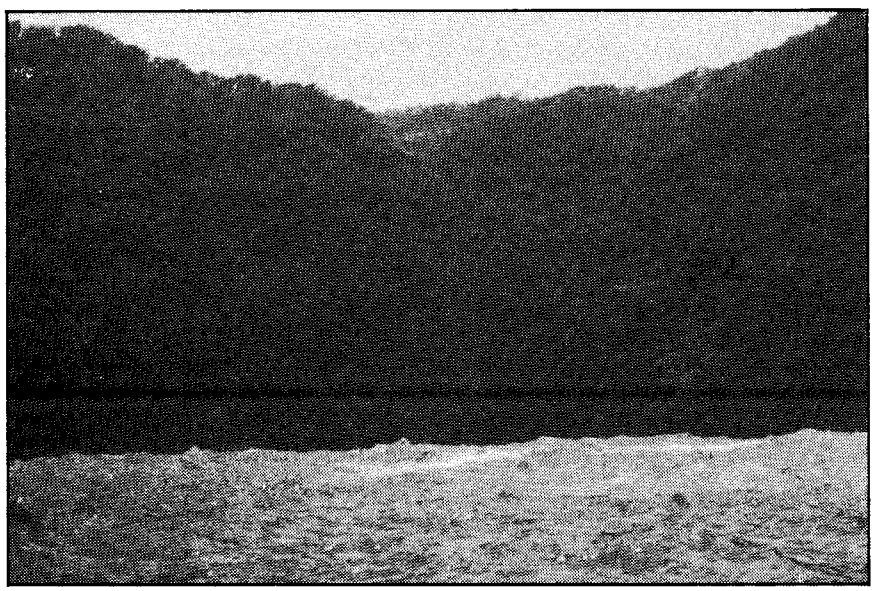


Figure 11. Tafeu Cove west of Vatia.

It is a moot point, anyway, since there are no sandy beaches within the park boundaries (although there are small deposits of coral sand on some of the coral rubble beaches).

The herbaceous strand is limited seaward by the hightide mark, and inland by the edge of the littoral shrubland or littoral forest. In the park it is most frequently encountered in a narrow zone on wind-swept headlands (Fig. 12). The most characteristic species in these places are grasses such as *Lepturus repens* and *Ischaemum murinum*, sedges such as *Fimbristylis cymosa* and *Mariscus javanicus* (**sele-sele**), the vine *Ipomoea pes-caprae* (beach morning-glory, **fue moa**), and the fern *Acrostichum aureum* (swamp fern, **sa'ato**). In protected areas on steep cliffs, ferns such as *Phymatosorus scolopendria* (**lau magamaga**) and *Asplenium nidus* (bird's-nest fern, **laugapapa**) and the vine *Hoya australis* (wax flower, **fue selela**) may dominate. Another herbaceous species occurring here, *Hedyotis biflora*, belongs to the same genus as *Hedyotis foetida*, a species that is common in similar habitats on Ta'u but absent from Tutuila.

Another type of rocky substrate vegetation that might be classified as herbaceous strand is the rocky point (Polauta Ridge and Pola Islet) north of Vatia, where a number of herbaceous species cling to the scantily clad cliffs. One of them, *Boerhavia glabrata*, is a new record for American Samoa (it was collected twice in Western Samoa, but is irregularly distributed elsewhere in the Pacific). It has small sticky fruits that adhere to bird feathers, which accounts for its presence around this area where numerous seabirds nest. Other species may occur on Pola Islet, but its sheer sides and the surrounding waves make exploration unfeasible at this level of study. The vegetation there will be discussed in more detail under littoral shrubland.

Coral rubble beaches are found in several places within the park. In bays where coral rubble typically accumulates, the waves pile up the rubble at a steep angle. At the top of the slope there is a plateau where the flat ground surface extends into the forest. The best examples of this are Amalau Bay (see Fig. 8) and the southern end of Tuafanua beach (see Fig. 10). However, both of these are disturbed. Amalau is near habitations, and the presence of coconuts and disturbed vegetation inland of the beach attests to human activities. Tuafanua was apparently hard hit by hurricanes, as evidenced by the number of fallen trees found there.

In the flat zone at the top of the slope where patches of sand may also be present, prostrate creeping vines typically comprise the dominant lifeform. The most common of these species are *Ipomoea pes-caprae* and *Vigna marina* (beach pea, **fue sina**). Less common are *Canavalia rosea* (**fue fai va'a**) *Ipomoea macrantha*, *Operculina ventricosa*, and *Stictocardia tiliifolia*. The latter two species are not typically littoral; they are more often found inland as weeds. All of these vines are native species, except *Stictocardia* and *Operculina*. Two other native species are sometimes found here, *Zehneria mucronata* and *Zehneria samoensis*, but they are more typically found a short distance inland under the shade of the littoral forest.

Lifeforms other than littoral vines occur on coral rubble beaches. The most typical non-vine species are the grasses *Thuarea involuta*, *Paspalum vaginatum*, and *Lepturus repens*, and the sedge *Fimbristylis cymosa*. In more hospitable areas, inland weeds such as *Mikania micrantha* (mile-a-minute vine, **fue saina**) may also occur. In some places the *Barringtonia* trees that form the littoral forest may grow over the edge of the ocean creating a shade that precludes herbaceous strand from becoming established.

Talus slopes are found in two places in the park –on either side of Pola Point. The eastern portion of this is Vatia beach, which is accessible. The other, Tuafanua, is reached from Vatia by a trek over a low saddle (70 m elevation) and a steep ascent through lowland forest. Tuafanua beach, about 1 km in length, is limited southward by a rocky headland and disappears northward at the base of the steep cliffs that form Pola Point. Talus dominates the northern end of this beach, below the cliffs. The talus itself is mostly barren, and the littoral vegetation begins mostly inland where there is an accumulation of coral rubble. This may be due to the inability of plants to find a suitable foothold between the irregular rocks and boulders, or possibly the recent hurricanes scraped clean this lower portion of the beach.

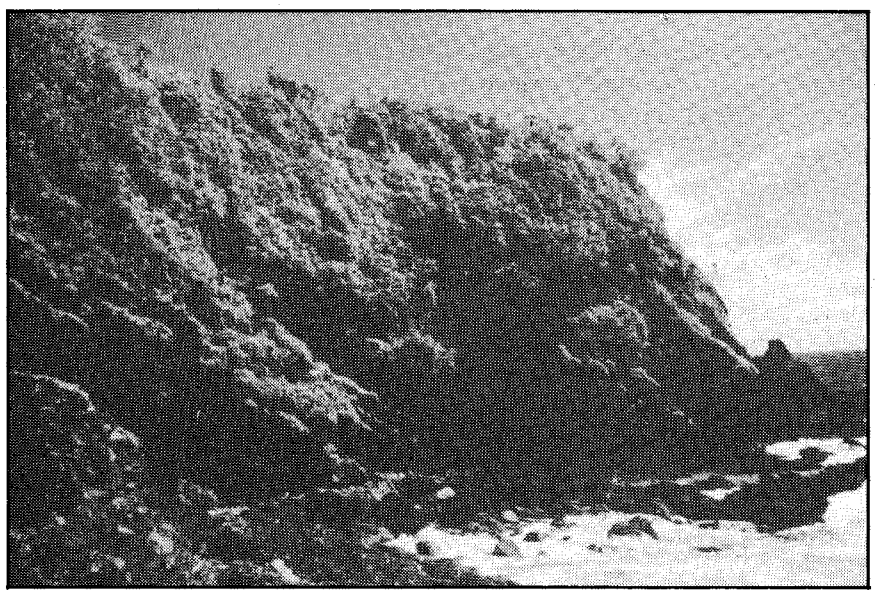


Figure 12. Littoral shrubland vegetation on windswept Sauma Point.

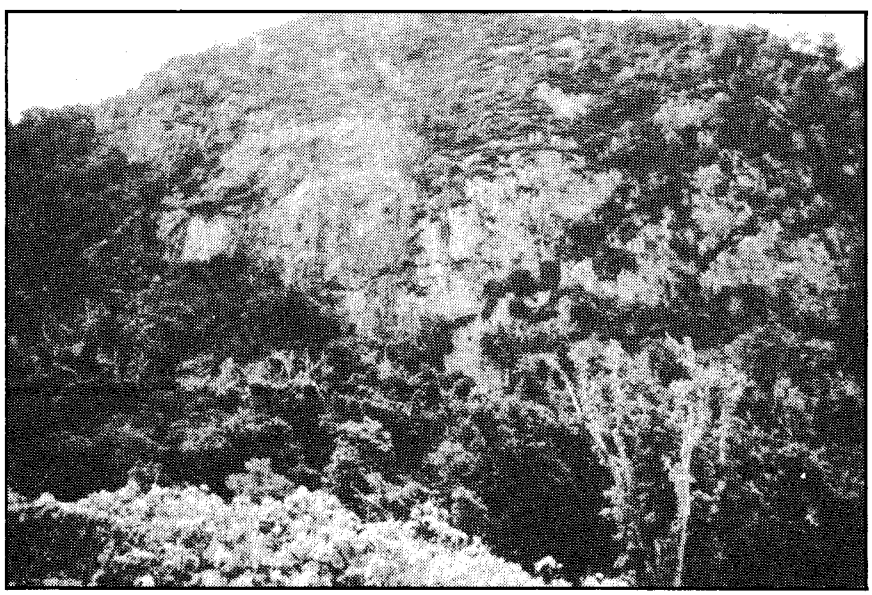


Figure 13. Littoral shrubland vegetation on Polauta Ridge.

2. Littoral Shrubland

This is the native shrubby vegetation typically occurring inland of the herbaceous strand (when present) and seaward of the littoral forest. It is same community recognized on Ta'u (Whistler 1992b). Like herbaceous strand, it may occur on either rocky, sandy, or coral rubble shores. However, it most commonly occurs on rocky coasts, and often blends into the herbaceous strand on this sub-strate, especially when the shrubs are dwarfed by prevailing sea winds. Littoral shrubs are typically intolerant of shade, and do not extend into the forest, where different shrubs, saplings, and ferns dominate. Within the park boundaries areas of littoral shrubland occur primarily where rocky points slope into the sea rather than forming cliff-bound headlands.

Only a few examples of this community exist within the park boundaries, at least in areas that are accessible; the best examples on Tutuila are on the Tafuna coast on the north-central part of the island between Fogagogo and Vaitogi, where the lava-bound coast forms a suitable habitat for the shrubs. The best examples in American Samoa are on the southern tip of Olosega, and on the south corners of Ta'u.

The most typical littoral shrubland species in Samoa are *Scaevola taccada* (**to'ito'i**) and *Wollastonia biflora* (beach sunflower, **ateate**). Scaevola is a shrub that is widespread in the Pacific. *Wollastonia*, a species with a similarly wide distribution, is more of a subshrub in most areas, appearing even vinelike when it hangs down from cliffs of headlands. Other typical species in this habitat are *Clerodendrum inerme* (**aloalo tai**), *Colubrina asiatica* (**fisoa**), *Dendrolobium umbellatum* (**lala**), and *Cyrtandra samoensis*.

The best accessible area of littoral shrubland within the park is found on the precipitous slopes of Polauta Ridge at the north end of Vatia beach (Fig. 13). An equally good example is Pola Islet (Fig. 14), but this in inaccessible. The vegetation on the islet and on the cliffs of the ridge is actually a mixture of littoral herbs, shrubs, and trees that find a tenacious existence on the cliffs and in rock cracks. Because the littoral plants present are not trees, the vegetation cannot be classed as littoral forest. But since most of the species on Pola Islet are woody, it is probably most accurate to consider the whole plant cover as littoral shrubland.

The dominant species present here is *Scaevola taccada*. Other common woody species present are *Clerodendrum inerme*, *Premna serratifolia*, *Hibiscus tiliaceus*, *Morinda citrifolia*, and *Pisonia grandis*. The most abundant herbs are the grasses *Lepturus repens* and *Stenotaphrum micranthum*, and the fern *Acrostichum aureum*. Higher up the slopes the fern *Davallia solida* forms dense patches, probably in cracks and on ledges. A different kind of littoral shrubland is present at the north end of Vatia on the flat coral rubble bench above the sloping beach. This is dominated by *Hibiscus tiliaceus*, but also common here are *Clerodendrum inerme*, *Barringtonia asiatica*, *Morinda citrifolia*, and *Ficus scabra*. This may actually be the remains, and beginnings, of a littoral forest that was cut down or destroyed by hurricanes. A similar vegetation covers the talus slopes behind this area, and may be a disclimax vegetation kept from reverting to littoral forest by the talus that slides or falls down from the adjacent cliffs.

Another variation of littoral shrubland sometimes mentioned in the literature is one dominated by *Pandanus tectorius* (screwpine, **fasa**). While there are areas on Tutuila where this tree-like monocot forms monodominant stands, such as on the Tafuna coast between Fogagogo and Vaitogi, the plant is uncommon within the park boundaries. It fact, *Pandanus* was not even noted during the survey as occurring on any of the beaches visited (it was, however, seen at higher elevations on Mauga-o-Tula). Consequently, the possible distinctiveness of *Pandanus* scrub vegetation is a moot point within the park boundaries.

3. Littoral Forest

This is the forest that occurs directly on the shore (or just inland of the other zones of littoral vegetation) and is dominated by trees that owe their distribution either directly or indirectly to the effects of the sea. It is the same community recognized on Ta'u (Whistler 1992b). It often occupies a narrow zone sometimes only 50 or 100 m in width, especially on level coasts where it is replaced inland by lowland forest. This was the case in Amalau before it was disturbed; here the disturbed littoral forest zone is replaced inland by secondary forest

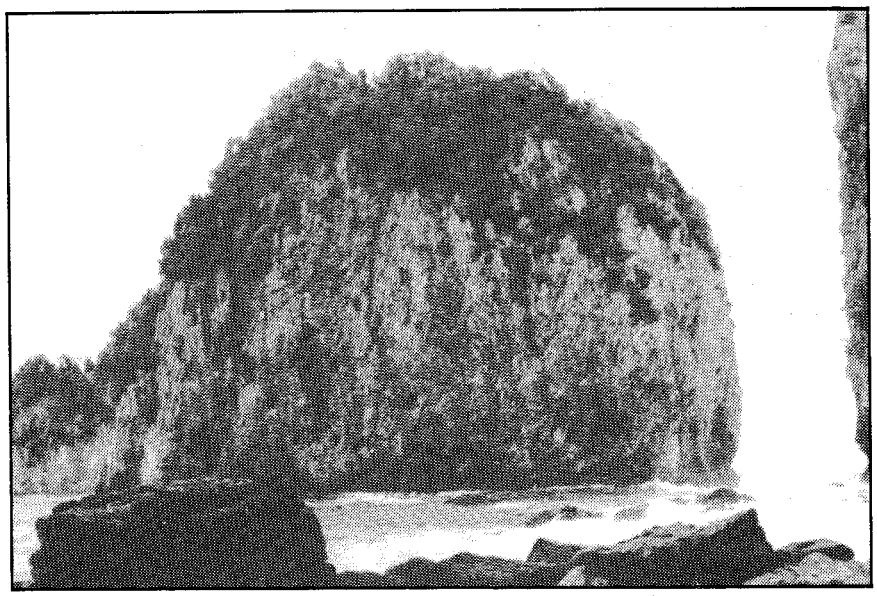


Figure 14. Littoral shrubland vegetation on Pola Islet.

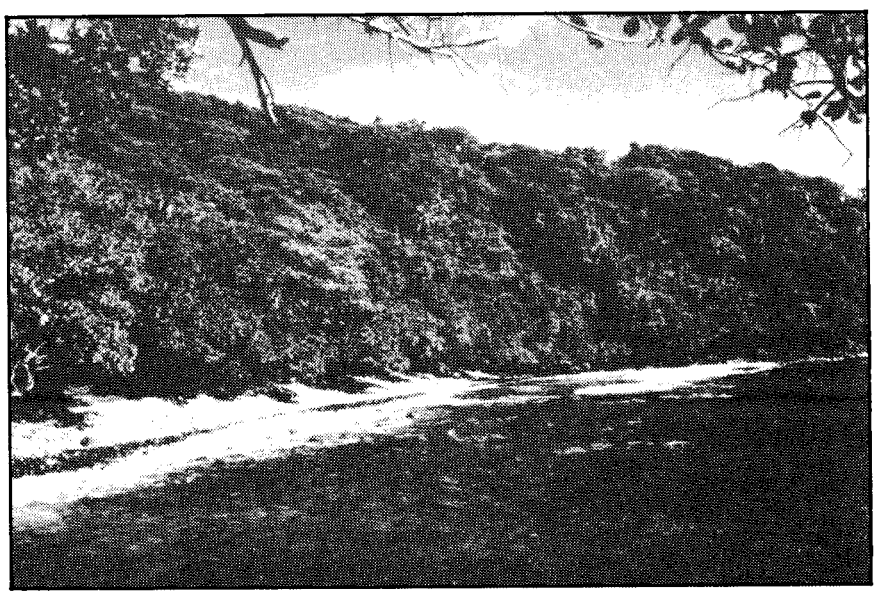


Figure 15. Aiga Bay, west of and outside of the Tutuila park.

and farther inland by lowland forest dominated by *Dysoxylum maota*. Before Amalau was disturbed, it was probably very similar to a site studied at Aiga Bay on the western end of the island (Whistler 1980) and shown in Fig. 15. On steep coasts, the zone of littoral forest may extend much farther inland. In a plot (Appendix B: plot 2) on Sauma Ridge at 185 m elevation and nearly a half mile away from the coast (down the ridge), a littoral tree, *Barringtonia asiatica* (fish-poison tree, **futu**) was the second dominant species with 17% relative dominance.

Barringtonia is, in fact, the dominant littoral forest tree on all the coasts within the park, as it is on nearly all of the coasts of the whole island. This huge tree has thick, spreading branches that may even overhang the shore in protected areas. On the three areas of coral rubble beach within the park, *Barringtonia* probably has a relative dominance of over 80%. A similar figure may apply to the littoral forest on steep slopes.

The second most abundant species is either *Terminalia catappa* (tropical almond, **talie**) or *Calophyllum inophyllum* (Alexandrian laurel, **fetau**), which are similar in size and shape to *Barringtonia*, although perhaps somewhat taller. Also present in the littoral forests within the park are *Hernandia nymphaeifolia* (Chinese-lantern tree, **pu'a**), *Pisonia grandis* (pisonia, **pu'avai**), *Hibiscus tiliaceus* (beach hibiscus, **fau**), *Thespesia populnea* (Pacific rosewood, **milo**), *Cerbera manghas* (**leva**), *Cocos nucifera* (coconut, **niu**), and *Guettarda speciosa* (**puapua**).

On sandy beaches *Hernandia*, which is a huge tree like the three most abundant species noted above, apparently replaces or competes with *Barringtonia* in dominance. Since there are no sandy beaches within the park boundaries, this is a moot point. However, *Hernandia* shares dominance with *Barringtonia* and *Pisonia* in the small area of littoral forest north of the village of Vatia (Fig. 16).

Pisonia is typical of undisturbed beaches where seabird colonies are found (its sticky fruits are transported attached to seabird feathers). The probable demise of seabird colonies in the past because of overharvesting may account for the limited extent of *Pisonia* on Tutuila as well as within the park (it was only seen to be common at the north end of Vatia village). On uninhabited Rose Atoll, however, which is the site for an extensive seabird colony, the only patch of forest present is entirely dominated by huge *Pisonia* trees.

Hibiscus is an adaptable species that may dominate in freshwater swamps, on the margins of mangrove forests, along estuaries, on beaches, on talus slopes, and in disturbed lowland forest up to the higher elevations of the island. It is a secondary species on beaches (as it is in most of the places where it is found), and its presence usually indicates some kind of disturbance. It is a smaller tree than the littoral trees discussed above, and often forms dense thickets that are penetrated only with difficulty. The coconut is another species whose presence usually indicates disturbance. Although it may naturally dominate on sandy beaches of atolls, on the coasts of Samoa it is probably mostly or entirely a secondary species planted for its nuts.

The other three trees, *Cerbera*, *Guettarda*, and *Thespesia*, are smaller and less common than the foregoing species, and have not been reported in Samoa to form a significant part of any littoral forest. A few other species, such as *Planchonella grayana*, *Diospyros samoensis* (**'au'auli**), and *Diospyros elliptica* (**'anume**), are common in some littoral forests. However, these trees are coastal rather than littoral, i.e., they occur in coastal regions, but not usually on the immediate shore. They are more frequent on coastal ridges, and will be discussed in more detail under lowland forest.

B. Wetlands

As noted above, this category comprises swamps and marshes. Although no swamps or marshes are found within the Tutuila park boundaries, the marsh adjacent to Vatia village is discussed here because it is so close to the park, because it is relatively undisturbed, and because it is a vegetation type under considerable pressure in Samoa. The report on the Ta'u unit of the National Park (1992B) discussed a wetland from that island under "disturbed coastal marsh." The largest marsh on that island is located at Ta'u village; it is similar to the one at Vatia, but was not discussed in the 1992 report because it is not within the park boundaries.

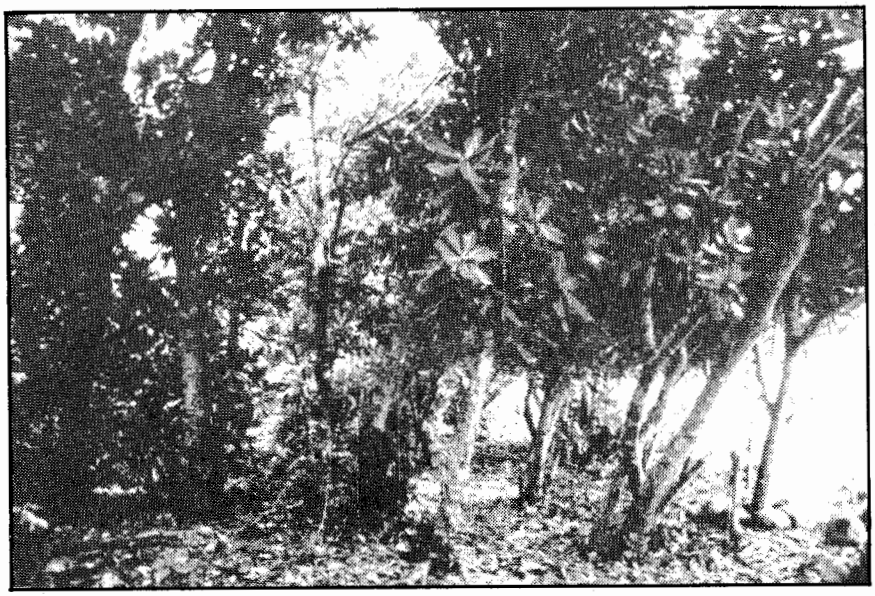


Figure 16. Littoral forest north of Vatia.

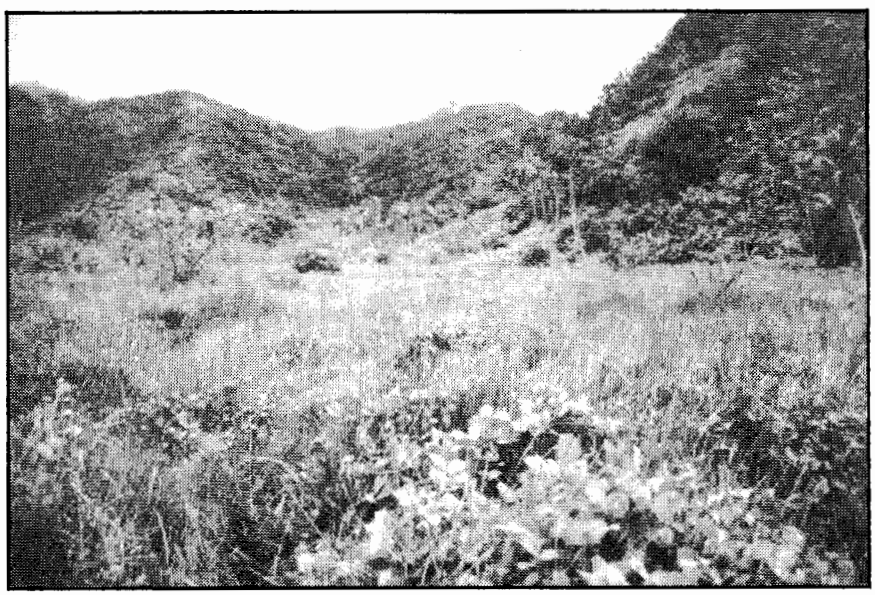


Figure 17. Vatia coastal marsh.

4. Coastal Marsh

This is the herbaceous vegetation growing in water-logged freshwater depressions. It is typically found in coastal areas, usually in bays that have been filled in and subsequently protected from the sea by a barrier of sand. In these areas water from incoming streams accumulates and forms wetland soil. If the barrier of sand is complete, a freshwater marsh forms; if the barrier is breached by an exiting stream, a mangrove forest usually forms. Not all freshwater marshes are coastal nor are all formed in bays; in Western Samoa some are found in montane craters, and one on 'Aunu'u Island is located in a coastal volcanic crater.

The marsh at Vatia is located behind (west of) Vatia village (Fig. 17). It was apparently once used for growing taro, but there is no indication that this was recent. The dominant plant in the center of the marsh is *Eleocharis dulcis* (water chestnut, **'utu'utu**), an indigenous sedge that typically dominates Samoan marshes. Not present in the marsh, nor apparently on the island, is the marsh fern *Cyclosorus interruptus*, which is often abundant in marshes on other islands in Samoa. Also common in the Vatia marsh are *Vigna marina* (the littoral beach pea vine), and *Rhynchospora corymbosa* (**selesele**). In a couple of places *Acrostichum aureum* (swamp fern, **sa'ato**) forms clumps. Other species present in smaller quantities are *Commelina diffusa* (**mau'utoga**), *Mikania micrantha* (mile-a-minute vine, **fue saina**), *Ludwigia octovalvis*, *Ludwigia hyssopifolia*, and *Alternanthera sessilis*–all typical introduced wetland species. Along most of the edges there are thickets of *Hibiscus tiliaceus* (beach hibiscus, **fau**).

Also present in the marsh is the small fragrant herb *Limnophila fragrans*. It is rare in Samoa, and over most of its former Pacific range, and should be a candidate for endangered species status in American Samoa. The only other place it is noted from on Tutuila is Faga'alu Stream, and that record is 73 years old. It is, however, found in the marsh at Ta'u, the one at the Ofu airport, and the one on Olosega. The Vatia marsh is the best preserved one on Tutuila, and possibly the second best in the territory, since the Ofu and 'Aunu'u marshes were devastated by recent hurricanes.

C. Rainforest

The tropical rainforest is the high forest composed mostly of native trees adapted to moist forest conditions. Before the arrival of the first Polynesians in Samoa, nearly all of the land surface of the archipelago was clothed in a mantle of tropical rainforest. The only areas not covered with it were the coastal zones, where the harsh conditions prevent rainforest from becoming established; wetlands (marshes, mangrove forest, freshwater forest), where water-logged soil inhibits rainforest development, small summit areas where soil factors allow only scrubby vegetation to grow; and cliff faces. These types of vegetation, including rainforest, are all classified as climax vegetation –they are relatively stable in structure and composition over long periods of time.

To the list of non-rainforest types of vegetation can be added two types of successional vegetation –that found on lava flows, and secondary vegetation communities (secondary scrub, secondary forest). These have suffered some kind of severe disturbance, but if left alone, they will eventually revert to rainforest. Lava flows are not currently found on Tutuila (although the Tafuna Plain was formed by a geologically recent lava flow) and will be discussed no further. The disturbance causing most secondary vegetation is the activity of man. The early Samoans cleared large areas of the island for growing crops and establishing villages. In addition to the areas now used for villages and plantations, some inland and isolated places in the park show signs of old villages and plantations –archaeological sites and occasional cultivated trees persisting far away from any currently used land.

Thus all of the primary vegetation within the park boundaries can be classified as rainforest, except for the coastal areas (herbaceous strand, littoral shrubland, and littoral forest) and the one area of montane scrub behind the village of Vatia.

Variation within the Rainforest

The rainforest within the park is not uniform: several different types can be recognized on the basis of floristic composition. Four major factors cause these floristic differences–soil, topography, elevation, and disturbance.

Soils differ in origin and age of the parent bedrock, and younger soils tend to be more fertile than older clayey soils. However, most of the park area has the same origin–the old Pago Pago volcano, the caldera of which forms Pago Pago harbor. The major differences in soil are between the hillside soils and the alluvial soils of some of the valleys, which leads to differences in the forests of the alluvial valleys and the forests of the ridges. The vast majority of the park area is classified as "Fagasa family-Lithic Hapludolls-Rock outcrop association" (Nakamura 1984), which comprises the ridges and upper valleys. The only other significant type present is "Aua very stony silty clay loam," which is located on the lower slopes and lowlands around Vatia, at Va'aogeoge Cove west of Vatia, and at Amalau Bay east of Vatia.

Topography is related to soil, since the alluvial valleys are flat to gently sloping and the hillsides are steep. Steep slopes increase the rate of run-off, and presumably create drier soil conditions. Conversely, the soil of the alluvial valleys is flat, with slower run-off and more water available from the streams and rivulets from the slopes, and presumably the trees found there thrive because of the moister soil conditions.

Elevation is important for two reasons–temperature and rainfall. Rainfall generally increases with elevation. In Western Samoa, Wright (1963) estimated it increased at a rate of 22–30% with every 100 m increase in elevation, at least in the areas he identified as "foothills." Temperature decreases with elevation, at a rate of about 0.7°C (1.3°F) per 100 m. Elevation probably makes a significant contribution to the variation of rainforest within the park, since it varies from near sea level to 480 m elevation–a potential difference of 106 to 144% in rainfall, if Wright's figures can be applied to Tutuila. Temperature is probably not that significant a factor, since the difference between the coastal areas and the summit of the park would be less than 3.5°C (6.3°F).

Disturbance is a factor that is difficult to assess. Vegetation is not static; it is always in a state of flux. But when a forest becomes relatively stable in flora and structure for long periods of time, it is termed climax forest. But since there are continually occurring disturbances–both man-made and natural--that affect small and large areas of the forest, the result is a mosaic of vegetation at different ages of development. If the disturbance is complete, i.e., the canopy trees are removed and the disturbance is of short duration (a hurricane, or several crops grown there before the land is abandoned), the area will relatively quickly undergo a series of predictable structural and floristic changes, a process known as succession.

The longer the period between disturbance, the more the mosaic parts tend to become uniform in flora and structure. The larger the area of disturbance, the larger the pieces in the mosaic. There are certain species whose presence in forest is an indication of past disturbance, particularly *Rhus taitensis*, *Alphitonia zizyphoides*, *Macaranga stipulosa*, and *Hibiscus tiliaceus*, which are discussed in more detail in the section on secondary forest.

The classification of the rainforest of the park into smaller units (communities or associations) is a difficult and often unrewarding task. While categories can be constructed by looking at part of the park, the classification becomes less and less maintainable when more areas are sampled. That is because such classifications are artificial–they are constructed mainly for the convenience of those studying the subject and may not represent any meaningful reality in nature. Plant species each distribute themselves in their own unique ways, based on environmental factors, and to link these species with variable distributions into concrete vegetation units can only lead to inconsistencies.

Another problem encountered when trying to put vegetation into categories is boundaries. If the community to be defined is monodominant (i.e., it is entirely dominated by a single species), a clear boundary may be present. Mangroves, for example, have a relatively clear boundary marked by the upper limits of the influx of salt water. However, communities with several dominant species are more difficult to define with boundaries. This is particularly a problem on ridges that extend from the sea to high elevation with no abrupt environmental boundaries (such as change in soil type). This uniformity of environment and absence of abrupt environmental boundaries is characteristic of the park.

However, there are differences within the rainforest of the park, and it is useful to recognize some vegetation units. The two units recognized here are communities and associations. Plant communities differ from each other in flora and structure; associations comprise subdivisions of communities that differ little in structure, but are dominated by different species. The communities and associations recognized within the park are determined mostly by elevation.

Based on differences in species composition and elevation, the rainforest in the park is divided here into two communities–lowland forest and montane forest. A somewhat arbitrary boundary dividing the two is an elevation of about 350 m (1150 ft), where there seems to be a decrease in tree species typical of the lowlands and an increase in species typical of the highlands. This same elevational boundary was used to distinguish lowland and montane forest on Ta'u (Whistler 1992b). The lowland forest is further divided into four types based on characteristic species, which are discussed below.

Characteristics of Rainforest

Rainforests share a number of similarities in structure and form. When undisturbed, they often have a fairly open floor dominated mostly by shade-tolerant herbs that are adapted to shady conditions. The herbs are mostly ferns, a few are terrestrial orchids, and very few are other flowering plants. A sizable number of the 109 fern species native to Tutuila (see Appendix A) are terrestrial species of primary forest. Of the 49 native species of orchids in Samoa, only about 12 are typical of the shady floor of primary forest (the others are mostly epiphytic). Grasses and sedges are relatively rare in undisturbed rainforest, since most of them are sun-loving species; they are most commonly found along trails in the forest, where more sunlight is available.

Shrubby species are relatively sparse on the floor of undisturbed rainforest, with the exception of a few shade-tolerant species. The shrub layer is instead often dominated by saplings of the canopy species, which, if given a chance, will eventually grow into the canopy. Canopy trees typically have large, relatively poorly dispersed seeds or fruits, unlike secondary forest species that have smaller, more readily dispersed seeds or fruits.

Several species characteristic of the floor of the rainforest do not readily separate into herbs or shrubs. The ti plant *Cordyline fruticosa* is shrublike, but is a non-woody monocot. Another monocot is the giant banana-like herb *Heliconia laufao* (**laufao**) that sometimes forms dense patches. Tree ferns are also in this difficult category. The tree fern *Cyathea vaupelii* (**olioli**) is common in the rainforest, but it is usually only a couple of meters in height. Several other large ground ferns are found in the rainforest, such as species of *Angiopteris* and *Marattia*, which have long thick stemmed fronds that radiate out from a large hemispherical base.

Disturbance that leads to the opening of the canopy leads to changes on the forest floor, as sun-loving species (many of them "weeds") rapidly invade. The presence of these sunlight-requiring invaders may be short-lived if the canopy is quickly restored. Some of the invaders, however, are the vines that ascend into the forest canopy and establish themselves for the long haul.

Other significant lifeforms are present in the rainforest besides the trees, shrubs, and herbs noted above. One of the most significant comprises climbers. Two strategies are employed by rainforest climbers–trunk-climbing and twining. Trunk climbers are species that produce adventitious roots along their stems that allow them to cling to the tree trunk. The most significant of these in the rainforest of the park are *Freycinetia reineckei*, *Freycinetia storckii* (both **'ie'ie**), *Piper graeffei* (**fue manogi**), and *Lomagramma cordipinna* (a fern). These may begin as creepers on the forest floor, but when they encounter a suitable tree, they ascend the trunk to where light conditions are much more favorable for their growth.

The other type of climber, if it is woody, is called a liana. Lianas typically climb by means of a twining growth motion of the stem. When they encounter a tree trunk, they twine around it and eventually up into the canopy. They may eventually loose their connection with the tree trunk (as when the tree dies and disintegrates or falls), resulting in cable-like vines hanging from the canopy. These two categories are not absolute, since some plants seem to be intermediate between the two. Another method of climbing is by means of tendrils, but this is not common in the rainforests of Tutuila; the best

example on Tutuila is the climbing reed-like *Flagellaria gigantea* (**lafo**). Some other vines appear to be independent of the ground and grow as epiphytes.

The other major lifeform in the forest is that of epiphytes. An epiphyte is a plant that grows on trees, using them as a place to grow while deriving no nutrition from them (as a parasite would). The most common epiphytes in the rainforests of Tutuila are ferns and orchids. Most of the 49 orchids of Samoa fit into this category, particularly members of the genus *Dendrobium* and *Bulbophyllum*. Epiphytes are light-loving species that cannot survive in the shady conditions on the forest floor, and consequently live perched upon the branches and upper trunks of the trees where the light conditions are better. They have to have some form of attachment to the tree, and they must be somewhat xerophytic to survive away from the moisture-laden soil. The two rainforest communities, lowland forest and montane forest, are discussed below.

5. Lowland Forest

This is the high tropical rain forest that covered most of the area of the park prior to the arrival of the first Polynesian settlers in Samoa. It currently covers the ridges and valleys on the north coast up nearly to the highest elevations where it is replaced by montane forest. Some of these ridges, particularly the upper portions between Fagasa and the TV transmitter, have recently been disturbed by taro plantations, and much of the same area was extensively damaged by the recent hurricanes. However, most of the lowland areas east of Toa Ridge (just to the east of the TV transmitter) and west of Afono are covered with native lowland forest that is relatively undamaged by the recent spate of hurricanes. Three types of lowland forest are distinguished below: valley lowland forest, coastal lowland forest, and ridge lowland forest.

a. Valley Lowland Forest – This is the forest that covers alluvial valleys near the coast. It is the same as the *Dysoxylum* lowland forest on coral rubble described on Ta'u (Whistler 1992b). The alluvium is deposited by streams, and the larger and broader the valley, the greater the area of this forest. The species that dominate here are probably adapted to moist loose soil conditions, and are generally absent or insignificant on the ridges, which presumably have drier, denser soil. This is one of the habitats most suitable for villages, and it is likely that Fagasa, Vatia, and Afono were covered with this type of lowland forest prior to settlement. The only area of this now within the park is at Amalau, but it is disturbed.

A plot in valley lowland forest was sampled on the west side of the stream in Amalau Valley inland from the road (see Appendix B: plot 10). This area is dominated by *Dysoxylum maota* (**maota**), which had an estimated relative dominance of 46%. The tree species second in dominance is *Planchonella samoensis* (**mamalava**). Also common are *Inocarpus fagifer* (Tahitian chestnut, **ifi**) and *Myristica fatua* (Samoan nutmeg, **'atone**). Other significant trees present are *Canarium vitiense* (**ma'ali**), *Kleinhovia hospita* (**fu'afu'a**), *Bischofia javanica* (**'o'a**), *Cananga odorata* (ilangilang, **moso'oi**), *Elaeocarpus ulianus*, *Macaranga stipulosa* (**lau fatu**), and *Ficus scabra* (**mati**).

This vegetation is very similar to one sampled in a similar bay called Aiga, just to the west of A'asu on the northwest coast of the island (Whistler 1980). In that plot *Dysoxylum* spp. (listed mostly as *D. samoense*, perhaps incorrectly) had a relative dominance of 74%. The most numerous trees there were *Myristica fatua* and *Barringtonia samoensis* (**falaga**). The latter species, which is related to the littoral *Barringtonia asiatica*, is typical along streams. It was also common at Amalau outside of the plot area along the stream. While there is no distinct riparian forest in Samoa, two species–*Barringonia samoensis* and *Inocarpus fagifer* are typical along streams (Fig. 18).

There is another area of this type of forest below the road in Amalau Valley. It is somewhat disturbed, but is also dominated by *Dysoxylum maota*, with a subcanopy primarily dominated by *Myristica fatua*. Another similar forest was described in the Ta'u report, based on a sample made there in 1976 (Whistler 1980). In that sample, the dominant tree was determined to be *Dysoxylum samoense* with a relative dominance of 86% (*D. maota* is not found on the island), an unusually high degree of monodominance for lowland forest.

Figure 18. Streamside vegetation at Amalau Valley.

When undisturbed, the floor of the forest is relatively open, and is usually dominated by shade-tolerant ferns. At Amalau, the dominant ground cover species was the fern *Lomagramma cordipinna*, with lesser amounts of *Arthropteris repens* (mostly on rocks and tree trunks) and *Tectaria stearnsii*, also ferns. Other terrestrial ferns present include *Asplenium nidus* (bird's-nest fern, **laugapapa**), *Asplenium polyodon*, *Pteris tripartita*, *Angiopteris evecta* (king fern, **nase**), *Bolbitis palustris*, *Phymatosorus scolopendria* (**lau magamaga**), *Pneumatopteris bryanii*, and *Diplazium proliferum*. This is very similar to the previously mentioned Aiga plot sampled in 1976, where *Lomagramma* was the dominant, followed by *Asplenium nidus* (Whistler 1980).

Trunk climbers are fairly common in this community, especially the aroid *Epipremnum pinnatum* and the previously mentioned ferns

Lomagramma cordipinna and *Arthropteris repens*, which are usually restricted to the lower trunks. Also common in some places is *Piper graeffei*. Similar results were recorded at Aiga, where *Epipremnum* and *Piper* were the two dominant species. Lianas are not very common in this community, at least at Amalau. The most typical species are *Gynochtodes epiphytica*, *Hoya pottsii*, and *Alyxia bracteolosa* (**lau maile**).

Epiphytes are not very abundant, at least when compared to montane forest. The most common species is *Asplenium nidus*, as it was at Aiga; also present are *Phymatosorus scolopendria*, *Davallia solida* (**laugasese**), *Davallia epiphylla* (**laugasese**), *Nephrolepis biserrata*, and *Antrophyum plantagineum*, all of which are ferns, and *Dendrobium dactylodes*, which is an orchid.

b. Coastal Lowland Forest - This is the lowland forest that occurs on ridges from inland of the littoral forest to about 200 m elevation (Fig. 19). It is virtually the same thing as the "'au'auli coastal forest" recognized in American Samoa (Whistler 1980) and "*Diospyros* coastal forest" described from the offshore islet of 'Upolu, Western Samoa (Whistler 1983), but was not reported in the park area on Ta'u (Whistler 1992b). It is characterized by species that are found on lower ridges and by the presence of a some of littoral species. It is somewhat transitional between the forest of interior ridges and littoral forest dominated by *Barringtonia asiatica* (**futu**). The boundaries between this forest and the other two are not distinct, especially since *Barringtonia* can be found at over 200 m elevation (and occasional trees at much higher elevations, but possibly planted there).

Two plots, nos. 1 and 2 in Appendix B, were sampled in this forest. Plot 2 was at Matapai Point (shown on most maps as "Matape") at the northeast corner of the park (and perhaps just a little outside of the currently proposed boundaries) at about 50 m elevation, the other on Sauma Ridge just to the west of Amalau Valley at 185 m. These two are somewhat heterogeneous, because they probably represent the lower and upper limits of this type of lowland forest. The lower plot had some littoral forest elements, such as *Terminalia catappa* (**talie**), and the upper had some elements from the higher elevation ridge forest.

By combining the data from the two plots, the following trees were shown to be the typical species (excluding secondary forest species): *Diospyros samoensis* (**'au'auli**) with an average relative dominance of 18%, *Garuga floribunda* (**vivao**) with 17%, *Barringtonia asiatica* with 12%, *Planchonella garberi* (**'ala'a**) with 10%, *Planchonella grayana* with 5%, *Guettarda speciosa* (**puapua**) with 3%, and *Syzygium clusiifolium* (**asi vai**) with 1%. Three other species characteristic of this vegetation are *Diospyros elliptica* (**'anume**), *Sterculia fanaiho* (**fana'io**), and *Syzygium dealatum* (**asi vai**?). A dominance of the *Syzygium* and the *Diospyros* species is probably the best indicator of this type of vegetation.

The forest floor is relatively open, since it is much drier than the above described lowland forest of alluvial valleys. The dominant species is probably *Asplenium nidus* (bird's- nest fern, **laugapa**). Also sometimes common are the ferns *Phymatosorus scolopendria* (**lau magamaga**), *Davallia solida* (**laugasese**), and *Tectaria stearnsii*. In sunny places where the canopy is broken, weeds such as *Nephrolepis hirsutula* (sword fern, **vao tuaniu**), may become common. Seedlings are often abundant, and sometimes may even dominate the forest floor. The most common of these are probably *Diospyros elliptica* and *Garuga floribunda*, but composition depends upon which trees dominate in the area. Littoral shrubs such as *Colubrina asiatica* (**fisoa**) and *Clerodendrum*

Figure 19. Coastal lowland forest near Tafeu Cove.

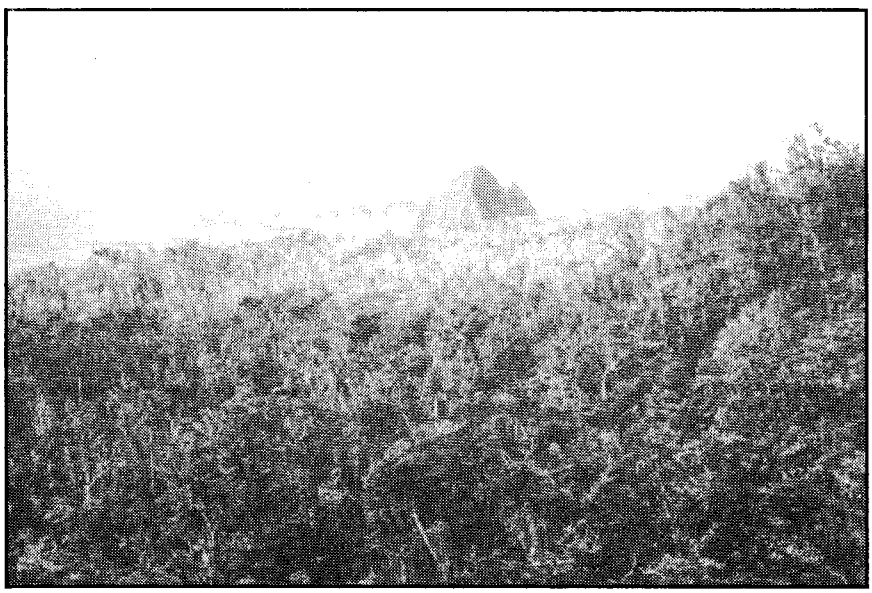


Figure 20. Disturbed lowland forest on ridges north of Mt. Alava.

inerme (**aloalo tai**) may also be common, particularly if the site is very near the ocean. Another shrub, *Alyxia stellata* (**nau**), is also sometimes common.

Vines are not common in this type of lowland forest, probably because of the dry soil and salty winds from the nearby sea. The most frequent species is probably the trunk climber *Epipremnum pinnatum*. Other species present include *Hoya australis* (**fue selela**), *Mucuna gigantea*, and *Ipomoea macrantha*. Epiphytes are also relatively sparse for the same reasons. The most frequent species are *Asplenium nidus*, *Davallia solida*, and *Davallia epiphylla*, all of which are ferns, and the orchid *Dendrobium dactylodes*.

c. Ridge Lowland Forest – This is the forest on the upper portion of the ridges and slopes, ranging from about 200 to 350 m elevation, but sometimes lower. This forest has indistinct boundaries because it blends into coastal lowland forest below it and montane forest community above it. It corresponds to the "mixed lowland forest" described for Ta'u (Whistler 1992b), the "asi ridge forest" of American Samoa (Whistler 1980), the "**mafoa** ridge forest" of 'Upolu, Western Samoa (Ollier *et al.* 1979), and the "asi forest" and "tamanu forest" of Savai'i and 'Upolu (Chandler *et al.* 1978). It probably covers the majority of the park, but the western half of the area has recently been disturbed by hurricanes and human activities (Fig. 20).

Ridge lowland forest is not a monodominant community, and any one of several trees may prevail at a particular site. The seven most characteristic canopy trees in the forest on Tutuila are shown in Table 1. The four canopy species averaged between 12 and 16% relative dominance. The first species, *Syzygium inophylloides* (**asi**), is also the dominant of the lowland forest of Ta'u (Whistler 1992b). *Calophyllum neo-ebudicum* (**tamanu**) is common throughout the archipelago in lowland forest of ridges, as is *Canarium vitiense* (**ma'ali**). *Buchanania merrillii* (no Samoan name) finds its greatest abundance on Tutuila; it is absent from Manu'a, and is uncommon in Western Samoa.

The subcanopy trees may sometimes be dominant, but they are not as tall nor as big (in girth or dbh) as the other species. *Diospyros samoensis* is a dominant tree of lowland forest of coastal ridges, and becomes progressively less important with increasing elevation. *Myristica fatua* (Samoan nutmeg, **'atone**) is typical of most types of lowland forest, but at higher elevation on ridges it is often replaced by *Myristica hypargyraea* (also called **'atone**). *Canarium harveyi* (**mafoa**) may be a modern introduction to Samoa, since it was not recorded in the islands before 1920; consequently, it may actually be a canopy tree that has not been in Samoa long enough to grow into the huge size characteristic of older native trees.

Table 1: Relative dominance (%) of characteristic trees of the lowland forest of interior ridges of the Tutuila park.

	PLOTS					AVERAGE
	5	6	7	8	9	
CANOPY SPECIES						
Syzygium inophylloides	16	11	22	25	4	16
Calophyllum neo-ebudicum	11	13	17	3	12	13
Canarium vitiense	8	7	12	11	25	13
Buchanaria merrillii	1	31	11	–	18	12
SUBCANOPY SPECIES						
Diospyros samoensis	27	5	10	10	–	10
Canarium harveyi	–	1	4	9	10	5
Myristica fatua	3	4	10	+	8	5

The above seven characteristic trees accounted for about 75% of the relative dominance of the five plots; most of the remainder comprised occasional secondary forest trees (*Hibiscus tiliaceus*, *Rhus taitensis*, and *Alphitonia zizyphoides*), montane forest species at the higher elevations, and coastal lowland forest species at the lower elevations. The presence of the secondary forest species indicates some kind of past disturbance.

It may have just been a small gap (see "gap replacement" in the section on secondary forest), but the presence of *Hibiscus* may indicate some human activity there.

A variation of this kind of lowland forest occurs when *Intsia bijuga* (**ifilele**) is present. This tree has an odd distribution on Tutuila: it is found at Nu'uuli just inland from the mangrove swamp, and on a number of ridges on the north shore of the island between Vatia and Fagamalo; there is also a population on Nu'usetoga islet at Masefau. It is common all along the ridge behind Vatia, including the top of Mata-o-Tula in the montane scrub, and on the lower part of Faiga Ridge, which is contiguous with it. It is odd that this tree is not reported on the ridges of the south part of the island, unless it was removed in the past by relentless logging (it is probably the finest timber tree in Samoa). It may be an ancient introduction to Samoa that only grows in areas where it was originally planted, but this is only speculative.

In plot no. 4 on Muli'ulu Ridge east of Fagasa, *Intsia* was the dominant species with a relative dominance of 20%. The other important species in that plot, in descending order of relative dominance, were *Canarium harveyi*, *Syzygium inophylloides*, *Canarium vitiense*, *Buchanania merrillii*, and *Calophyllum neo-ebudicum*, which are the same species typical of the lowland forest of the interior ridges. In the 1976 survey of the vegetation of American Samoa, the only plot where *Intsia* turned up was on Nu'usetoga Islet, where it was the dominant species with a relative dominance of 20%; the second dominant species there was *Syzygium inophylloides*. On a similar ridge on 'Upolu, *Intsia* was the dominant with 49% relative dominance (Park *et al.* 1992); the next four dominant species there, in descending order, were *Syzygium inophylloides*, *Canarium vitiense*, *Diospyros samoensis*, and *Myristica fatua*.

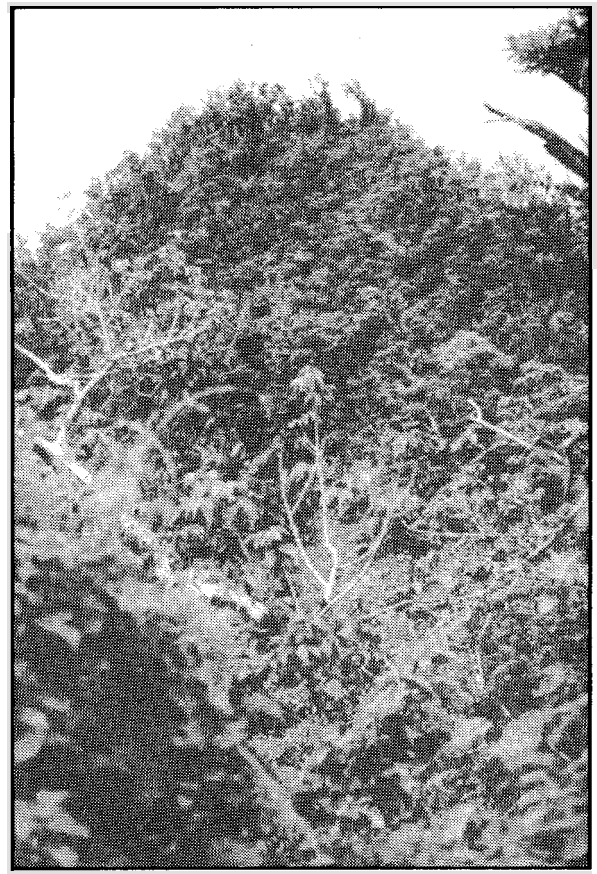
The floor of the forest often has a relatively dense ground cover (Fig. 21), partly perhaps because the steep sides of the ridges may allow more light through the canopy, but more importantly, because of the recent hurricanes. In shady areas on relatively flat places on the ridge tops, *Lomagramma cordipinna* may dominate, but in most areas in this forest it is relatively uncommon. The most common species are the ferns *Asplenium nidus* (**laugapapa**), *Tectaria stearnsii*, *Christella harveyi*, *Microsorium sylvaticum*, *Phymatosorus scolopendria* (**lau magamaga**), and *Nephrolepis hirsutula* (sword fern, **vao tuaniu**). In places with a disturbed canopy, vines such as *Gynochtodes epiphytica*, *Faradaya amicorum* (**mamalupe**), and *Alyxia bracteolosa* (**lau maile**) may form dense thickets.

There are also several small trees that are particularly common in this forest. The most frequent of these are *Ixora samoensis* (**filofiloa**), *Psychotria insularum* (**matalafi**), and *Aglaia samoensis* (**laga'ali**). Less common are *Casearia* sp. nova, *Citronella samoensis*, and *Flacourtia rukam* (**filimoto**). These are all native species; the introduced shrub *Clidemia hirta* (Koster's curse) is found here in small amounts, but is much more common at higher, wetter elevations. Also common are *Cordyline fruticosa* (**ti**), *Alyxia stellata* (**nau**), and *Zingiber zerumbet* (**'avapui**). The last species is particularly common along ridge tops, and may be a naturalized relict of former cultivation once occurring in these places. It apparently spreads only infrequently to other areas.

Epiphytes are more common here than in coastal lowland forest, but less common than at higher elevations in montane forest. The most common epiphytic orchids are *Dendrobium biflorum*, *Dendrobium dactylodes*, *Flickingeria comata*, *Bulbophyllum polypodioides*, and *Phreatia micrantha*. The most common epiphytic ferns are *Humata heterophylla*, *Humata polypodioides*, *Asplenium nidus*, *Davallia solida*, *Davallia epiphylla*, and *Phymatosorus scolopendria*.

Like epiphytes, vines are more common in this forest than in coastal lowland forest, but less common than in montane forest. The most frequent trunk climbers are *Freycinetia reineckei*, *Freycinetia storckii*, and *Piper graeffei*. *Epipremnum pinnatum*, which is common on the

Figure 21. Ridge lowland forest west of Amalau Valle



22. Montane forest on Alava Ridge.

coastal ridges, decreases in importance with increasing elevation. In moister places, the terrestrial fern *Lomagramma cordipinna* is also common ascending the lower portions of tree trunks. The most common lianas are *Gynochtodes epiphytica*, *Alyxia bracteolosa*, and *Hoya pottsii*.

6. Montane Forest

This is the rainforest occurring above about 350 m elevation and dominated by trees that are mostly absent at lower elevations. The highest point within the park is Mt. Alava (at 490 m elevation), so the upper limit of montane forest within the park is restricted to this elevation. It occurs mostly on the south edge of the park along Alava Ridge (Fig. 22) and on some of the upper valleys north of the ridge, mostly east of the TV transmitter on Mt. Alava where there is less disturbance.

This community is the same one described on Ta'u (Whistler 1992b), and corresponds to the "Maotamea montane forest" and the "fega-vao cloud forest" described in an earlier publication (Whistler 1980). The floristic differences that serve to distinguish it from lowland forest are caused mostly by the higher elevation, and indirectly by rainfall and temperature. Little reliable climatic data has been recorded in this community or at this elevation, but if the decrease of 0.65°C (1.17°F) per 100 m increase in elevation suggested by Wright (1963) for Western Samoa applies to Tutuila, the mean temperature is 2.3 to 3.2°C (4.1 to 5.7°F) cooler there than at sea level. No rainfall data has been recorded within the park, but the rainfall in its montane forest may be as much or more than the 5000 mm (200 in) per year in Pago Pago Harbor, and is certainly greater than in the lowland forest north of it.

When undisturbed, montane forest is similar in stature to lowland forest, but it has been severely damaged by the recent hurricanes (Fig. 23). But even before that, human disturbance took its toll–a road running from Fagasa Pass to the TV transmitter was built in about 1977, which has opened the area up to agriculture and erosion. The road, in fact, probably obliterated one of the marked plots set up during the 1975–1976 inventory (Whistler 1980). Consequently, no undisturbed examples of it were found during the present survey.

As noted above, the major canopy species of the lowland forest on ridges are *Syzygium inophylloides* (**asi**), *Canarium vitiense* (**ma'ali**), *Canarium harveyi* (**mafoa**?), *Calophyllum neo-ebudicum* (**tamanu**), *Intsia bijuga* (**ifilele**), and *Buchanania merrillii*. However, at higher elevations these trees become less important or disappear, and are replaced by species not found at lower elevations. The most characteristic species of the Tutuila montane forest are *Dysoxylum samoense* (**maotamea**), *Syzygium samoense* (**fena vao**), and *Crossostylis biflora* (**saitamu**). Other important species include *Hedycarya denticulata*, *Syzygium samarangense* (**nonu vao**), *Palaquium stehlinii* (**nasu**, in Western Samoa), *Myristica hypargyraea* (**'atone**), *Elaeocarpus tonganus* (**a'amati'e**), *Trichospermum richii* (**ma'osina**), *Astronidium pickeringii*, *Weinmannia affinis*, *Fagraea berteroana* (**pualulu**), and *Hernandia moerenhoutiana* (**pipi**).

Because no intact examples of montane forest were found during the present survey, no plots were sampled. However, in a plot sampled in montane forest on Alava Ridge in 1976 (Whistler 1980), and shown in Appendix B as plot no. 12 (recalculated so as to standardize it with the current plots) the dominant species, in order of relative dominance, were *Dysoxylum huntii* (22%), *Crossostylis biflora* (18%), *Syzygium samoense* (13%), *Palaquium stehlinii* (10%), and *Hedycarya denticulata* (9%). None of these trees are significant in forest at lower elevations.

Dysoxylum huntii is the most characteristic tree of this community. It is also a dominant in the montane forest of Ta'u, as well as in Western Samoa, where it is the major timber tree of higher elevations (above 600 m) on Savai'i and 'Upolu. It is rarely found below 300 m elevation, where it is replaced by two other species of the same genus, *Dysoxylum maota* (**maota**) and *Dysoxylum samoense* (**mamala**).

Syzygium samoense, the other characteristic canopy tree of the montane forest of Tutuila, is rarely found below 300 m elevation. In two plots sampled in montane forest on Olosega island (Whistler 1980), it ranked first and fourth in relative dominance. *Crossostylis biflora*, which is an inland species of the mangrove family Rhizophoraceae, is more of an understory tree that is not reported from below 250 m elevation, and is not found in Manu'a.

Figure 23. Montane forest on Toa Ridge.

Several other trees are characteristic of Alava ridge, but are more heliophytic (sun-loving) species that do not do well in the shade of undisturbed montane forest. The three most significant of these are *Metrosideros collina*, *Spiraeanthemum samoense*, and *Glochidion cuspidatum*. *Metrosideros*, which is probably the same species that comprises most of the native forests in Hawai'i, dominates the scrubby vegetation found on the upper part of the steep slopes of Alava Ridge, especially around the TV transmitter. *Spiraeanthemum* is also common there, and was found to be the dominant species in one type of cloud forest at 1600 m elevation on Savai'i (Whistler 1978). *Glochidion cuspidatum* is more of a secondary forest tree closely related to *Glochidion ramiflorum*, a tree that typically occurs in disturbed forests of the lowlands. Also common on these slopes are *Neonauclea forsteri* (**afa**), which is a secondary forest canopy species, and *Syzygium samoense*.

Some of the ridge top from the TV transmitter to the beginning point of the old trail down to Vatia is currently dominated by thickets of *Hibiscus tiliaceus* (**fau**). This tree is common in many types of habitats, especially disturbed ones, and its presence is probably the result of previous cultivation along the stretch of ridge. Most of the rest of the ridge in this area is open montane forest consisting of scattered trees growing out of a dense ground cover.

The distinction between the lower limit of the montane forest and the upper limit of lowland forest is not very clear, because there is a zone of variable width where the characteristic species of the two communities share dominance. In plot 11 (Appendix B) at 350 m elevation, for example, the five dominant trees were *Calophyllum neo-ebudicum*, *Syzygium inophylloides*, and *Buchanania merrillii*, which are lowland forest species, and *Syzygium samoense* and *Hernandia moerenhoutiana*, which are montane forest species.

In undisturbed montane forest, the ground cover is often dense, and is comprised of shade tolerant ferns. The most characteristic and abundant species is probably *Lomagramma cordipinna* (Fig. 24); other common species include *Asplenium nidus*, *Asplenium polyodon*, *Trichomanes* spp., and *Microsorium sylvaticum*.

Other plants present in the forest floor of montane forest include *Angiopteris evecta* (king fern, **nase**), *Marattia smithii*, and *Cyathea vaupelii* (**olioli**). *Angiopteris* and *Marattia* are very similar to each other–they have long thick fronds arising from a thick base. *Cyathea* is a small tree fern. These ferns are present in both undisturbed and disturbed forest. Also common in these places are *Zingiber zerumbet* (wild ginger, **'avapui**), *Heliconia laufao* (**laufao**), and *Cordyline fruticosa* (**ti**). Native grasses such as *Centosteca lappacea* (**sefa**), *Oplismenus compositus*, and *Cyrtococcum oxyphyllum* are also found in montane forest, most often in clearings or along trails.

In the disturbed montane forest on Alava ridge, the native, shade tolerant ferns are outcompeted in the sunny conditions by introduced, weedy heliophytic species, the most common of which are *Mikania micrantha* (**fue saina**), *Clidemia hirta*, and *Paspalum conjugatum* (**vao lima**). *Mikania* is a vine that grows over low vegetation and even up in the lower branches of trees. *Clidemia* is a noxious shrub that is uncommon in lowland forest, but very common in the summit scrub community of Ta'u (although it apparently did not reach that island until after 1976). Also common here are the two *Freycinetia* species, which often form dense tangles that are traversed only with difficulty.

The amount and variety of epiphytes is another characteristic that serves to distinguish montane forest from lowland forest. The difference is not only in the amount or biomass of epiphytes, but also in the number of species present. The montane forest is the most floristically diverse on Tutuila, not only for epiphytes, but also for trees and ground cover species. Because of the cooler, conditions in the montane forest, there is a profusion of epiphytes that are mostly absent from lowland forest. By far the most important epiphytes are ferns and orchids. Only one epiphytic vascular plant species reported here was neither a fern (or fern ally) nor an orchid–*Procris pedunculata*, a member of the nettle family. It was not very common, however.

Many of the trees on the less disturbed parts of Alava Ridge are covered with epiphytes. The most characteristic fern is probably *Trichomanes humile*, a filmy fern that cannot exist in drier forests. Also common are *Hymenophyllum imbricatum* (another filmy fern), *Hymenophyllum*

Figure 24. *Lomagramma cordipinna* dominating floor of montane forest.

polyanthos, *Davallia solida* (which occurs all the way down to sea level), *Humata heterophylla*, *Ctenopteris blechnoides*, and *Ctenopteris contigua*. Mosses and liverworts are also common.

Many different epiphytic orchids are found in this forest, but probably the most abundant one is *Dendrobium sladei*. Other common species include *Dendrobium biflorum*, *Flickingeria comata*, *Liparis condylobulbon*, *Phreatia micrantha*, *Phreatia matthewsii*, *Bulbophyllum polypodioides*, *Bulbophyllum longiscapum*, *Glomera montana*, *Diplocaulobium fililobum*, and *Coelogyne lycastoides*.

Vines are also common in the montane forest. There are few lianas in the forest in the park, mainly because of the absence of a canopy. The most common species present are *Faradaya amicorum* (**mamalupe**) and *Alyxia bracteolosa* (**lau maile**). Less common and smaller species include *Medinilla samoensis*, *Dioscorea bulbifera*, and *Hoya vitiensis* (**fue selela**). The most common trunk climbers are *Freycinetia reineckei* and *Freycinetia storckii* (both called **'ie'ie**). Less common species include *Piper graeffei* (**'ava'ava aitu**). One fern, *Lomagramma cordipinna*, also becomes a trunk climber when it encounters a tree while growing across the forest floor (see Fig. 24).

D. Summit Vegetation

The summit vegetation category comprises a single plant community on Tutuila, montane scrub, first described in Samoa by Whistler (1980). Another type of summit vegetation, "summit scrub" was described from Ta'u (Whistler 1992b); although this has a somewhat similar structure, it differs in origin and floristic composition.

7. Montane Scrub

This is the scrubby vegetation in which trees are dwarfed and secondary in importance (biomass) to the dense tangle of ground cover of species–mostly ferns and climbers. In Samoa this community appears to be unique to Tutuila, where it is restricted to ancient "trachyte plugs" scattered around the islands. As noted in the earlier section on geology, trachyte plugs are the remains of old volcanic cores. Their unique white clayey soil is characterized by a deficiency of calcium, magnesium, and phosphorus. The white soil is noticeable from a distance on the cliffs that are often found in areas of montane scrub (see Fig. 5).

There are several areas of trachyte with their associated montane scrub vegetation on Tutuila, the most significant of which are Mt. Matafao and Mt. Pioa. These two peaks, which reach 650 m (2142) and 520 m (1718 ft) respectively, can easily be seen from Pago Pago Harbor, but are not within the boundaries of the park. The trees present are scattered and mostly shrublike, and most belong to species different from those found in the surrounding lowland forest. In an earlier survey of these vegetation types (Whistler 1980), the dominant trees recorded from montane scrub on Matafao, Pioa, and another area called Mt. Tau (near the airport) were *Pandanus reineckei*, *Rapanea myricifolia*, *Syzygium brevifolium*, *Astronidium pickeringii*, *Metrosideros collina*, and *Alstonia pacifica*. The ground cover, or perhaps more aptly described, the vegetation between the scattered trees, was dominated by *Dicranopteris linearis* (false-staghorn fern, **asaua**), *Dipteris conjugata* (a fern reported in Samoa only from Matafao and Pioa), *Davallia epiphylla*, and *Freycinetia storckii* (**'ie'ie**).

Only a single trachyte plug is found within the park boundaries–Mt. Mauga-o-Tula behind the village of Vatia (Fig. 25). Its steep summit (a ridge with high points on either end) is reached only with difficulty via an ill-defined trail ascending the east-facing slope. This trachyte ridge is only half the elevation of Pioa and Matafao (less than 300 m), yet it has some of the same species that characterize montane scrub. In a cursory sample on Mauga-o-Tula during the present survey, the dominant trees recorded were *Metrosideros collina*, *Intsia bijuga* (**ifilele**), *Alstonia pacifica*, *Eurya pickeringii*, *Psychotria insularum* (**matalafi**), and *Erythrospermum acuminatissimum*. This is a mixture of lowland ridge forest species and montane scrub species. However, the dominant ground cover species is *Dicranopteris linearis*, which is characteristic of, although not entirely restricted to, montane scrub (Fig. 26). Also present, but of lesser importance, are *Scleria polycarpa*, *Oplismenus hirtellus*, and *Lindsaea ensifolia*.

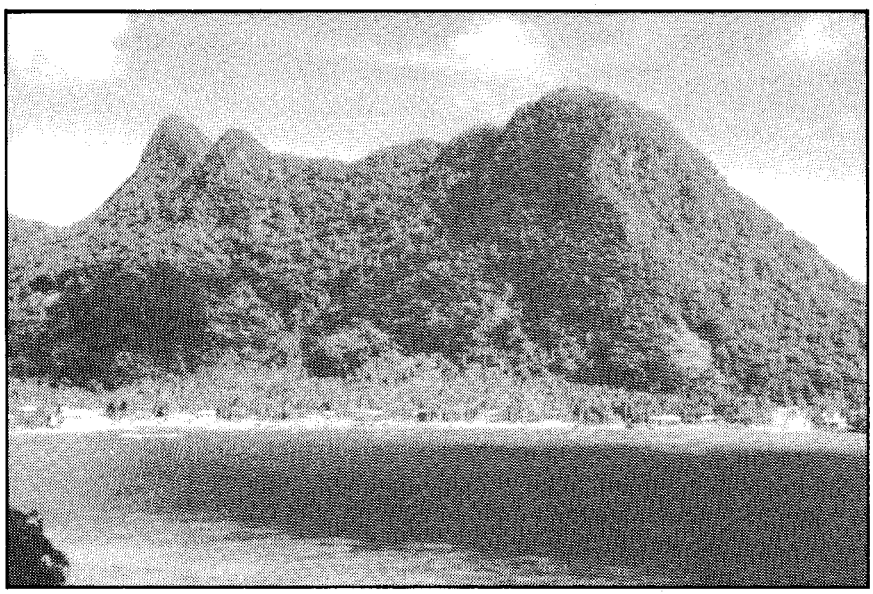


Figure 25. Mauga-o-Tula Ridge behind Vatia.

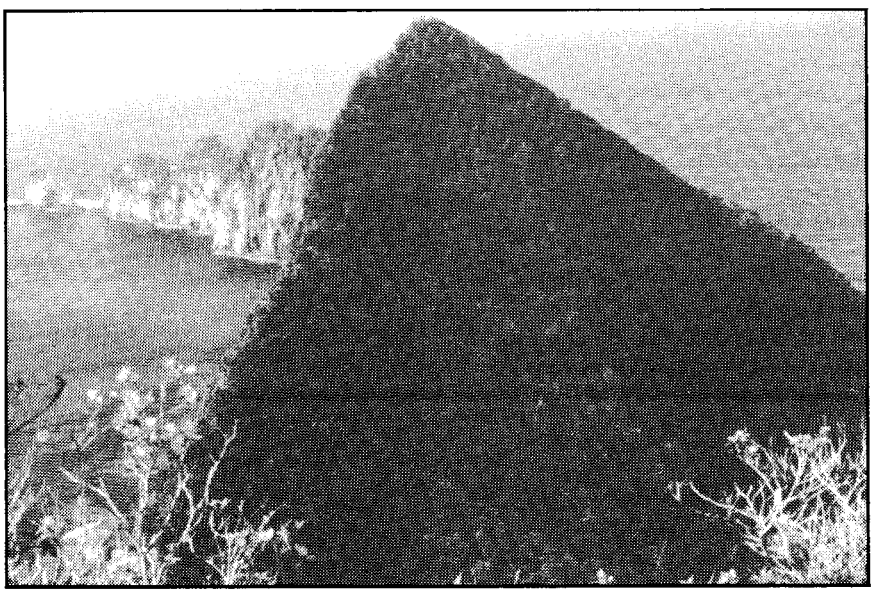


Figure 26. Montane scrub vegetation on Mauga-o-Tula, Vatia.

Although Mauga-o-Tula lacks some of the characteristic montane scrub species of other trachyte plugs, such as Matafao and Pioa, it still can be be classified as montane scrub because of the dominance of *Metrosideros* trees and by the ground cover dominated by *Dicranopteris*.

Secondary Vegetation

Secondary vegetation includes all those plant communities that are in a state of relatively rapid change in structure and species composition brought about by some kind of disturbance. The disturbance can be natural, as from hurricanes and landslides, or it can be caused by the activities of man, such as the clearing of forests for plantations and villages. Until the arrival of the first Polynesian settlers perhaps 3000 years ago, all disturbance was natural. Nowadays, however, it is most often caused by the activities of man.

Three secondary vegetation communities are recognized below. They are successional, i. e., over time after a disturbance, the first one, managed land vegetation, evolves into the second one, secondary scrub, and this in turn evolves into the third one, secondary forest. Species dominating disturbed vegetation have some characteristics in common: (1) they are relatively fast growing; (2) they have mostly small, readily dispersed seeds; (3) they are intolerant to shade and disappear when the large primary forest trees, or other secondary species, shade them out. The species of the first community, managed land vegetation, are mostly aliens, i.e., non-native, but those of the other two are mostly indigenous (but not endemic) species.

The three communities are described below. They are basically the same as those included in the report for the Ta'u unit of the Park (Whistler 1992b), although a few of the species are different (Ta'u has fewer species).

8. Managed Land Vegetation

Managed land comprises those areas that are actively managed by man, and includes villages, plantations, pastures, roads, and airports. The managed land within the park comprises only villages, plantations, and roads (and roadsides). Although the village of Vatia, which is surrounded by the park, is excluded from the park itself by a 200 ft elevation boundary line, there are several houses in Amalau Valley (possibly only four) above and below the road, and thus the land around these structures fit into the village category. The TV transmitter atop Mt. Alava and the area around a house along the Alava Ridge road, belong here as well.

The plantations in the park are found mostly around the village of Vatia above the 200 ft elevational line (Fig. 27), perhaps some on the slope to the west of Afono, and some patches below and north of the Alava Ridge road. The most commonly cultivated plants in plantations (and villages) are coconuts, taro, and bananas. When coconut plantations are abandoned, the coconuts may persist for many decades, but eventually disappear because they do not compete well reproductively with rainforest trees. Taro and bananas are usually grown only for one or a few times on a piece of land cut out of the forest, after which the plot is abandoned to fallow. It is then rapidly overgrown with herbaceous weeds, and eventually by shrubs and small trees, at which time it is classified as secondary scrub (discussed below).

Paved roads obviously have no vegetation, but their margins can be classified as managed land. The only paved road within the park runs from Afono to Vatia, and its margins are periodically cut or sprayed with herbicide. The road cut along this and other roads probably also would be classified as managed land, at least until they become vegetated with forest or scrub.

The only other road within the park is the dirt road running from Fagasa Pass to the TV transmitter–the Alava Ridge road. It is passable only by means of 4-wheel drive vehicles because of erosion and mud puddles, but a family travels it regularly by truck to their house located part way along the road. The managed land vegetation of this road consists of the low plants on the road itself, the taller weedy plants along the margins, and the plants on the roadcuts along its route.

Nearly all the plants found on managed land are introduced species. Before the arrival of the Europeans, the weeds introduced by the Polynesians and a few native species shared dominance. Now, however, most of the weeds, including the most dominant species, are modern introductions–mostly from tropical America. Because of the competition of these more recently

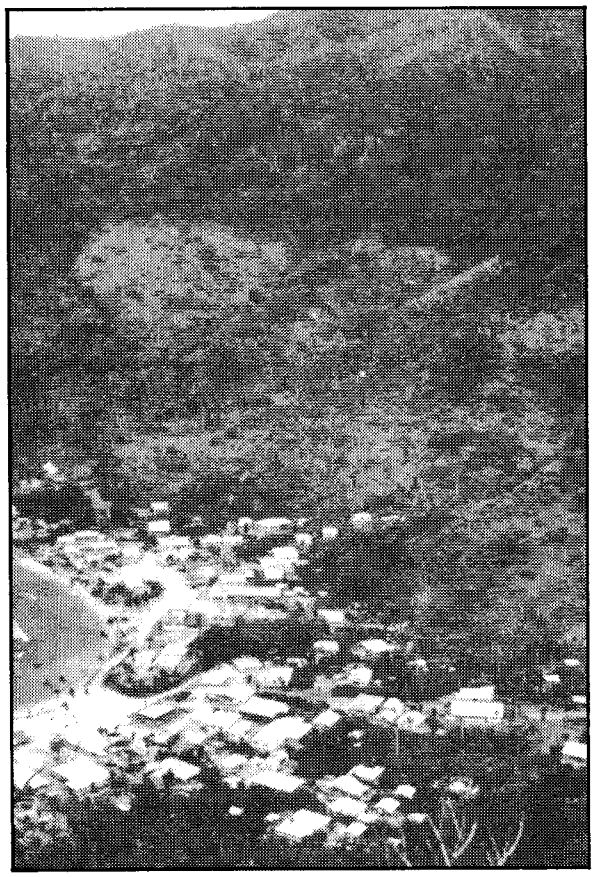


Figure 27. Vatia Village showing extent of managed land vegetation.

introduced weeds, many of the Polynesian weeds have been severely reduced or have disappeared from American Samoa. Polynesian weeds reported on Tutuila but not collected on the island in the last half century include *Amaranthus viridus* (Amaranthaceae), *Cyathula prostrata* (Amaranthaceae), *Senna sophera* (Fabaceae), and *Uraria lagopodoides* (Fabaceae).

The dominant weedy plants found on managed land are *Mikania micrantha* (mile-a-minute vine, **fue saina**), *Nephrolepis hirsutula* (sword fern, **vao tuaniu**), *Bidens alba* (beggar's-tick), and *Paspalum conjugatum* (T-grass, **vao lima**). Many other species may be common, depending upon soil, moisture, and type of management. About 250 species introduced species have become naturalized in the archipelago (Whistler 1988b), and about 168 of these occur on Tutuila (Appendix A); most of these are weeds that thrive in sunny disturbed areas; most are flowering plants, but a few are ferns. *Mikania*, unlike the other three most abundant weed species, is a vine than can smother other herbaceous or shrubby vegetation, and may inhibit timely regeneration of forest from disturbed land.

The dominant plants on the margins of the Alava Ridge road include *Brachiaria mutica* (California grass), *Mikania micrantha*, *Calopogonium muconoides*, *Mimosa pudica* (sensitive plant, **vao fefe**), and *Ludwigia octovalvis* (primrose willow). There is very little if any current management, since the road is largely abandoned, so these are often mixed with shrubs and trees characteristic of secondary scrub. The roadway itself is dominated by a different set of species that do not thrive in the dense shade of the taller roadside plants; the most common plants here include *Ludwigia octovalvis, Eleusine indica* (goose grass, **ta'ata'a**), *Cuphea carthagenensis*, and *Paspalum conjugatum*. The roadsides from Afono to Vatia are dominated by weeds such as *Desmodium tortuosum* (especially in places that have not recently been sprayed or cut), *Bidens alba*, *Paspalum conjugatum*, and *Calopogonium muconoides*.

Roadcuts are similar to cliffs in that erosion on the steep surfaces prevents a stable climax vegetation from becoming established. On the Alava Ridge road, the dominant species are weedy vines, such as *Mikania micrantha* and *Dioscorea bulbifera* (bitter yam, **soi**), secondary scrub species, such as *Pipturus argenteus*, secondary forest trees, such as *Neonauclea forsteri* (**afa**), and ferns, such as *Pneumatopteris glandulosa, Angiopteris evecta* (king fern, **nase**), *Pleisoneuron attenuatum*, and *Macrothelyptris polypodioides*. Also common is the large native reed *Miscanthus floridulus* (**u**). The roadcuts on the eastern part of the park are dominated mostly by secondary forest trees, such as *Macaranga harveyana* (**lau pata**), *Pipturus argenteus* (**soga**), and *Morinda citrifolia* (Indian mulberry, **nonu**), and herbaceous species such as *Dioscorea bulbifera* (bitter yam, **soi**), *Mikania micrantha*, *Nephrolepis hirsutula* (**vao tuaniu**), and *Macrothelypteris polypodoides*. In some places *Dicranopteris linearis* (**asaua**, false staghorn fern) is dominant, especially on cliffs forming the edge of the road.

Other than the taro, coconut, and banana plantations around the fringes of the villages and along roads, there is hardly any current agricultural activity within the park boundaries. Only one person, a non-Samoan residing in Vatia, is currently known to have any inland plantations. One is on the hillside west of Amalau Valley, another is on Toa Ridge about halfway between the TV transmitter and the north coast, and another is reportedly on the ridge just to the west of Tafeu Bay. The Toa Ridge plantation is an area of *Dicranopteris linearis*, which is suggestive of ancient village or plantation sites. Currently only a few orange trees and a mango are planted there, all of them quite young. The area west of Tafeu Bay has some coconuts, possibly a remnant of former human activity (the name of the area is Nu'utoga, literally "Tongan village," which may indicate its ancient status). The farmer using this area believes that some of the trees there may be old cultivated species that he doesn't recognize, but unfortunately the area was not visited because of weather conditions.

9. Secondary Scrub

This is the type of disturbed vegetation that is dominated by shrubs and small trees. It is usually a successional stage between managed land, or land disturbed naturally (as by a landslide), and secondary forest. The species that dominate here are mostly woody rather than herbaceous. When the land is managed, or weeded in the case of plantations, these woody plants are kept in check,

since they are perennial species that take longer to grow and reproduce. The lower, smaller, and faster growing herbaceous plants are dominant under these conditions, since weeding never eliminates weeds–at best, it controls and prevents them from overrunning the crop. However, when management has ended, or after a landslide, the disturbance has ended, the small shrubs and trees soon take over and eventually shade out the herbaceous species, other than the vines.

Vines found in secondary vegetation can be divided into two types–herbaceous vines and woody vines (lianas). Herbaceous vines are common in secondary scrub, since they can cover the shrubs and low trees. However, when taller trees prevail, herbaceous vines cannot climb high enough and are generally shaded out below the canopy. Lianas are less common in secondary scrub than they are in secondary forest, since they lack the large trees to climb, but most of them probably get their start at this stage.

The most common secondary scrub trees, more or less in order of abundance, are *Hibiscus tiliaceus* (beach hibiscus, **fau**), *Macaranga harveyana* (**lau pata**), *Pipturus argenteus* (**soga**), *Morinda citrifolia* (Indian mulberry, **nonu**), *Carica papaya* (papaya, **esi**), *Omalanthus nutans* (**fogamamala**), *Kleinhovia hospita* (**fu'afu'a**), and *Trema cannabina* (**magele**). Most of these have relatively large, ovate or heart-shaped leaves and do not grow to be very tall.

Hibiscus is a very adaptable tree, since it is common in disturbed littoral forest, in thickets on the margins of mangrove swamps and streams, and inland on disturbed hillsides. Its distinctive gray-green color and growth form make it easy to spot from a distance. It is often found in secondary forest as well, commonly as scattered, scrambling individuals. Its presence there probably indicates major disturbance in the past.

The largest areas of secondary scrub in the park are on the ridges north of Alava Ridge. These are mostly abandoned plantations that are now overgrown with scrubby vegetation. It should be kept in mind, however, that the vegetation categories outlined here are not distinct entities and often blend into each other. The vegetation on the ridges is often a mixture of scrub and scattered lowland forest trees that have survived the recent hurricanes.

10. Secondary Forest

This vegetation comprises high forest that is structurally somewhat similar to primary forest, but is dominated by secondary rather than primary forest species. Secondary species were noted earlier to typically have relatively small, easily dispersed seeds. They may be either bird dispersed, with succulent fruits that are attractive to birds, or wind dispersed with very light or winged seeds or fruits that are transported by the wind. Secondary species are also characterized by their transitory dominance–they do not perpetuate themselves in areas lacking disturbance.

Primary species, on the other hand, have larger seeds that give the seedling extra stored energy to insure a greater survival rate on the shady forest floor. When the forest canopy becomes established, the small seeds of secondary forest species are at a disadvantage for survival, and their reproduction is inhibited. Primary forest species reproduce in their own shade and maintain their dominance until the next major disturbance. The seedlings themselves may also have different tolerances to shade, with the primary forest species being adapted at the seedling stage to relatively low light intensities.

The transitory nature of the dominance of secondary forest canopy trees in their own forest is reflected in population dynamics; although they dominate the largest size classes, they are severely under-represented in the smaller size classes –which include the trees that will eventually inherit the canopy. For example, at a sampled plot at Faleiulu on Ta'u (Whistler 1980), the two dominant trees were both secondary species; all 24 sampled individuals were over 15 cm dbh. On the other hand, 30 of the sampled individuals were primary forest canopy species, but only 11 of these were over 15 cm dbh. Barring further disturbance over the short run, the primary forest trees will eventually replace the secondary forest species in that plot. Secondary forest also has less species diversity, since the forest is younger and has not had sufficient time for all the species formerly there to become re-established.

A complicating factor in the distinction between primary and secondary forest is called "gap replacement." When a tree falls in primary or

even mature secondary forest, it leaves an opening in the canopy–it may even take a few other canopy individuals with it when it falls. The canopy opening allows secondary forest trees to become established in primary forest. However, many primary forests lack any of the major secondary forest species, which possibly indicates the gaps routinely occurring in forests do not allow enough light to favor secondary forest species.

The most characteristic secondary forest species in Samoa is *Rhus taitensis* (**tavai**), which grows to be a huge tree. Large areas of forest dominated by this tree occur on Tutuila. It can be recognized from a distance by its layered branches tinted red with young leaves, and in aerial photographs by the even texture of the canopy. It may dominate alone, or it may share dominance with another species, *Alphitonia zizyphoides* (**toi**). Other typical secondary species include *Cananga odorata* (ilangilang, **moso'oi**), *Bischofia javanica* (**'o'a**), *Elattostachys falcata* (**taputo'i**), *Neo-nauclea forsteri* (**afa**), and *Macaranga stipulosa* (**lau fatu**). However, these rarely become dominant, and the latter species is probably typical of gap replacement.

Several other trees are somewhat intermediate between primary and secondary forest species. *Dysoxylum maota* (**maota**) and *Dysoxylum samoense* (**mamala**) are species that appear in young secondary forest. In alluvial valleys they may completely dominate, but elsewhere they may disappear or comprise only a minor part of the relative dominance. *Pometia pinnata* (**tava**) is a dominant primary forest species on area of rocky soil from recent lava flows (i.e., as it was on the Tafuna plain before the native vegetation was decimated), but on hillsides it appears to be a pioneer species. This is a moot point, however, because *Pometia* has not been recorded from the north side of the island and consequently not within the park boundaries. Another species should also be mentioned, *Paraserianthes falcataria*. This introduced tree is common along the beginning part of the Alava Ridge road, but since it has small, poorly dispersed seeds, it does not readily spread.

The most significant secondary forest in the park is found on the slopes below Alava Ridge road and above Fagasa Bay. The dominant species here is probably *Neonauclea forsteri* (**afa**), but nearly as common are several other species, including *Dysoxylum samoense, Rhus taitensis, Alphitonia zizyphoides, Myristica fatua* (Samoan nutmeg, **'atone**), *Bischofia javanica* (**'o'a**), and *Cananga odorata*. It is not apparent why these ridges are covered with secondary forest. There is no sign of current agriculture, although there is on the ridges farther east along the road (see Fig. 20), and the presence of large trees suggests that agriculture is not the cause. Although the area seems far enough above Fagasa to be unlikely as a plantation area, it may have been utilized for this long ago–long enough ago that no signs of any plantation exist now. Perhaps the most likely explanation is that the steep slopes are unstable, resulting in a "disclimax" vegetation of secondary forest. This is somewhat similar to the "*Dysoxylum* lowland forest on talus slopes and cliffs" described from Ta'u (Whistler 1992b). The disturbed condition may have been abetted by erosion from the ridge road.

Another area of secondary forest is found on the slope below the road just to the west of Amalau Valley. The dominant species here is probably *Dysoxylum maota* (**maota**), but also common are *Cananga odorata, Kleinhovia hospita, Garuga floribunda* (**vivao**), *Planchonella samoensis* (**mamalava**), and *Ficus scabra* (**mati**). This forest is a combination of ridge lowland forest, valley lowland forest, and secondary forest species, and is possibly on land that was formerly cultivated.

DISCUSSION AND RECOMMENDATIONS

Two or three decades ago, Samoa had the highest percentage of intact native vegetation of any Polynesian archipelago. This may still be true, but since then nearly all of the forests of the lowlands (up to about *ca.* 400 m elevation) have been felled for their timber or cut and burned for agriculture to keep up with the population growth of the islands.

The park is important because of the native vegetation it contains. Some of the best lowland forest remaining in the archipelago is found on Tutuila. It occurs in two main areas, one within the park boundaries between Fagasa and Afono, the other on the northwest Tutuila coast between the villages of Fagamalo and Fagasa. These two areas are similar in being mostly uninhabited (both

have one village in the middle) and consist of rugged coastlines and ridges covered with native forest. Thus the park represents a significant portion of the remaining lowland forest in American Samoa. It also represents a significant portion of the quality lowland forest of the whole archipelago as well, since much of the remaining lowland forest of Western Samoa was devastated by the recent hurricanes, while most of that within the Tutuila park is in relatively good condition. In addition to the lowland forest within the park, there is one area of another unique plant community, montane scrub, a vegetation type that is restricted in the archipelago to Tutuila.

The park is also important for floristic reasons. The native flora of the whole archipelago consists of about 540 species of flowering plants and 230 species of ferns and fern allies. Tutuila is home to 57% of the native flowering plants of the archipelago and 50% of the native fern and fern allies. The park itself contains 39% (209 species) and 35% (81 species), respectively. There are 49 species of native orchids on the island, a number similar to that found in the rest of Polynesia (outside of Samoa) combined, and 30 of these have been recorded in the park. Consequently, this relatively small park on a small island comprising less than 5% of the total land area of the archipelago, is home to a significant percent of the total native flora of Samoa.

The need to protect this area, and other sensitive areas is heightened because of the recent rapid population growth. While the population of Western Samoa is rising only slowly because of out-migration, and the population in Manu'a is decreasing, the population of Tutuila is rapidly increasing. Over the last 10 years, the population has increased 44% (Craig 1992) to about 46,600 (as of 1990) and at this rate will top 100,000 by the year 2010. Much of this population has settled in the Tafuna area, where the unique *Pometia* lowland forest that once covered the whole area has now been almost entirely wiped out. There will be increasing pressure for land, and for the development of roads into hitherto inaccessible areas. Thus the need to protect the few remaining areas of native vegetation cannot be over-emphasized.

By merely designating an area as a National Park is not enough to protect the plants and animals in the area. The concept of a park is unheard of in the traditional "fa'asamoa," and the conflict that arises is complicated by the Samoan land tenure system and ancient concepts of land use. Unlike the situation with bats and some bird species, there are no individual plant species that are threatened by human activity at this time. But the plants are threatened by the loss of their pollinators and dispersers–typically the birds and bats. Their habitat is threatened. Thus the following recommendations are made.

1. Strict enforcement of hunting laws.

There are laws on the books for American Samoa that prohibit shooting birds and bats, but such laws do not conform to Samoan tradition and for the most part are ignored. This lack of local support leads to weak enforcement. Even though there is a law against hunting birds and bats, there is no prohibition against importing shotgun shells, which are hardly used for anything but birds and bats. As far as enforcement in the park is concerned, stiffer penalties, including federal prison terms (if possible) may be effective, since nothing else has been found to work. Honest and diligent enforcement officers are needed–that have the integrity and courage to enforce laws and apprehend violators, even if the offenders are members of their own extended families. Perhaps some kind of village enforcement could be feasible, if the villagers can be made to understand how the loss of wildlife will eventually effect them.

2. Control of feral pigs within the park.

There is currently a problem of feral pigs in parts of the park. Well-traveled pig trails were seen on some of the ridges. In the past the feral population was kept in check by local hunters, but with increasing urbanization and rising material culture, pig hunting has decreased to practically nothing. Perhaps a bounty on feral pigs, or hired hunters who are allowed to keep the slain pigs, would be effective. The feasibility of traps and exclosures should also be studied.

3. Limiting vehicular access to the park.

Most of the disturbance within the park is along the Alava Ridge road. As the pressure on land increases in the future, individuals may claim and clear even more land along the road, destroying the native vegetation. While traditional farming is allowed by the park agreement, there is no need to make it easier by improving access. The road should be blocked so that few if any vehicles can use the road (this would have to be worked out with families currently farming the area or living

there). No increased access should be promoted at this time, until it is certain that it will not lead to additional development of the interior of the park. Access roads to new projects in Samoa have always opened up the roadside areas to destruction.

4. Establishing a list of endangered plant and animal species.

There is currently no Federal list of endangered species in American Samoa. Federal regulations apply to Guam, but so far have not been used in American Samoa. This has probably been due to lack of local interest in such a listing. The Federal government and the American Samoa government should be prodded into becoming involved; the least they could do is make a list of candidate species of animals and plants that are rare or endangered; this could be culled from Appendix A of this report.

5. Other critical areas that may need protection.

It may be feasible to extend the boundaries of the park to include other critical habitats or areas of native vegetation. Two areas adjacent to the park, Mt. Matafao and Mt. Pioa, have a unique native montane scrub vegetation that is home to a number of rare Samoan species. On the other hand, because these two areas are on poor soil, have steep slopes, and are relatively inaccessible, they may not need further protection. A much larger project, left to a later time (to see if the current park works out), is to study the feasibility of expanding the park to include the area from Fagasa to Fagamalo on the northwest Tutuila coast, which is largely native lowland forest.

6. Control of harmful weeds.

There are 96 alien plant species recorded from the park, most of which are modern introductions (introduced during the European Era beginning about 1830) rather than Polynesian introductions. A few of these are trees that are naturalized in the forest, but the vast majority are weeds adapted to living in disturbed places. Two of the weeds are particularly common in the park. *Mikania micrantha* (mile-a-minute vine, **fue saina**) has been present in Samoa for nearly a century, but many foresters believe that it retards forest regeneration because of its smothering growth. It is one of the few introduced weeds that occurs in undisturbed native forest. It is not much of a problem within this kind of forest, since it does not thrive in the shade, but in cut-over areas it is. Farmers don't mind it, in taro anyway, since it is easy to pull up and clear. The other plant is *Clidemia hirta* (Koster's curse). Although it is found in lowland forests, it is not very common there. However, in montane forest, where it is wetter, it is a dominant species in sunny places. It is a very serious problem on the top of a Ta'u, despite the fact that it has apparently been on that island for less than 20 years (Whistler 1992b). These two weeds may be good candidates for biological control.

There are a number of other potentially harmful species present in Western Samoa, such as *Funtumia elastica* (**pulu vao**) and *Solanum torvum*, that are not yet found in American Samoa. These should not be allowed into the country under any circumstances. Another potentially harmful species, *Castilla elastica* (**pulu mamoe**) is an invasive species in Western Samoa, and was recently recorded from Tutuila (near Fagamalo) and Ta'u (personal observation, 1993). It should be eliminated before it becomes further established.

7. Control of other pests.

In reaction to the establishment of the African snail on Tutuila, the predatory snail *Euglandina* was introduced as a biological control. Although it may help with the African snails, it unfortunately is leading to the demise of some of the native land snails on the island. A similar sequence of events has recently taken place on Ta'u as well (Whistler 1992b). Some native species are currently known from only a few isolated localities within the park. A comprehensive study of the snails within the park, as well as on the whole island, is needed, to see what can be done to save the threatened species.

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APPENDIX A

ANNOTATED CHECKLIST OF THE FLORA OF TUTUILA

The following checklist of the flora of Tutuila is based on field work carried out on the island from 27 May to 12 June 1992 and 17 December 1992 to 5 January 1993, as well as on collections of all botanists since 1839. Not all of the species listed have been recorded within the park; some, especially those restricted to habitats not existing in the park, are highly unlikely to occur there. Species not yet recorded from the park are marked with an asterisk; specimens collected within the park are followed by an exclamation point.

The species on the checklist are divided into four groups, Pteridophyta (ferns), Fern Allies, Dicotyledonae, and Monocotyledonae. Each of these taxonomic categories is further divided into plant families arranged in alphabetical order; the species within the families are also arranged alphabetically. Each entry includes the scientific name, common names (if any; English names, when present, are in brackets), a brief description, habitat, reported elevation, geographic range, and a list of all specimens noted from the island. Because the average number of specimens collected for each species is low, the elevations listed are those recorded for the species in the whole archipelago.

The cited specimens, all of which are from Tutuila, can be found in the collections of the Bishop Museum, the Smithsonian Institution, the National Tropical Botanical Garden, and the University of Hawai'i (the author's personal collection). A voucher set was also prepared for the National Park Service. Specimens noted in previous publications but not verified by the author are noted as "n.s." (not seen). Specimens lacking a collection number are noted as "s.n." (without number).

The taxonomy employed in the list follows *The Pteridophyte flora of Fiji* (Brownlie 1977) for the ferns and fern allies, and *Flora vitiensis nova* (Smith 1979–1991) for the flowering plants, with only a few exceptions. The Samoan names were taken from Whistler (1984).

PTERIDOPHYTA

ADIANTIACEAE

Acrostichum aureum L.
[swamp fern] sa'ato

Large, erect, leathery fern up to 2 m or more in height with pinnate, leathery fronds and sori densely covering the lower surface of the upper, fertile pinnae. Common on coastal rocks and in coastal marshes, recorded only near the coast. Indigenous, pantropical in distribution. McMullin 43; Setchell 93, 238; Eames T23; Garber 967; Bryan 967, 980!; Yuncker 9366, 9423; Lamoureux 3028; Whistler 2823, 2853, 3292, 8906!.

Adiantum philippense L.
[maidenhair fern]

Delicate terrestrial fern with shiny black to dark brown stipes, pinnate fronds with a lamina 15-20 cm long, and sori extending all along the outer margins of the fertile lobes. Uncommon in shady places, reported from 50 to 200 m elevation. Indigenous, widely distributed in the Old World tropics. Whistler 8412, 9355!.

Bolbitis palustris (Bracken.) Hennipman

Medium-sized terrestrial fern with a short, creeping rhizome, dimorphic pinnate fronds, margins cut about 1/3 of the way to the midrib into rounded lobes, and sori covering the entire lower surface of the pinnae of fertile fronds. Occasional to locally common in shady forest, reported from 30 to 600 m elevation. Indigenous, reported from Australia to Rapa. Reinecke 5c; Whistler 3534, 3616, 9078, 9121.

Pityrogramma brackenridgei (Carruthers) Maxon

Small terrestrial fern with a short rhizome covered with linear brown scales, fronds tufted, lamina pinnatifid, and sori covering the silvery undersurface of the lobes. Occasional in sunny places such as roadcuts, reported from near sea level to 1550 m elevation. Endemic. A Kew specimen was determined by Tyron in 1965 as *P. chrysophylla* (Sw.) Link; if this is to be followed, the Samoan plant would be indigenous rather than endemic. USEE s.n.; Setchell 118, 237; McMullin 42; Lamoureux 3029; Whistler 3753, 8064, 8408, 8615!, 8988!.

Pteris comans Forst. f.

Medium-sized terrestrial fern with a short, erect rhizome, deltoid-ovate, deeply bipinnatifid fronds, reticulate venation, lanceolate lobes, and sori arranged along the entire margin. Occasional to common in littoral to lowland forest, reported from near sea level to 200 m elevation. Indigenous, ranging from Australia to Polynesia. Setchell 124; Stearns s.n.; Garber 973; McMullin 26; Long 3098; Lamoureux 3099; Whistler 2909, 8422, 9033!.

Pteris ensiformis Burm. f.

Small terrestrial fern with a creeping rhizome, clumped pinnate fronds, 3 or 4 pairs of long, narrowly lanceolate, finely toothed lobes (fertile ones often 3-branched), and sori continuous along the margins. Occasional in coastal and lowland forest, reported from near sea level to 200 m elevation. Indigenous, ranging from India to Polynesia. Reinecke 15a; Setchell 108; Garber 877; Yuncker 9339; Whistler 8452, 8540!, 8693!.

Pteris pacifica Hier.

Medium-sized terrestrial fern with an erect rhizome, clumped, deeply pinnatifid, glossy fronds with up to 8 pairs of lateral pinnae cut to near their midrib into narrowly lanceolate, rounded lobes, and sori nearly continuous along the pinnae margins. Occasional in coastal to lowland forest, reported from 20 to 200 m elevation. Indigenous, ranging from the Solomon Islands to Polynesia. Reinecke 14a; McMullin 9; Garber 872; Wilder s.n.; Dumas 8; Kuruc 143; Whistler 8446, 8574!, 9031!, 9128.

Pteris tripartita Sw.

Large terrestrial fern up to 2 m or more in height, with a short, erect rhizome, tripartite fronds, open venation, narrowly lanceolate pinnae mostly 2-3 cm wide and cut to near the midrib, and long sori extending to near the sinus on the lower edge of the lobes. Occasional in disturbed places and forest, reported from near sea level to 800 m. elevation. Indigenous, ranging from Africa to Tahiti. Veitch s.n.; McMullin 31; Whistler 3777, 8435, 8595!, 9031!, 9117.

***Pteris vaupelii** Hier.

Large terrestrial fern with an erect rhizome, deeply pinnatifid, glossy fronds with lateral pinnae cut to near the midrib into narrowly lanceolate, rounded

lobes, and sori nearly continuous along the pinnae margins. Uncommon in lowland to cloud forest, reported from near sea level to 1700 m elevation. Endemic. Whistler 9092.

ASPIDIACEAE

Arachniodes aristata (Forst. f.) Tindale

Medium-sized terrestrial fern with a scaly, creeping rhizome, deltoid, tripinnate and quadripinnate fronds, aristate segment tips, and indusiate sori in a single row on each side of the midvein of the ultimate segments. Uncommon in lowland to montane forest, reported from 50 to *ca.* 600 m elevation. Indigenous, ranging from southern Africa to Tahiti. Whistler 8554!, 8645!.

Ctenitis samoensis (Christen.) Holttum

Medium-sized terrestrial fern with a creeping rhizome, deltoid, quadripinnate fronds, tomentose ribs, medial sori on veins, and small, reniform, caducous indusia. Uncommon in lowland to montane forest, reported from 240 to *ca.* 600 m elevation. Indigenous, also found on Rarotonga. Reinecke 92? (n.s.); Sledge 1829; Whistler 8591!, 8555!.

Pleocnemia leuzeana (Gaud.) Presl

Large terrestrial fern with an erect rhizome, fronds up to 4 m in height, lamina bipinnate to tripinnatifid, yellow glandular hairs present on the undersurface of the minor veins, and large exindusiate sori. Occasional in lowland to montane forest, reported from near sea level to 1000 m elevation. Indigenous to Samoa, ranging eastward to Indonesia. Graeffe s.n. (n.s.); Yuncker 9432!?; Whistler 8063, 8498, 8741!, 9071.

Tectaria setchellii Maxon

Large terrestrial fern with a decumbent rhizome, unwinged stipes, deltoid pinnate-bipinnate lamina 25-40 cm long, 2-5 pairs of lobed pinnae, and small, irregularly scattered sori lacking indusia. Occasional in coastal and lowland forest, reported from near sea level to 250 m elevation. Endemic. Veitch s.n.; Setchell 119, 360; Wilder s.n.; Yuncker 9364, 9411; Long 3091, 3107; Whistler 8423, 8425, 8550!.

Tectaria stearnsii Maxon

Medium-sized terrestrial fern with an erect rhizome, tufted fronds, obovate, mostly bipinnatifid lamina 30-50 cm long, small sori at the ends of short veinlets, and usually with no indusia. Common in coastal and lowland forest, reported from near sea level to 450 m elevation. Endemic. Veitch s.n.; Reinecke s.n.; Setchell 40, 208, 227; Garber 927; Meebold 8261, 16863; Wilder s.n.; Yuncker 9322, 9433, 9440; Wisner 16, 62, 63, 64; Whistler 3844, 8424, 8465, 8700!, 9124. The difference between this and *T. dissecta* Forst. f. found on adjacent islands needs to be explored.

ASPLENIACEAE

Asplenium australasicum Hooker

Large epiphyte or terrestrial fern similar to *A. nidus*, but with the midrib on lower surface angled rather than rounded. Occasional in lowland to montane forest, reported from 250 to 390 m elevation. Indigenous, widespread in the South Pacific. Whistler 9337!, 9344!.

Asplenium cuneatum Lam.

Terrestrial fern with a short-creeping rhizome, bipinnate lamina up to 25 cm long, pinnae up to 12 on each side and merging into a lobed apex, 1-4 elongate sori on each pinnule, and entire indusia. Occasional in coastal to cloud forest, reported from 50 to 1550 m elevation. Indigenous, widespread in the tropics. Reinecke 3f; Setchell 395; Meebold 16619; Dumas 17; Garber 844, 854; Long 1956, 1975, 1997b; Kuruc 147; Whistler 8556!, 9074, 9130.

***Asplenium feejeense** Bracken.

Terrestrial fern with simple, narrowly lanceolate fronds up to 50 x 7 cm, tip attenuate and ending in a terrestrial, proliferous bud, and sori in parallel rows between the margin and midrib. Occasional in coastal to montane forest, reported from 50 to 900 m elevation. Endemic. Yuncker 9408; Kuruc 144.

Asplenium horridum Kaulf.

Terrestrial fern with pinnatifid fronds up to 2 m long, hairy stipes, numerous, narrowly lanceolate pinnae 10-15 cm long and lobed to near the midrib, and linear sori arranged several to a lobe.

Uncommon in montane to cloud forest, reported from 400 to 1500 m elevation. Indigenous, ranging from Malaysia to Hawai'i. Reinecke 76b; Whistler 9049!, 9085.

Asplenium laserpitiifolium Lam.

Large terrestrial fern with a stout, long-creeping rhizome, tufted, dark brown or black stipes, a deltoid, tripinnate to quadripinnatifid lamina up to 60 x 20 cm, rhomboid-trapezoid ultimate segments, and 1 or 2 linear sori on the ultimate lobes. Occasional in lowland to montane forest, reported from near sea level to 750 m elevation. Indigenous, ranging from the Mascarenes to Polynesia. Setchell 213; Garber 926; Yuncker 9319; Whistler 3843, 8062, 8577!, 9118.

Asplenium nidus L.
[bird's-nest fern] laugapapa

Large epiphytic or terrestrial fern with simple, sessile, glossy fronds up to 2 m long arranged in a rosette, basal portion of the midrib rounded on the lower surface, and numerous, closely parallel rows of sori on the lower surface of the frond from the midrib to halfway to the margin. Common in littoral to cloud forest, reported from near sea level to 1100 m elevation. Indigenous, found throughout the Old World tropics. Reinecke 103b; Setchell 13; Whistler 2838, 8704!, 9126.

Asplenium polyodon Forst. f.

Small terrestrial fern with a short-creeping rhizome, tufted fronds, deltoid, pinnate lamina 10-45 cm long, up to 15 pairs of falcate to lanceolate, acuminate pinnae, and linear sori almost covering the full length of the vein. Common in lowland to montane forest, reported from near sea level to 700 (1300) m elevation. Indigenous, ranging from Madagascar to Polynesia. Reinecke 37a?, 58; Setchell 47; Garber 855, 864, 865; Eames T18 (n.s.); Yuncker 9321, 9377; Wisner 65; Whistler 8528!, 9120.

Asplenium tenerum Forst. f.

Small to medium-sized epiphytic or terrestrial fern with a short, erect rhizome, tufted fronds, pinnate lamina cut into 15-30 pairs of toothed, round-tipped oblong pinnate, and linear sori along the veins from near the midrib to near the margins. Uncommon in lowland to montane forest, reported from 30 to 700 m elevation. Indigenous, ranging from Ceylon to Polynesia. Yuncker 9327; Whistler 3533, 9129, 9352!.

***Asplenium unilaterale** Lam.

Small terrestrial fern with a creeping rhizome, shiny black stipes, linear-lanceolate, pinnate fronds up to 20 x 4 cm having a pinnatifid tip, 20 or more pairs of pinnae, and numerous linear sori. Uncommon in coastal to montane forest, reported from 180 to 700 m elevation. Indigenous, ranging from East Asia to Polynesia. Reinecke 35b, 35f; Whistler 9073.

ATHYRIACEAE

Diplazium bulbiferum Bracken.

Medium-sized terrestrial fern with a short, erect rhizome, pinnatifid lamina, broadly lanceolate pinnae up to 15 cm long divided to near the midrib into oblong, toothed lobes, and linear sori on most of the veins of the lower surface of the lamina. Uncommon in lowland forest, reported from 50 to *ca.* 400 m elevation. Indigenous, ranging from Vanuatu to Samoa. Wilder s.n.; Whistler 8492, 8575!.

Diplazium dilatatum Bl.

Medium-sized terrestrial fern with an erect rhizome, broadly deltoid, pinnate or bipinnate lamina up to 50 x 20 cm, largest pinnules distinctly lobed, forked veins bearing linear sori, and indusia almost ciliate in appearance. Uncommon in lowland to cloud forest, reported from 300 to 1400 m elevation. Indigenous, ranging from India to Polynesia. Whistler 3601, 8526!, 8652!, 9157.

Diplazium harpeodes Moore

Large terrestrial fern with an erect rhizome, bipinnatifid to tripinnatifid lamina up to 1 m in length, lanceolate pinnules cut about halfway to the midrib into blunt, often toothed lobes, and linear sori on most of the veins of the lower surface. Uncommon in lowland to cloud forest, reported from near sea level to 1300 m elevation. This species is quite variable and may need further taxonomic work. Indigenous, ranging from Fiji to Pitcairn Island. USEE s.n.; Veitch s.n.; Setchell 204; Long 1982; Whistler 3625, 3846?, 3847, 8635!, 9075, 9076, 9131.

Diplazium proliferum (Lam.) Thouars

Large terrestrial fern with a short, stout, erect rhizome, spiny stipe and rachis, bulbils often present, pinnate lamina up to 1 m in length, lanceolate pinnae with shallowly lobed margins, and sori along all the veins of the lower surface. Uncommon in lowland to montane forest, reported from near sea level to 600 m elevation. Indigenous, ranging from tropical Africa to Samoa. Graeffe 444; McMullin 15, 16; Setchell 15; Garber 836; Bryan 1377; Kuruc 148; Whistler 8447, 8527!, 8596!, 9139.

***Lunathyrium japonicum** (Thunb.) Kurata

Medium-sized fern with scaly stipes and rhizomes, deeply bipinnatifid fronds, short sori along the veins midway between the costule and margins, and thin, entire indusia. Uncommon in lowland to cloud forest, reported from 180 to 1600 m elevation. Indigenous, ranging from Japan to Polynesia. Veitch s.n.; Whistler 9077.

BLECHNACEAE

***Blechnum doodioides** (Bracken.) Brownlie

Medium-sized terrestrial fern with erect an rhizome, tufted stipes, dimorphic pinnatifid fronds, basal segments of sterile fronds reduced to rounded lobes, pinnae of fertile fronds narrowly lanceolate, and sori linear and parallel to the costa. Locally common in sunny areas in montane to cloud forest, reported from 750 (but lower if actually occurring on Tutuila) to 1650 m elevation. Indigenous, ranging from Southeast Asia to Samoa. Reinecke 145a. This record should be checked.

Blechnum orientale L.

Large terrestrial fern with a stout, erect rhizome, simply pinnate fronds up to 2 m in height, and sori in a continuous line on either side of the midrib. Common in lowland to montane forest, reported from *ca.* 50 to 700 m elevation. Indigenous, ranging from tropical Asia to the Austral Islands. Setchell 28; Eames T16; Christophersen 1031, 3516; Kuruc 149; Whistler 8611!, 8907!.

Blechnum vulcanicum (Bl.) Kuhn

Large terrestrial fern with an erect rhizome, dimorphic pinnate fronds, sterile fronds cut nearly to the midrib into narrowly lanceolate, finely parallel-veined lobes, and sori covering the entire lower surface of the linear lobes of the fertile fronds. Occasional in montane scrub to cloud forest, reported from 400 to 1600 m elevation. Indigenous, ranging from Malaysia and New Zealand to the Marquesas. Christophersen 1129!, 3561.

CYATHEACEAE

***Culcita straminea** (Labill.) Maxon

Large terrestrial fern with a large prostrate to suberect stem, tufted fronds up to 4 m long, deltoid, 3- to 4-pinnate lamina, quaternary segments cut into acute lobes bearing 1 or sometimes 2 sori, and an indusium of 2 valves. Locally common in montane forest and scrub, reported from 300 to 650 m elevation. Indigenous, ranging from Vanuatu to central Polynesia. Setchell 389; Christophersen 1027, 3541; Sledge 1825; Whistler 9060.

Cyathea decurrens (Hooker) Copel.

Small tree fern with large fronds, smooth stipes, upper surface of costa and costules densely hairy, bipinnate lamina, ultimate segments deeply lobed, and globose sori lacking indusia. Uncommon in the montane forest, reported from 450 to 910 m elevation. Indigenous, ranging from Australia and New Caledonia to the Cook Islands. Whistler 9046!.

Cyathea lunulata (Forst. f.) Copel.
[tree fern] olioli

Tree fern with large fronds having warty, somewhat glacous stipes, bipinnate lamina with pinnules lobed to the costules, linear-lanceolate lobes 2-3 mm wide, and inconspicuous indusia. Common in disturbed forest, reported from 20 to 900 m elevation. Indigenous, ranging from the Marianas to Samoa. Setchell 2, 73, 225; McMullin 32; Yuncker 9417, 9424; Whistler 8982a!.

***Cyathea truncata** (Bracken.) Copeland
[tree fern] olioli

Tree fern with densely tomentose and warty stipes, tripinnate lamina, tertiary pinnules small and petiolulate, small sori, and rudimentary indusia of thin scales hidden beneath the sori. Occasional to common in montane scrub, reported from 500 to 1300 m elevation. Indigenous, ranging from the Solomon Islands to Samoa. Powell 119; Reinecke

171; Setchell 393; Christophersen 1029, 3531; Whistler 2717, 3551, 8481, 9061, 9194.

Cyathea vaupelii Copeland
[tree fern] olioli

Tree fern with large fronds, smooth rachises, bipinnate lamina with pinnules lobed to the costules, oblong lobes mostly 4-5 mm wide, and conspicuous indusia. Occasional in lowland to montane forest, reported from 50 to 820 m elevation. Endemic. Reinecke 89d; Setchell 2, 225; McMullin 14; Eames T21; Christophersen 3546; Yuncker 9430; Whistler 3550, 8517!, 8674!, 8901!.

DAVALLIACEAE

Arthropteris repens (Bracken.) Christen.

Epiphytic or terrestrial fern (typically on lower tree trunks) with a long-creeping, thin rhizome, pinnate fronds up to 30 x 5 cm, and sori between the costa and the margin. Common in lowland to cloud forest, reported from near sea level to 1500 m elevation. Indigenous, ranging from Borneo to Samoa. Reinecke s.n.; Whistler 3532, 8578!, 9123.

Davallia epiphylla (Forst. f.) Spreng.

Terrestrial or epiphytic fern with a widely creeping rhizome covered with hairlike scales, lamina broadly deltoid, 4-5-pinnate, fertile segments bifid at the apex, sori immersed, and an indusium with a free acuminate tip. Common in lowland to montane forest, reported from near sea level to 650 m elevation. Indigenous, ranging from Fiji to Tahiti. McMullin 12; Setchell 36; Wilder s.n.; Yuncker 9303; Long 1978, 3106; Wisner 58; Kuruc 150; Whistler 3545, 8703, 8715!, 8983!, 9154.

***Davallia plumosa** Baker

Medium-sized epiphytic fern with a densely scaly, creeping rhizome, non-ciliate rhizome scales, usually tripinnate fronds, immersed sori, and cylindrical indusia with the rounded outer edge reaching the edge of the segment or a little longer. Uncommon in the montane to cloud forest, reported from 900 to 1650 m elevation. If the record is correct, this elevation would have to be down to at least 650 m. Endemic to Samoa. Reinecke s.n. (n.s.). A questionable record.

Davallia solida (Forst. f.) Sw.

Epiphytic fern with a stout, creeping rhizome, tripinnate to tripinnatifid, deltoid fronds, sori on terminal subdivisions of lobes, and tubular indusia. Common in lowland to cloud forest, reported from near sea level to 1400 m elevation. Indigenous, ranging from Malaysia to eastern Polynesia. Reinecke s.n.; McMullin 21; Setchell 61; Garber 824; Diefenderfer 7; Whistler 2825, 8702!.

Humata heterophylla (Smith) Desv.

Epiphytic fern with a long-creeping rhizome, dimorphic fronds, simple, lanceolate, finely veined sterile fronds, lobed fertile fronds having marginal sori, and thin indusia. Occasional to locally abundant in lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from Sumatra to Polynesia. Safford 940; Setchell 280; Garber 827, 881; Lamoureux 3016; Long 1966; Whistler 2819, 3016, 8538!.

Humata polypodioides Bracken.

Epiphytic fern with a long-creeping rhizome covered with appressed, brown scales, uniform pinnate fronds with lamina and stipe of similar length, and terminal, submarginal sori covered with an indusium attached only at the base. Uncommon in lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, also found in Fiji and Vanuatu, and possibly New Guinea. Safford 16; McMullin 18; Setchell 219; Garber 826; Yuncker 9347; Long 1976b; Whistler 2820, 8681!, 8701!.

***Humata serrata** Bracken.

Epiphytic fern with a long-creeping rhizome covered with narrow scales, dimorphic, 2-3-pinnate deltoid fronds, terminal, submarginal sori covered with an indusium and attached only at the base, and an acute "horn" extending beyond the sori. Uncommon in montane to cloud forest and montane scrub, reported from 400 to 1500 m elevation. Indigenous, also found in New Caledonia, or perhaps endemic to Samoa. USEE s.n. (n.s.); Powell 136; Whistler 9087.

Nephrolepis biserrata (Sw.) Schott

Medium-sized epiphytic or terrestrial fern with a short rhizome, erect, pinnate fronds up to 2 m in length, scales on young stipes, pinnae with crenate margins lacking an auricle, sori between the margins

and the costules, and reniform indusia. Common in lowland to montane forest, reported from near sea level to 1000 m elevation. Indigenous, pantropical in distribution. Reinecke 172; Setchell 18, 209; Christophersen 1032; Yuncker 9330; Long 1992, 3047; Whistler 3544, 8979!.

Nephrolepis hirsutula (Forst. f.) Presl

Medium-sized terrestrial fern with a short, thick rhizome, erect pinnate fronds up to 1.2 m long, rachis and surfaces usually with pale scales, pinnae with an auricle and crenate margins, sori near the pinnae margins, and reniform indusia. Common in disturbed places, reported from near sea level to 1550 m elevation. Indigenous, ranging from tropical Asia to Polynesia. Reinecke 1b; Setchell 317; Garber 873; Christophersen 3499; Yuncker 9367; Whistler 9099!, 9140.

Oleandra neriiformis Cav.

Epiphytic fern with a long brittle rhizome, simple linear-lanceolate fronds with close, conspicuous veins, sori in a single row close to the midrib, and reniform indusia. Occasional to common in montane forest to cloud forest, reported from 500 to 1500 m elevation. Indigenous, ranging from tropical Asia to Samoa. Veitch s.n.; Reinecke 108b; Setchell 398; Whistler 3549, 8739!, 9086.

DENNSTAEDTIACEAE

Orthiopteris tenuis (Bracken.) Brownlie

Medium-sized terrestrial fern with an erect rhizome, tufted deltoid, compound fronds, grooved rachis and costa, and terminal marginal sori enclosed within a cup-like indusium drawn downwards into a point with the margins fused to the segment. Uncommon in montane forest, reported from 400 to 900 m elevation. Indigenous, ranging from Samoa to New Guinea. This genus is in need of revision. Brownlie (1977) noted that this name may apply only to an endemic Fijian species. Whistler 9050!

GLEICHENIACEAE

Dicranopteris linearis (Burm. f.) Underwood
[false-staghorn fern] saua

Large terrestrial fern with a creeping, reddish-hairy rhizomes, fronds forked 1-3 times, lamina bipinnatifid, segments narrowly oblong, and sori with up to 15 sporangia. Occasional to common in disturbed places, fernlands, and montane scrub, reported from near sea level to 1550 m elevation. Indigenous, widely distributed in the Old World tropics and subtropics. Setchell 110, 367? (n.s.); Garber 868; Wilder s.n.; Christophersen 1026, 3493; Mitchell 516; Yuncker 9344; Wisner 145; Lamoureux 3026; Whistler 2929, 8610!, 8686!.

GRAMMITIDACEAE

Ctenopteris blechnoides (Grev.) Wagner & Grether

Small epiphytic fern with a short-creeping rhizome, a black rachis, lanceolate, pinnate lamina less than 1.8 cm wide, triangular sterile lower lobes, linear-oblong upper fertile lobes, and oblong to round sori sometimes nearly covering the segment. Occasional in mangrove to montane forest, reported from near sea level to 900 m elevation. Indigenous, ranging from Ceylon to Tahiti. Reinecke 176; Setchell 391 p.p.; Garber 787; Christophersen 1054, 1217, 3553; Sledge 1827; Whistler 2788, 8944, 8997!, 9045!, 9340!.

Ctenopteris contigua (Forst. f.) Holttum

Small epiphytic fern with a short rhizome, clustered, winged stipes, lanceolate, subpinnate lamina lobed to near the midrib, and sori embedded at the tip of the upper lobes. Occasional in lowland to cloud forest, reported from 300 to 1500 m elevation. Indigenous, ranging from Ceylon to Tahiti. Reinecke 124a; Christophersen 1127!, 1216, 1825!; Whistler 8547!, 8943!.

***Ctenopteris lepidum** (Brause) .....

Small epiphytic fern with rhizome short-creeping, stipes 2-6 cm long, lamina lanceolate, subpinnate, lower segments triangular and sterile, upper ones linear and fertile, and exindusiate oblong or round sori almost covering undersurface of segment. Occasional in montane forest, reported from 450 to 725 m elevation. This species has apparently not yet been transferred to the genus *Ctenopteris*. Endemic. Reinecke 166b; Setchell 391 p.p.; Christophersen 1055, 1072; Whistler 9084.

***Grammitis hookeri** (Bracken.) Copeland

Small epiphytic fern with a short-creeping rhizome, reddish hairy stipes 2-4 cm long, simple, lanceolate lamina, and round sori in a single row on either side

of the costa. Uncommon in montane to cloud forest, reported from 600 to 1500 m elevation. Indigenous, also found in Hawai'i and Fiji. Sine coll. s.n. (at Kew); Christophersen 3543.

HYMENOPHYLLACEAE

Hymenophyllum imbricatum Bl.

Medium-sized filmy fern with a widely creeping rhizome, winged rachis, spaced fronds up to 25 cm long, 2- to 3-pinnatifid lamina, lobes narrowed below the tip, and a globose sorus enclosed within the suborbicular lips of the indusium. Locally common in montane to cloud forest, reported from 500 to 1600 m elevation. Indigenous, ranging from Sumatra to Tahiti. Setchell 392; Long 3059; Whistler 8636!, 8735!, 9043!.

Hymenophyllum polyanthos Sw.

Small filmy fern with a widely creeping, wiry rhizome, winged rachis, spaced fronds 5-25 cm long, 2- 3-pinnatifid lamina, lobes wider than the sorus, and the obovate sorus enclosed within the rounded lips of the indusium. Occasional in lowland to montane forest, reported from near sea level to 1000 m elevation. Indigenous, widely distributed in the wet tropics. Reinecke 175; Christophersen 1056, 1131!, 1195, 1196, 1214, 3529; Whistler 8543!, 8713!, 8998!, 9042!, 9089!.

***Hymenophyllum praetervisum** Christ

Small epiphytic filmy fern with a long-creeping rhizome, unwinged stipes, thin fronds, lamina 1-2 cm wide with toothed margins, and a sorus enclosed within a turbinate indusium having dentate margins. Uncommon in montane to cloud forest, reported from 500 to 1300 m elevation. Endemic. Reinecke 88b.

***Trichomanes apiifolium** Presl

Medium-sized terrestrial fern with an erect rhizome, stipes covered with long reddish hairs, 3-4-pinnatifid fronds up to 50 cm high, and a sorus enclosed within a tubular indusium. Uncommon in montane forest, reported from 425 to 900 m elevation. Indigenous, ranging from the Philippines and Malaysia to Samoa. Veitch s.n.; Reinecke 115, 174.

***Trichomanes bimarginatum** van den Bosch

Tiny epiphytic fern with a creeping rhizome covered with dark, simple hairs, short, dark hairy stipes, a simple, oblong to obovate lamina less than 2 cm long, 1-3 sori on the lamina apex, and an immersed tubular indusium. Uncommon in montane to cloud forest, reported from 400 to 1100 m elevation. Indigenous, ranging from Ceylon to Samoa. Reinecke s.n.

Trichomanes bipunctatum Poiret

Small epiphytic fern with a slender, long-creeping rhizome, deltoid-ovate, tripinnatifid fronds 4-8 cm long with a submarginal, false vein in the segments, and a sorus enclosed within a tubular indusium. Uncommon in lowland to cloud forest, reported from near sea level to 1200 m elevation. Indigenous, ranging from Madagascar to Tahiti. Reinecke 135; Christophersen 1145!; Whistler 8699!, 8991!, 9334!.

Trichomanes boryanum Kuntze

Small to medium-sized terrestrial fern with an erect rhizome, tufted, pinnate fronds with narrowly oblong pinnae, and a sorus enclosed within a tubular indusium located on the upper margins of the upper pinnae. Occasional to common in lowland to montane forest and in streambeds, reported from near sea level to 800 m elevation. Indigenous, ranging from the Vanuatu to Samoa. Garber 884 (n.s.); Christophersen 1121!, 1144!; Meebold 16865; Yuncker 9315; Long 3112; Whistler 8644!, 8731!.

***Trichomanes caudatum** Bracken.

Small epiphytic filmy fern with a creeping rhizome, a rachis winged in the upper part only, lanceolate tripinnatifid fronds 5-30 cm long, sori conspicuous on short axillary segments or terminal, and a cylindrical indusium. Rare in montane to cloud forest, reported from 600 to 1200 m elevation. Indigenous, ranging from Australia to Tahiti. Veitch s.n.

Trichomanes dentatum van den Bosch

Small terrestrial fern with an erect rhizome, clustered fronds with a tripinnatifid, broadly deltoid lamina up to 20 cm long, few hairs on the rachis,

and a sorus enclosed within a tubular indusium. Uncommon in lowland to montane forest reported from 150 to 900 m elevation. Indigenous, ranging from New Caledonia to Polynesia. Yuncker 9323; Whistler 8710!, 8743!, 9006!.

***Trichomanes endlicherianum** Presl

Small epiphytic fern with a slender creeping rhizome, winged rachis, irregularly bipinnatifid fronds 1.5-6 cm long, 2-6 pairs of narrowly oblong to lanceolate pinnae, margins with 2 rows of specialized cells, and a sorus enclosed within a tubular indusium. Apparently rare in montane forest, reported from 500 to 1600 m elevation. Indigenous, ranging from Norfolk Island and New Zealand to Tahiti. Reinecke 135.

Trichomanes humile Forst. f.

Small epiphytic fern with a slender, long-creeping rhizome, winged rachis, bipinnatifid fronds 2-5 cm long, lobed margins with 2 rows of elongate cells, and a sorus enclosed within a tubular indusium. Common in littoral to cloud forest, reported from near sea level to 1300 m elevation. Indigenous, ranging from Malaysia to Tahiti. Reinecke s.n.; Garber 940; Christophersen 1146!; Yuncker 9333; Long 3119; Whistler 8529!, 8944!, 9095!, 9336!, 9350!.

Trichomanes intermedium van den Bosch

Medium-sized fern with an erect rhizome, stipe having caducous wings, fronds tufted, lamina tripinnate to quadripinnatifid, 8-30 cm long and bearing some appressed hairs, ultimate segments narrow, and the sorus enclosed within a tubular indusium. Occasional in lowland to montane forest, reported from near sea level to 670 m elevation. Indigenous, ranging from New Guinea to Samoa. Setchell 218; Garber 843, 885; Wilder s.n.; Christophersen 1815!; Mitchell 518; Yuncker 9406; Whistler 8638!.

***Trichomanes maximum** Bl.

Medium-sized fern with a short-creeping rhizome, stipes having caducous wings, lamina quadripinnate, ultimate segments less than 0.5 mm wide, and the sorus enclosed within a tubular indusium. Uncommon in lowland to cloud forest, reported from 300 to 1200 m elevation. Indigenous, ranging from Malaysia to Tahiti. Setchell 218; Garber 733?.

Trichomanes saxifragoides Presl

Small fern with a wiry, creeping rhizome, flabelliform, reniform fronds mostly less than 1.5 cm long and wide, and a sorus enclosed within a tubular indusium. Locally common in lowland to montane forest, reported from near sea level to 1000 m elevation. Indigenous, ranging from Africa and Japan to Hawai'i. Reinecke 88b; Whistler 8648!.

***Trichomanes taeniatum** Copeland

Small epiphytic fern with a creeping rhizome, fronds digitate or dichotomous, margins ciliate but without a specialized margin or false vein, and sori enclosed within a tubular indusium. Rare in montane scrub on and probably montane forest elsewhere in Samoa, reported from 450 m elevation. Indigenous, also found in the Society Islands. Sledge 1824.

Trichomanes tahitense Nadeaud

Small epiphytic, prostrate fern with a creeping rhizome, sessile, peltate fronds adhering to the tree surface, veins radiating from the point of attachment, and 1-3 sori enclosed within a tubular indusium. Occasional in lowland to montane forest, reported from *ca.* 20 to 500 m elevation. Indigenous, ranging from Java to eastern Polynesia. Whistler 3646, 8490, 8591!, 9335!.

HYPOLEPIDACEAE

Histiopteris incisa (Thunb.) J. Sm.

Large, often scrambling terrestrial fern with a long-creeping rhizome, shiny black stipes, tripinnatifid fronds, pinnules cut into triangular lobes with the lowest ones like stipules, and sori continuous along the margins except at the tips. Common in montane to cloud forest and montane scrub, reported from near sea level to 1700 m elevation. Indigenous, widely distributed in the Southern Hemisphere tropics and temperate zone. Setchell 394; Whistler 9037!.

***Hypolepis tenuifolia** (Forst. f.) Bernhardi

Large terrestrial fern with a densely hairy, long-creeping rhizome, fronds broadly deltoid or ovate, quadripinnate, and sori covered by a pseudoindusium formed by the reflexed margin. Uncommon in sunny places in lowland to cloud forest, reported from 50 to 1700 m elevation. Indigenous, ranging

from China to Pitcairn Island. USEE s.n.?; Setchell 191?, 390. The identity of these specimens has not been verified.

LINDSAEACEAE

Lindsaea ensifolia Sw.
ssp. **agatii** (Bracken.) Kramer

Small terrestrial fern with a creeping rhizome clothed in reddish brown scales, pinnate to bipinnate lamina having 8-15 pinnae per side, anastomosing veins, and sori covered with an indusium and nearly continuous on the pinnae margins. Occasional to locally common in littoral to montane forest and fernlands, reported from near sea level to 600 m elevation. Indigenous, ranging from Australia and the Marianas to Samoa. Sledge 1826; Whistler 2975, 3752, 3756, 8662!, 8730!, 9192.

Lindsaea harveyi Carruthers ex Seem.

Medium-sized terrestrial fern with a short-creeping rhizome, bipinnate or rarely simply pinnate fronds 10-50 cm long, 1-5 pinnae to a side with a similar terminal one, an oblong sorus one to a lobe on 2-4 nerve endings, and an indusium not quite reaching the margin. Uncommon in lowland to montane forest, reported from *ca.* 100 to 1000 m elevation. Indigenous, ranging from New Caledonia to Samoa. Setchell 272; Garber 883; Christophersen 1828!, 3514; Whistler 3655, 8942, 8995! Another species reported from Tutuila, *L. pacifica* Kramer, is virtually indistinguishable from this and its existence there as a separate entity is doubtful.

***Lindsaea pulchra** (Bracken.) Carruthers ex Seem.

Small terrestrial or epiphytic fern with a long-creeping rhizome covered with reddish brown acuminate scales up to 3 mm long, some veins anastomosing, lamina simple, 15-40 pinnules per side, sorus 1 to each lobe on 2-4 vein endings, and a delicate indusium not reaching the margin. Uncommon in lowland to cloudforest, reported from 320 to 1500 m elevation. Indigenous, ranging from the Bismarck Archipelago to Samoa. USEE s.n.; Reinecke 72a.

Lindsaea tetragona Kramer

Medium-sized terrestrial fern with a short-creeping rhizome clothed in yellowish brown triangular Scales, fronds bipinnate with 3-9 pairs of lateral pinnae and a similar terminal one, veins free, and marginal sori covered by an indusium. Uncommon in lowland to montane forest, reported from 300 to 500 m elevation. Indigenous, ranging from the Celebes to Tahiti. USEE s.n.; Tetens s.n.; Graeffe s.n.; Whistler 9340!.

Microlepia speluncae (L.) Moore

Medium-sized terrestrial fern with a creeping rhizome, tripinnate lamina, narrowly deltoid pinnules, secondary pinnules with crenate or lobed margins, and sori situated at the sinuses and covered with an indusium. Uncommon in sunny places in lowland to montane forest, reported from near sea level to 600 m elevation. Indigenous, pantropical in distribution. Setchell 90, 359; Bonaparte 4393; Whistler 8592!, 9122.

LOMARIOPSIDACEAE

Elaphoglossum feejeense Bracken.

Medium-sized epiphytic fern with a thick, short-creeping rhizome, leathery, simple, oblanceolate fronds attenuate at the base, and sori covering the entire undersurface of the fertile fronds. Uncommon in lowland to montane forest, reported from *ca.* 500 m elevation. Indigenous, also found in Fiji. Christophersen 1204, 1210, 3489, 3520; Whistler 8727!, 8941, 9052!. The difference between this and *E. reineckei* Hier. et Lauterb. of the other Samoan islands is not always apparent.

Lomagramma cordipinna Holttum

Medium-sized terrestrial or epiphytic fern with a long-creeping or climbing rhizome, pinnate immature fronds, pinnate to bipinnate mature fronds, and sori covering the lower surface of fertile pinnae. Common to locally abundant in lowland to montane forest, reported from near sea level to 800 m elevation. Indigenous, also found in Fiji. Safford (according to Holttum); Reinecke 55b; Wilder s.n.; Long 1977; Sledge 1831; Whistler 2967, 8489, 8594!, 9174.

MARATTIACEAE

Angiopteris evecta (Forst. f.) Hoffman
nase

Large terrestrial fern with fronds up to 3 m in length that radiate from a short, massive, fleshy stock,

bipinnate lamina, lanceolate pinnules 10-20 cm long having an enlarged base, and sori of 7-12 sporangia free from each other, in a dense row 1-2 mm from the margins. Common in lowland to cloud forest, reported from near sea level to 1400 m elevation. Indigenous, ranging from Malaysia to Tahiti. Safford 4941; McMullin 17; Comstock s.n.; Setchell 38, 207; Eames T27; Garber 838; Long 1950; Whistler 8975!, 9125.

Angiopteris opaca Copeland
nase

Large terrestrial fern similar to the preceding species, but with rachis and stipe densely scaly rather than bearing scattered hairs. Occasional in lowland to montane forest, reported from 50 to 600 m elevation. Indigenous, also found in Fiji. Christophersen 991; Whistler 9047!, 9198.

Marattia smithii Mett.
nase

Large terrestrial fern similar to the preceding two species, but with sporangia fused laterally to form a single structure. Uncommon in montane forest, reported from 400 to 600 m elevation. Indigenous, ranging from Vanuatu to Samoa. Wilder s.n.; Sledge 1823; Whistler 8734!, 9090, 9197.

OPHIOGLOSSACEAE

Ophioglossum pendulum L.

Epiphytic fern with a small rhizome, pendulous, strap-shaped fronds 40-120 cm long, and sori embedded in a spike attached to the center of the frond. Uncommon in coastal to montane forest, reported from near sea level to 550 m elevation. Indigenous, ranging from Madagascar to Hawai'i. Lamoureux 3001; Sledge 1822; Whistler 2818, 2926, 3001, 8746!.

***Ophioglossum reticulatum** L.

Tiny terrestrial fern with a single ovate lamina and sori embedded in a single erect spike. Uncommon in lowland to cloud forest, reported from 300 to 1700 m elevation. Indigenous, ranging from tropical Asia to Polynesia. Powell 127.

POLYPODIACEAE

***Dipteris conjugata** Reinwardt

Large terrestrial fern with a creeping rhizome, remote stipes,veins dichotomously branched, lamina divided to the base into two spreading halves, these divided into four lobes which are further divided, and numerous sori scattered on the lower surface. Locally abundant in montane scrub, reported from 500 to 650 m elevation. Indigenous, ranging from Thailand to Samoa. Reinecke 173; Setchell 380; Garber 784; Christophersen 1034, 3564; Sledge 1832; Whistler 2714, 9162.

***Lemmaphyllum accedens** (Bl.) Donk

Small epiphytic fern with a long-creeping rhizome, short stipes, dimorphic fronds, the sterile ones elliptic to ovate, the fertile ones similar but with an attenuate tip, and sori in a single row on both sides of the midrib of the upper attenuate part. Occasional in lowland to montane forest, reported from 300 to 900 m elevation. Indigenous, ranging from Malaysia to Samoa. Graeffe 459 (n.s.); Powell 93? ("Manua and Tutuila"); Whistler 9093, 9186.

Microsorium sylvaticum (Bracken.) Copeland

Large terrestrial fern with a creeping rhizome, simple, deeply lobed, simply pinnate fronds up to 2 m in height, and numerous tiny sori scattered irregularly over the lower surface of the lobes. Occasional in lowland to montane forest, reported from 25 to 850 m elevation. Indigenous, apparently ranging eastward to Tahiti. Kuruc 151; Whistler 3842, 8501, 8557!.

Phymatosorus nigrescens (Bl.) Pichi Serm.

Medium-sized terrestrial fern with a stout, creeping rhizome, frond deeply cut into 1-10 pairs of lobes (or sometimes simple and lanceolate), and deeply embedded sori forming conspicuous tubercles on the upper surface. Occasional in lowland to montane forest, reported from 200 to 1000 m elevation. Indigenous, ranging from Fiji to Tahiti. Christophersen 997; Long 1996d; Whistler 8643!, 9132.

Phymatosorus scolopendria (Burm. f.) Pichi Serm.
lau auta; lau magamaga

Large terrestrial or epiphytic fern with a long-creeping, scaly rhizome, simple, glossy-green

lamina deeply cut into 1-10 lobes, and large round sori in 1 or 2 rows on either side of the midrib of each lobe. Common to abundant in littoral to montane forest, reported from near sea level to 650 m elevation. Indigenous, ranging from tropical Africa to the Marquesas. Setchell 62; Garber 804; Wilder s.n.; Comstock 4; Yuncker 9385; Whistler 2824, 8630!.

Polypodium subauriculatum Bl.

Large epiphytic fern with a creeping rhizome clothed in dark brown scales, pinnate pendant fronds up 1 m long, lanceolate pinnae, and immersed sori in a single row on both sides of the costa. Uncommon in lowland to montane forest, reported from 300 to 850 m elevation. Indigenous, ranging from tropical Asia to Samoa. Reinecke 165; Meebold 16862; Whistler 3637!, 9048!.

Pyrrosia lanceolata (L.) Farwell

Small epiphytic fern with a long-creeping rhizome, simple, thick, narrowly lanceolate to oblanceolate fronds, and closely arranged sori covering the apical half of the lower lamina surface. Common in lowland to montane forest and in plantations and villages, reported from near sea level to 540 m elevation. Indigenous, ranging from India to Samoa. Reinecke 151; Rechinger 1265; Setchell 4, 538; Garber 803; Wilder s.n.; Meebold 16515, 26515; Yuncker 9306; Wisner 2; Lamoureux 3000; Whistler 1458, 2821, 8535!.

SCHIZAEACEAE

Schizaea dichotoma (L.) Smith

Terrestrial fern with a creeping, underground rhizome, clumped fronds dichotomously branched 2-8 times ultimately into narrow, spreading lobes, and terminal sori with sporangia in two rows. Uncommon in lowland to montane forest reported from 100 to 580 m elevation. Indigenous, ranging from Madagascar to the Marquesas. Reinecke 57b; Setchell 271; Garber 939; Christophersen 3536; Whistler 8464, 8583!.

THELYPTERIDACEAE

Christella dentata (Forssk.) Brownsey & Jermy

Medium-sized terrestrial fern with a short-creeping rhizome, pubescent stipes, lamina pinnate, pinnae lobed about halfway to the costa, the lowest 2 or 3 pairs gradually reduced and generally reflexed, the basal pair of veins united to form an excurrent vein to the sinus, pubescent surfaces, yellow glands on the lower surface, and a cordate-reniform indusium. Uncommon in sunny disturbed places, reported from near sea level to 600 m elevation. Indigenous, widespread throughout the Old World tropics and subtropics. Whistler 3845, 8636!.

Christella harveyi (Mett.) Holttum

Large terrestrial fern with a long-creeping rhizome, pubescent stipes, pinnate lamina, pinnae lobed to near the costa, up to 5 pairs of reduced pinnae, basal veins free, pubescent surfaces, yellow glands present on the lower surface, and a reniform, glabrous indusium. Common in disturbed places and lowland forest, reported from near sea level to 350 m elevation. Indigenous, widespread from the Bismarck Archipelago to Samoa. Setchell 25; Stearns s.n.; McMullin 2; Meebold 26581; Whistler 8442, 8531!.

***Christella pacifica** Holttum

Medium-sized terrestrial fern with a long-creeping rhizome, pinnate fronds, pinnae lobed almost halfway to the costa, lowest pairs gradually reduced, basal pair of veins united, lower surface pubescent, sori medial, and indusium short-hairy. Uncommon in disturbed areas, reported at *ca.* 200 m. Indigenous, also found in Fiji and New Caledonia. Yuncker 9346 (n.s.).

***Christella parasitica** (L.) Leveille

Medium-sized terrestrial fern with a creeping rhizome, pinnate fronds, pinnae cut to about 2/3 of the way to the costa, lowest pairs hardly reduced, surfaces pubescent, orange glands present, the lowest veins united, sori in a row along the costa, and indusium hairy. Occasional in disturbed places, reported from near sea level to 550 m elevation. Indigenous, ranging from east Africa to Hawai'i. Whistler 8396.

***Christella subjuncta** (Baker) Holttum

Medium-sized terrestrial fern with a long-creeping rhizome, fronds pinnate, cut to near the costa into 30 pairs of pinnae, the lowest 2 or 3 pairs reduced, lower pinnae surface pubescent, veins free or one pair united, sori submarginal, and indusia small and

pubescent. Uncommon in disturbed places, reported from *ca.* 50 m elevation. Endemic. Powell 75; McMullin 2a; Setchell 10b.

Macrothelypteris polypodioides (Hooker) Holttum

Large terrestrial fern with a short rhizome, bipinnate totripinnatifid fronds, the largest pinnules 7 x 2 cm, pale scales with marginal hairs on the rachis and lower surfaces of pinnules, small sori, and small indusia bearing a few capitate hairs. Occasional in open sunny places such as roadcuts, reported from near sea level to 100 m elevation. Indigenous, ranging from Thailand to Tahiti. Whistler 1456, 8426, 8448, 8614, 8976!.

Macrothelypteris torresiana (Gaud.) Ching

Large terrestrial fern with a stout, short-creeping rhizome, large bipinnate-tripinnatifid fronds, largest pinnae up to 5 cm long, hairs but no scales on rachises and lower surface of pinnules, small sori, and a small indusium bearing a few capitate hairs. Occasional in sunny disturbed places, reported from near sea level to 1000 m elevation. Indigenous, ranging from the Madagascar to Hawai'i. Reinecke 177?; Wilder s.n.; Meebold 16864, 26587; Yuncker 9394; Whistler 8432, 8732!, 9083.

Plesioneuron attenuatum (Bracken.) Holttum

Large terrestrial fern with a short erect rhizome, pinnate lamina, 25-30 pairs of pinnae, the basal basioscopic lobe of pinna much reduced, apex attenuate, sori near the costules, and the indusium dark and pubescent. Occasional in sunny, disturbed places, reported from 40 to 400 m elevation. Indigenous, ranging from the Bismarck Archipelago to Tahiti. Wilder s.n.? (n.s.); Whistler 8523!, 8546!, 8695!, 8900!.

Pneumatopteris bryanii (Christen.) Holttum

Large terrestrial fern with an erect rhizome, pinnate laminalobed about 2/3 of the way to the costa, lowest 2-4 pairs abruptly reduced, 1-1.5 pairs of veins united, sori near the costules, and indusia small and glabrous. Uncommon in disturbed places, reported from near sea level to 600 m elevation. Endemic. Whistler 3626, 8593!.

Pneumatopteris glandulifera (Bracken.) Holttum

Large terrestrial fern with a decumbent rhizome, many reduced pinnae each consisting of an crophore and a green rim at its base, costules with small acrophores at their bases, lower 1 or more veins united, and no indusia present. Occasional in sunny places, reported from near sea level to 300 m elevation. Indigenous, ranging from the Solomon Islands to Rarotonga. USEE s.n.; Setchell 283; Whistler 8606!.

***Pneumatopteris rodigasiana** (T. Moore) Holttum

Large terrestrial fern with an erect rhizome, pinnate lamina, pinnae lobed about halfway to costa, the lowest 9 pairs reduced, the basal pair of veins united, sori inframedial, and the indusium pubescent. Uncommon in disturbed places, reported from 50 to 600 m elevation. Indigenous, ranging from the Solomon Islands to Niue. Setchell 519 (n.s.).

***Pneumatopteris transversaria** (Bracken.) Holttum

Large terrestrial fern with an erect rhizome, pinnate lamina, pinna lobed about halfway to the costa, lowest six or so pairs reduced, the basal pair of veins united, sori near the costules, and the indusium small and glabrous. Uncommon in disturbed places, reported from 150 to 600 m elevation. Indigenous, also found in Fiji. USEE s.n.; McMullin 10.

***Sphaerostephanos reineckei** (Christen.) Holttum

Medium-sized terrestrial fern with an erect rhizome, up to 15 pairs of reduced pinnae consisting of an acrophore and a tiny lamina, the basal pair of veins united, lower lamina surface pubescent and bearing glands, and no indusia. Uncommon in montane forest, reported from 400 to 1300 m elevation. Endemic. Sledge 1820.

Sphaerostephanos unitus (L.) Holttum

Medium-sized terrestrial fern with a long-creeping rhizome, pinnate, coriaceous lamina, pinna divided about halfway to the costa, the lowest 6 or more pairs reduced, small yellow glands present on the lower surface, 1.5 pairs of veins united, sori supramedial, and indusium pubescent. Uncommon to locally common in disturbed places, reported at 120 m elevation. Indigenous, ranging from east Africa to Samoa. Setchell 10, 226; Kuruc 142; Whistler 8031, 8978!.

VITTARIACEAE

Antrophyum alatum Bracken.

Epiphytic fern with a short-creeping rhizome, tufted simple spathulate fronds, and sori arranged in longitudinal rows on veins of the lower surface of the lamina. Occasional in lowland to montane forest, reported from 30 to 500 m elevation. Indigenous, ranging from New Caledonia to Tahiti. Garber 839; Mitchell 508; Meebold 16636; Yuncker 9400; Kuruc 146; Whistler 8576!, 9127.

Antrophyum plantagineum (Cav.) Kaulfuss

Small epiphytic fern with a short rhizome, stipes 3-10 cm long, lamina strap-shaped, and linear sori on the lower surface following along the veins. Occasional to common in lowland forest, reported from near sea level to 350 m elevation. Indigenous, ranging from Malaysia to the Marquesas. Veitch s.n.; Setchell 46, 151; McMullin 34; Garber 840, 903; Yuncker 9316; Wisner 6; Long 1958a, 1997a, 3054; Whistler 8549!, 9119, 9353!.

Vaginularia angustissima (Bracken.) Mett.

Epiphytic, clump-forming fern with a creeping rhizome, simple, linear fronds *ca.* 2 mm wide, and sori in a groove opening towards the costa on the lower surface of the lamina. Occasional in lowland to montane forest, reported from 30 to 550 m elevation. Indigenous, also found in Fiji and probably Vanuatu. Setchell 43a, 251; Garber 904; Whistler 8582!.

Vittaria elongata Sw.

Epiphytic fern with a creeping rhizome, simple, linear fronds 10-40 cm long and 3-7 mm wide, and sori in a marginal groove. Occasional in lowland to cloud forest, reported from near sea level to 1400 m elevation. Indigenous, ranging from tropical Asia to the Marquesas. Reinecke 40, s.n.; McMullin 47; Long 1957, 3095; Whistler 2822, 8542!.

Vittaria scolopendrina (Bory) Thwaites

Epiphytic fern with a creeping rhizome, simple, sessile, pendant, linear fronds 40-90 cm long and up to *ca.* 2.5 cm, and sori in a marginal groove. Uncommon in lowland to montane forest, reported from 300 to 850 m elevation. Indigenous, ranging from Madagascar to Samoa. Sledge 1821!; Whistler 9200.

FERN ALLIES

LYCOPODIACEAE

Lycopodium carinatum Desv.

Epiphytic herb with dimorphic leaves densely arranged around the stems, with the sterile leaves gradually passing into the smaller ovate fertile leaves. Occasional in lowland to cloud forest, reported from near sea level to 1400 m elevation. Indigenous, ranging from India to Samoa. Garber 924; Christophersen 1824!; Lamoureux 3017; Long 1995, 1996e; Whistler 3628, 8532!.

Lycopodium cernuum L.

Terrestrial herb with much-branched stems, linear-subulate leaves 2-3 mm long, and numerous strobili solitary on the tips of the branchlets. Uncommon in sunny places, reported from 70 to 1650 m elevation. Indigenous, found throughout the temperate and tropical regions. Reinecke 11b; Setchell 109, 273, 403; Bryan 976!; Christophersen 1033, 3548; Mitchell 512; Long 2609; Whistler 2934, 8406, 8709!.

Lycopodium phlegmaria L.

Epiphytic herb with dimorphic leaves abruptly differing from each other, the sterile leaves 2-4 mm wide, the tiny fertile leaves arranged in long, slender, forked spikes. Uncommon in lowland to cloud forest, reported from near sea level to 1300 m elevation. Indigenous, found throughout the Old World tropics. Veitch s.n.; Reinecke 10a; Setchell 60, 182, 269, 396; Bryan 89; Christophersen 1125!, 1823!, 1830!; Yuncker 9318; Wisner 144; Long 1958, 1995b, 3075; Whistler 3629, 8500, 8545!, 8904!.

Lycopodium squarrosum Forst. f.

Epiphytic herb with stems branched 2-4 times, sterile leaves narrowly lanceolate, 1-2 cm long, and passing imperceptibly into the upper, fertile leaves. Uncommon in lowland to montane forest, reported from near sea level to 1550 m elevation. Indigenous, ranging from tropical Asia to Tahiti. Setchell 270; Christophersen 1218, 3525; Lamoureux 3002; Whistler 8499, 8544!, 8729!.

PSILOTACEAE

***Psilotum complanatum** Sw.

Leafless pendulous epiphytic herb with a short-creeping rhizome, flattened branches 2-3.5 mm wide, and conspicuous yellow sporangia. Uncommon in lowland forest, reported from near sea level to 360 m elevation. Indigenous, widespread in the tropics. Lamoureux 3015; Yuncker 9415; Whistler 2789.

SELAGINACEAE

Selaginella laxa Spring

Tiny terrestrial herb with prostrate stems, tiny dimorphic leaves, and dimorphic sporophylls. Uncommon on rocks in sunny places, reported from near sea level to 500 m elevation. Indigenous, ranging from Fiji to Tahiti. USEE s.n.; Veitch s.n.; Reinecke s.n.; Meebold 21358; Setchell 107, 152; Yuncker 9334; Whistler 8402, 8451, 8696!, 8905!.

Selaginella whitmeei Baker

Erect terrestrial herb with ovate acuminate leaves on the main stem, ovate to lanceolate lateral leaves, and spores borne in tetragonous strobili. Occasional in lowland to cloud forest and in rocky stream beds, reported from 150 to 1650 m elevation. A number of virtually indistinguishable "species" have been named from Samoa, and further taxonomic work is needed to show if they are actually distinct species. Endemic. Reinecke 62, 62a, 62b, 62f, 62v?; Stearns s.n.; Setchell 49, 71, 183, 223, 277; Garber 845, 923; Bryan 77; Meebold 17123; Yuncker 9325; Christophersen 1215!, 1812!, 1813!, 1814!, 1816!, 1817!, 3502, 3524, 3544; Wisner 143; Long 1996f, 3053; Lamoureux 3014; Sledge 1830; Whistler 8407, 8522!, 8548!, 8940!.

NOTE: Several other species have been attributed to Tutuila, but these claims are not supported by voucher specimens or are otherwise likely to be mistakes. This includes the following species: (1) *Lastreopsis davalloides* (Bracken.) Tindale, which was attributed to the island by Christ; (2) *Asplenium lobulatum* Mett., based on Reinecke 37a, which may be just a form of another species, and is, in any case, otherwise only reported from 1400 to 1700 m elevation; and (3) *Dennstaedtia flaccida* (Forst. f.) Bernhardi, attributed to the island by Christensen.

DICOTYLEDONAE

ACANTHACEAE

***Asystasia gangetica** (L.) T. Anders.
[Chinese violet]

Weak-stemmed herb with opposite leaves, white to purple campanulate flowers in terminal racemes, and a clavate capsule. Uncommon to rare as an adventive or an escape in disturbed areas, reported only from the lowlands. A modern introduction, native to the Old World tropics. Yuncker 9393; Whistler 307.

Blechum brownei Juss.

Herb with opposite leaves and small white, campanulate flowers borne among ovate bracts in terminal spikes. Uncommon in disturbed areas, reported from near sea level to 610 m elevation. A modern introduction, native to tropical America. Whistler 9058.

***Hemigraphis alternata** (Burm. f.) T. Anders.

Prostrate herb with opposite purple leaves, purple bracts, and white campanulate flowers. Locally common as a weed in lawns, reported only from the lowlands. A modern introduction, native to tropical Asia. Whistler 8933.

Justicia procumbens L.

Small herb with opposite leaves and tiny lavender, bilabiate flowers in dense, ovoid, bract-bearing, terminal spikes. Common in disturbed areas, reported only from the lowlands. A modern introduction, native to tropical Asia. Whistler 320, 2757, 8958!, 9176.

Ruellia prostrata Poir.
vaouli

Herb with opposite leaves, solitary, axillary, lavender, campanulate flowers, and a club- shaped capsule. Common in disturbed areas, reported only from the lowlands. A modern introduction, native to the Old World tropics. Whistler 9082, 9105!.

***Ruellia tuberosa** L.

Tough-stemmed herb with opposite leaves, large, lavender, campanulate flowers solitary in the leaf axils, and club-shaped capsules. Uncommon as a

weed in villages and along roadsides, reported only from near sea level to 300 m elevation. A modern introduction, native to the Old World tropics. Whistler 2760, 8440.

AIZOACEAE

***Sesuvium portulacastrum** (L.) L.

Prostrate succulent herb with opposite leaves and white to lavender flowers bearing numerous stamens. Uncommon on coastal rocks, reported only near sea level. Indigenous, widespread in the Pacific. Whistler 8428.

AMARANTHACEAE

***Achyranthes aspera** L.
tamatama

Subshrub with opposite leaves, tiny purple flowers, and sharp, grass-like fruits in terminal spikes. Occasional in coastal areas and sometimes weedy, reported from near sea level to 125 m elevation. Indigenous or a Polynesian introduction, widespread in the tropics. Setchell 146; Wilder 9; Garber 962; Wisner 62; Whistler 8427.

Alternanthera sessilis (L.) R. Br. ex DC.

Creeping herb with opposite leaves and inconspicuous flowers in white, sessile, axillary, globose clusters. Occasional to common in disturbed places, particularly in wetland crops such as taro, reported from near sea level to 1000 m elevation. A modern introduction, possibly native to southern China. Setchell 303; Wilder 26; Garber 862; Lamoureux 3085; Whistler 3954, 8601!.

***Amaranthus viridis** L.

Red-stemmed herb with alternate leaves notched at the tip, and terminal and axillary spikelike panicles of tiny inconspicuous, green flowers. Uncommon in croplands and waste places, reported only from the lowlands. A Polynesian introduction, now pantropic in distribution. Setchell 319; Garber 968.

***Cyathula prostrata** (L.) Bl.

Low, weak-stemmed herb with opposite leaves, tiny green, inconspicuous flowers in narrow, long-stalked terminal spikes, and bur-like fruits. Uncommon in disturbed places including secondary forest, reported from near sea level to 1100 m elevation. A Polynesian introduction, native to the Old World tropics. Setchell 215, 326.

ANACARDIACEAE

Buchanania merrillii Christoph.

Large tree with simple, alternate, long-petioled oblanceolate leaves, white flowers in axillary panicles, and hard, purple, lens-shaped fruits. Occasional in lowland to montane forest, reported from 250 to 450 m elevation. Endemic. Setchell 430, 437; Garber 921; Christophersen 1010; Long 1971; Spence 474!; Whistler 2691!, 2962, 8516!.

Rhus taitensis Guillemin
tavai

Large tree with milky sap, alternate pinnately compound leaves, tiny white flowers, and small, purple, fleshy fruits. Common to abundant in lowland and especially secondary forest, reported from 10 to 700 m elevation. Indigenous, ranging from Futuna to Tahiti. Setchell 65; Bayliss s.n.; Yuncker 9332; Wisner 7; Spence 476!; Whistler 2734, 3642.

ANNONACEAE

Cananga odorata (Lam.) Hook. f. & Thoms.
[ilangilang] moso'oi

Straight, medium-sized tree with alternate leaves all in one plane, large, fragrant, yellow apocarpus flowers, and black subglobose fruits. Occasional to common in disturbed forest, reported from 15 to 600 m elevation. A Polynesian introduction, or possibly indigenous, widespread westward to South Asia. Setchell 179; Diefenderfer 3; Whistler 3119, 9108!.

APIACEAE

Centella asiatica (L.) Urb.
[Asiatic pennywort] tono

Low herb with creeping stems rooting at the nodes, alternate, kidney-shaped leaves, and tiny green, inconspicuous, axillary flowers. Occasional to common in sunny disturbed places, reported from near sea level to 700 m elevation. Probably a Polynesian introduction, native to tropical Asia. Reinecke 524; Garber 965; Whistler 1455, 9081!.

APOCYNACEAE

Alstonia pacifica (Seem.) A. C. Smith

Small tree with glossy opposite leaves, milky sap, small white flowers, and long, curved, cylindrical capsules. Common in open forest on ridges in the mountains, reported from 150 to 1300 m elevation. Indigenous to Samoa, ranging westward to the Solomon Islands. Setchell 381, 387; Christophersen 1042, 1061, 1139!, 1257, 1265, 3540; Long 1970, 1973; Whistler 2707, 2715, 3301, 8519!, 8676!, 9066.

Alyxia bracteolosa Rich
lau maile

Vine with milky sap, shiny opposite leaves, tiny white flowers, and bluish-black globose fruits. Common in lowland to cloud forest, reported from 10 to 1300 m elevation. Indigenous, also found in Fiji, Horne Island, Wallis, and Tonga. Setchell 211, 279; Swezey & Wilder 35; Garber 856; Christophersen 3539; Diefenderfer 9; Mitchell 521; Yuncker 9349; Wisner 149, 150; Long 3109; Spence 467!; Whistler 2771!, 2907A, 2982, 3109, 8671!, 9097!.

Alyxia stellata (Forst.) Roemer & Schultes
nau

Scandent shrub with small, shiny opposite leaves, milky sap, tiny white flowers, and small subglobose to ellipsoid fruits. Common in open forest and on ridges, reported from 20 to 1700 m elevation. Indigenous, ranging from New Caledonia to the Marquesas. Setchell 294, 542; Bryan 84; Christophersen 3551; Mitchell 521; Wisner 126; Lamoureux 3020; Whistler 1277, 2889, 8672!.

Cerbera manghas L.
leva

Medium-sized tree with glossy whorled leaves, milky sap, showy white flowers with a red throat, and a large, red, ellipsoid fruit. Occasional in littoral forest and sometimes cultivated and persisting in secondary forest, reported from near sea level to 650 m elevation. Indigenous, ranging from Malaysia to the Marquesas. Setchell 92; Diefenderfer 20; Yuncker 9427; Lamoureux 3011; Whistler 1420, 2835, 8663!.

***Ervatamia obtusiuscula** Markgraf
pulu

Small tree with milky sap, opposite leaves, white flowers with contorted corolla lobes, and orange, 2-lobed fruits. Uncommon in lowland forest, reported from 10 to 250 m elevation. Indigenous, ranging from Vanuatu to Makatea and Tahiti. Reinecke 539, 553, 569.

ARALIACEAE

Meryta macrophylla (Rich) Seem.
ma'ulu'ulu; fagufagu

Small dioecious tree with large, simple, alternate leaves, thick, compact male inflorescences, greenish female flowers, and large, green, fused fruits. Occasional in coastal to montane forest, reported from 15 to 800 m elevation. Indigenous to Samoa, also found in Tonga. Garber 929; Christophersen 1006, 1130!, 1253, 1254; Long 3094; Spence 468!; Whistler 2718.

Polyscias samoensis (A. Gray) Harms
tagitagi; afia

Small tree with alternate, pinnately compound leaves, flowers in compound umbels, and flattened, round, striate fruits. Common in coastal to montane forest, reported from near sea level to 400 m elevation. Indigenous, also found on Niuafo'ou. Graeffe 251; Setchell 255, 374; Wilder 44, 87; Long 3101; Rainey 2393; Whistler 1436, 2722, 2799, 8989!, 9146.

ARISTOLOCHIACEAE

Aristolochia cortinata Reinecke

Woody climber with alternate, ovate leaves, curved-tubular, purple flowers, and an ovoid capsule. Uncommon in lowland to montane forest, reported from 20 to 600 m elevation. Endemic. Garber 937; Mitchell 519; Whistler 2869, 2899, 8580!, 8902!.

ASCLEPIADACEAE

***Asclepias curassavica** L.
[milkweed]

Erect, scarcely branching shrub with milky sap, opposite leaves, orange and red flowers in umbels, and a follicle bearing comose seeds. Uncommon as a weed, particularly in pastures, reported from 70 to

650 m elevation. A modern introduction, native to tropical America. Setchell 184; Garber 890.

Hoya australis R. Br. in Traill
fue selela; suni; olive vao

Vine with milky sap, fleshy opposite leaves, white flowers usually marked with red at the corolla base, and a follicle bearing comose seeds. Occasional from littoral to montane forest, reported from near sea level to 580 m elevation. Indigenous, ranging from Australia to Samoa. Lister s.n.; Setchell 515; Wisner 118, 124; McKee 2956; Long 3090; Whistler 2833.

Hoya pottsii Traill
fue selela

Vine with opposite leaves 3–5 palmately veined from the base, white waxy flowers in umbels, and a cylindrical follicle bearing comose seeds. Occasional in the coastal to montane forest, reported from near sea level to 600 m elevation. Indigenous, ranging from Hainan Island to Samoa. Christophersen 1007; Meebold 16769; Yuncker 9379; Long 1985; Whistler 1460, 8505, 9098!.

Hoya vitiensis Turrill
fue selela

Vine with milky sap, opposite, thick, mostly lanceolate leaves, white or maroon flowers 15–28 mm across, and a cylindrical follicle bearing comose seeds. Occasional in lowland to montane forest, reported from 200 to 750 m elevation. Indigenous, also found in Fiji. Christophersen 1011, 3562; Long 3045; Whistler 2765!, 2793, 3110, 3111, 8717.

***Hoya** sp. nova
fue selela

Vine with milky sap, opposite, thick, mostly lanceolate leaves, white, waxy flowers, and a cylindrical follicle bearing comose seeds. Occasional in lowland to montane forest, reported from near sea level to 600 m elevation. Apparently endemic to American Samoa (Tutuila, Ofu, and Ta'u), but further work needs to be done on this genus in Samoa. Whistler 2705.

ASTERACEAE

Acmella uliginosa (Sw.) Cass.

Erect herb with toothed, opposite leaves and yellow disc and ray florets in small, ovoid heads. Uncommon in disturbed places, especially in wet areas, reported from near sea level to 250 m elevation. A modern introduction, native to tropical America. Whistler 318, 8049, 8513!.

Ageratum conyzoides L.

Erect herb with coarse, opposite, fragrant leaves and lavender disc florets in heads arranged in terminal panicles. Common as a weed in sunny, disturbed places and croplands, reported from near sea level to 1650 m elevation. A modern introduction, native to tropical America. Eames T5; Lamoureux 3058; Whistler 8949!.

Bidens alba (L.) DC.
[beggar's-tick]

Herb with pinnately lobed or compound, opposite leaves, yellow disc florets, white, spreading ray florets, and small, cylindrical, barbed achenes. Abundant in disturbed places, apparently displacing the following species, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 2970, 8570!.

Bidens pilosa L.
[beggar's-tick]

Herb with pinnately lobed or compound, opposite leaves, yellow disc florets in heads, and small, cylindrical, barbed achenes. Now uncommon (in American Samoa) in dry, sunny disturbed places, reported from near sea level to 1550 m elevation. A modern introduction, native to tropical America. USEE s.n.? (n.s.); Eames T29, Whistler 8926!.

***Conyza bonariensis** (L.) Cronquist
[hairy fleabane]

Erect, scarcely branching herb with hairy stems, alternate, gray-green leaves, branching panicles of small heads, and small, plumed achenes. Rare as a weed in disturbed places, perhaps now extirpated from Samoa, reported at *ca.* 10 m elevation. A modern introduction, native to South America. Whistler 3605.

Crassocephalum crepidioides (Benth.) S. Moore

Tall herb with toothed or lobed, alternate leaves, drooping heads of disc florets red-brown at the tips, and plumed achenes. Common to abundant in disturbed places, especially in taro fields, reported from near sea level to 1800 m elevation. A modern introduction, native to tropical Africa. Lamoureux 3060; Whistler 8619!.

***Eclipta prostrata** (L.) L.

Small herb with opposite leaves and small, aster-like heads of white ray and disc florets. Uncommon in disturbed places, mostly in wet soil, reported only from the lowlands. A modern introduction, pantropic in distribution. Lamoureux 3072; Whistler 328.

Eleutheranthera ruderalis (Sw.) Schultz-Bip.

Coarse herb with opposite leaves and drooping stalked heads or several disc florets. Uncommon in disturbed places. A modern introduction, native to tropical America. Trail 280.

Emilia sonchifolia (L.) DC.
fua lele

Erect herb with alternate, sessile, variously shaped leaves with clasping auricles, a panicle of several heads of lavender disc florets, and plumed achenes. Common in sunny disturbed places, reported from near sea level to 450 m elevation. A modern introduction, native to the Old World tropics. Setchell 12; Eames T9; Garber 811; Lamoureux 3061, 3062? (n.s.), 3063; Sachet 37; Whistler 304, 322, 2935, 8950!.

Erechtites valerianifolia (Wolf) DC.
fua lele

Tall, erect herb with alternate, deeply pinnately lobed leaves, pink disc florets in heads arranged in terminal panicles, and plumed achenes. Occasional to common in open, disturbed places, reported from near sea level to 1750 m elevation (but uncommon at low elevations). A modern introduction, native to tropical America. Setchell 11; Christophersen 957; Whistler 9053!.

Mikania micrantha H. B. K.
[mile-a-minute vine] fue saina

Herbaceous vine with opposite leaves, white disc florets in heads arranged in panicles, and plumed achenes. Abundant in disturbed places, reported from near sea level to 1600 m elevation. A modern introduction, native to tropical America. Long 2606a; Whistler 8632!, 9133.

***Pseudelephantopus spicatus** (B. Juss. ex Aubl.) Baker
vao malini

Wiry, deep-rooted herb with alternate leaves and purple to white disk florets in heads arranged in a narrow, spike-like inflorescence. Occasional in lawns and disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 9072.

***Struchium sparganophorum** (L.) Kuntze

Erect herb with alternate leaves and inconspicuous, white disc florets in sessile, axillary heads. Occasional on streamsides and other wet places, reported from near sea level to 350 m elevation. A modern introduction, native to tropical America. Whistler 3229.

Synedrella nodiflora (L.) Gaertn.
tae'oti

Coarse herb with opposite leaves and yellow disc florets arranged in sessile, axillary heads. Common in disturbed places, reported from near sea level to 550 m elevation. A modern introduction, native to tropical America. Setchell 19, 540; Eames T11; Wilder 29; Garber 814; Lamoureux 3067, 3074; Whistler 8626!, 8957!.

***Tridax procumbens** L.
[coat buttons]

Ascending herb with opposite, toothed leaves and solitary, long-stalked heads of white ray and yellow disc florets. Occasional in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 9346.

Vernonia cinerea (L.) Less.
[ironweed]

Small herb with alternate leaves, purple disc florets in heads arranged in loose terminal cymes, and plumed achenes. Occasional to common in disturbed places, reported from near sea level to 360 m elevation. A modern introduction, native to tropical America. Eames T3; Lamoureux 3057; Whistler 2758, 9012!.

***Wedelia trilobata** (L.) Hitchc.

Low-growing herb with opposite leaves having toothed margins, showy yellow composite flowers on long peduncles, and yellow disk and ray florets. Uncommon as an escape from cultivation and sometimes weedy, reported only from the lowlands. A modern introduction, native to the New World Tropics. Whistler 9059.

Wollastonia biflora (L.) DC.
[beach sunflower] ateate

Subshrub with opposite leaves, panicles of composite flowers, and yellow disc and ray florets. Common to abundant in sunny coastal areas, sometimes extending inland in coconut plantations, reported from near sea level to 450 m elevation. Indigenous, ranging from tropical Asia to the Austral Islands. Setchell 17, 125; Garber 812; Bryan 975; Yuncker 9368; Mitchell 529; Wisner s.n.; Lamoureux 3091; Whistler 1434, 2915, 8562!.

Youngia japonica (L.) DC.
[Oriental hawksbeard]

Rosette-forming herb with lobed, basal leaves, yellow ray disc florets in heads in long, thin, branching panicles, and plumed achenes. Uncommon in disturbed places, reported from near sea level to *ca.* 300 m elevation. A modern introduction, native from India to Japan. Whistler 5733, 8419, 8647!.

BARRINGTONIACEAE

Barringtonia asiatica (L.) Kurz
[fish-poison tree] futu

Large tree with large, alternate, obovate leaves, large flowers with numerous long, white and pink stamens, and large top-shaped fruits. Common to abundant in littoral, coastal, and ridge forests, reported from near sea level to *ca.* 200 m elevation. Indigenous, ranging from Madagascar to the Marquesas. Setchell 105, 144, 160, 344; Long 2597; Whistler 2913, 8916!.

Barringtonia samoensis A. Gray
falaga

Medium-sized tree with large alternate leaves, flowers in hanging racemes, numerous showy red stamens, and top-shaped fruits. Occasional in lowland to montane forest, reported from 5 to 600 m elevation. Indigenous, ranging westward to Indonesia. USEE s.n.; Horne 3, 4; Setchell 45, 159, 202, 250; Bryan 87; Garber 851, 857, 860, 883, 944; Christophersen 1036; Yuncker 9362; Wisner 122, 125; Spence 482!; Whistler 1276, 2863, 3287, 3654, 9110.

BORAGINACEAE

Corda aspera Forst. f.
tou

Small tree with alternate leaves, small white sympetalous flowers, and white fleshy fruits. Rare in lowland forest, reported from 30 to 275 m elevation. Indigenous or a Polynesian introduction, ranging from the Philippines to Samoa. Whistler 3112, 3113, 9347!.

***Cordia subcordata** Lam.
tauanave

Medium-sized tree with alternate leaves, showy orange flowers and green, subglobose fruit. Uncommon in littoral forest, reported only near sea level. Indigenous, ranging from tropical Asia to eastern Polynesia. Setchell 369; Christophersen 1175; Yuncker 9381; Whistler 2808.

***Heliotropium procumbens** Mill.

Low herb with narrow, pubescent, alternate leaves and tiny white sympetalous flowers in scorpeoid cymes. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 2968.

***Tournefortia argentea** L. f.
[beach heliotrope] tausuni

Small tree with silvery-pubescent, alternate leaves, small white flowers in compound, scorpeoid cymes,

and small, round, green fruits. Occasional on the seaward edge of littoral forest, reported only near sea level. Indigenous, ranging from Mauritius to southeastern Polynesia. Setchell 128, 231, 557; Comstock 11; Wisner 89; Long 1939; Whistler 1430.

BRASSICACEAE

***Rorippa sarmentosa** (DC.) Macbr.
[Polynesian cress] a'atasi

Small herb with pinnately lobed leaves, tiny white flowers in terminal racemes, and small linear pods. Occasional as a weed, sometimes occurring in sunny undisturbed habitats, reported from near sea level to 1700 m elevation. Indigenous or perhaps a Polynesian introduction, ranging from New Caledonia to Hawai'i. Setchell 325; Whistler 1466, 8433.

BURSERACEAE

Canarium harveyi Seem.
mafoa?

Medium-sized tree with alternate, pinnately compound leaves, 5–9 ovate to oblong leaflets, and a large purple fruit. Occasional in coastal to montane forest, reported from near sea level to 600 m elevation. A modern introduction or possibly indigenous, also found in Fiji, Tonga, and Niue. Swezey & Wilder 256; Whistler 2693, 2873, 8508!, 9113.

Canarium vitiense A. Gray
ma'ali

Large tree with fragrant resin, alternate, pinnately compound leaves bearing 7–13 elliptic leaflets, and ellipsoid to ovoid fruits. Occasional in lowland to montane forest, reported from 10 to 700 m elevation. Indigenous, also found in Fiji and Tonga. Setchell 420, 574; Whistler 1281, 2939, 3123.

Garuga floribunda Decne.
vivao

Large tree with pubescent, alternate, pinnately compound leaves with leaflets that turn red individually when aging, small white flowers, and blue-black globose fruits. Occasional in coastal to lowland forest, reported from 10 to 250 m elevation. Indigenous, ranging westward to the Philippines and Indonesia. Setchell 432; Whistler 3116.

CARICACEAE

Carica papaya L.
[papaya] esi

Scarcely branching, dioecious tree with large, alternate, palmately lobed leaves, cream- colored, salverform male flowers in pendulous racemes, solitary, axillary, cream- colored flowers, and a large edible orange fruit. Common in disturbed places and cultivated in villages, reported only from the lowlands. A modern introduction, native to tropical America. USEE s.n.? (n.s.); Setchell 70; Garber 972; Whistler 8928!, 9134.

CASSYTHACEAE

Cassytha filiformis L.
fetai

Leafless, green to orange, string-like parasitic vine with small white flowers and globose fruits. Uncommon on Tutuila in littoral areas, reported from near sea level to 300 m elevation. Indigenous, pantropic in distribution. Whistler 8683!.

CELASTRACEAE

Maytenus vitiensis (A. Gray) Ding Hou

Shrub or small tree with alternate leaves, toothed leaf margins, small white flowers, and 3-angled capsules. Occasional in open forest on ridges and lava flows, reported from 25 to 600 m elevation. Indigenous, ranging from Fiji to the Gambier Islands. Wilder 36; Garber 899 (n.s.); Christophersen 1015; Wisner 158; Whistler 2706, 8455, 8685!.

CHRYSOBALANACEAE

Atuna racemosa Raf.
ifiifi

Medium-sized tree with alternate simple leaves, white flowers, and a large, flattened-ovoid, hard-shelled fruit. Now rare in lowland to montane forest, sometimes forming small groves, reported from near sea level to 450 m elevation. A Polynesian introduction, ranging from tropical Asia to Samoa. Setchell 325; Garber 892; Spence 480!.

***Parinari insularum** A. Gray
sea

Medium-sized tree with alternate leaves, small white flowers, and fragrant, mottled brown, ovoid fruits.

Uncommon in secondary forest, probably a relict of cultivation, reported only from the low-lands, perhaps now extirpated from Samoa. A Polynesian introduction from Fiji, also found in Tonga and Wallis. Setchell 560.

CLUSIACEAE

Calophyllum inophyllum L.
fetau

Large tree with fissured bark, glossy, finely veined, opposite leaves, showy yellow and white flowers, and a subglobose green fruit. Common and sometimes dominant in littoral forest, reported from near sea level to *ca.* 100 m elevation. Indigenous, ranging from tropical Africa to eastern Polynesia. Setchell 99, 99a; Wisner 111; Whistler 2832, 2921.

Calophyllum neo-ebudicum Guillaumin
tamanu

Large tree with fissured bark, finely veined, opposite leaves, showy white and yellow flowers, and a subglobose purplish drupe. Occasional to common in lowland to montane forest, reported from 25 to 650 m elevation. Indigenous, ranging from New Britain to Niue. Setchell 221, 334; Spence 496!; Whistler 2937, 8677!.

Garcinia myrtifolia A. C. Smith

Medium-sized tree with opposite, coriaceous leaves, white flowers bearing numerous yellow stamens, and an ellipsoid fruit. Uncommon to occasional in montane forest, reported from 320 to 650 m elevation. Indigenous, also found in Tonga and Fiji. Whistler 2986.

Mammea glauca (Merr.) Kost.
manapau

Medium-sized tree with opposite, coriaceous leaves, showy white flowers, numerous yellow stamens, and an ellipsoid fruit. Uncommon in coastal to montane forest, reported from 20 to 900 m elevation. Endemic. Whistler 2764!, 3836, 8534!, 8698!.

COMBRETACEAE

Terminalia catappa L.
talie

Large tree with alternate, subsessile, obovate leaves, spikes of small white flowers, and large, conspicuously winged fruits. Occasional in littoral to lowland forest, reported mostly from near sea level, but occasionally to 260 m elevation. Indigenous or possibly a European introduction, widespread in the Old World tropics. Setchell 351, 356; Comstock 17; Whistler 3751, 8917!.

Terminalia richii A. Gray
malili

Large tree with alternate, lanceolate leaves, small, spikes of white flowers, and purple, compressed-globose fruits. Uncommon in lowland to montane forest, reported from 5 to 600 m elevation. Indigenous, also found in Fiji and Niue. Whistler 2955, 9055!.

***Terminalia samoensis** Rechinger
talie

Medium-sized tree with alternate, petiolate, obovate leaves, spikes of white flowers, and unwinged, compressed-globose fruits. Uncommon in undisturbed littoral forest, reported only near sea level. Indigenous, ranging from the Celebes to Tahiti. Christophersen 1176; Whistler 2954, 5730.

CONNARACEAE

Rourea minor (Gaertn.) Alston

Woody climbing vine with simple, alternate, ovate leaves, white flowers, and a fruit that opens to expose the single red seed. Occasional in lowland to montane forest, reported from 50 to 500 m elevation. Indigenous to Samoa, ranging from India to Niue. Whistler 2883, 9201.

CONVOLVULACEAE

***Ipomoea alba** L.
[ung-choi]

Creeping or low-climbing vine with adventitious roots, alternate, cordate leaves, and a large, showy white, salverform corolla having a long, narrow tube. Uncommon in disturbed places, reported from *ca.* 100 to *ca.* 600 m elevation. A modern introduction, pantropic in distribution. Whistler 2936.

***Ipomoea aquatica** Forssk.

Creeping vine with alternate, hastate leaves and a white to light purple, rotate corolla. Uncommon in disturbed wet places, reported only from the low-

lands. A modern introduction, native to the Old World tropics. Whistler 8033a.

Ipomoea littoralis Bl.
palulu

Scrambling herbaceous vine with alternate, cordate leaves and ashowy purple, rotate corolla. Occasional in sunny coastal and lowland areas, and sometimes weedy in plantations, reported from 10 to 300 m elevation. Indigenous, widespread throughout the Pacific. Setchell 106; Eames T13; Wilder 88; Garber 911; Diefenderfer 16; Meebold 8233; Yuncker 9384; Wisner 85; Whistler 8637!.

Ipomoea macrantha Roemer & Schultes

Sprawling or scrambling vine with alternate cordate leaves and showy white flowers with a long corolla tube and spreading limb. Occasional to common in sunny coastal areas, reported from near sea level to 75 m elevation. Indigenous, widespread throughout the tropics. Long 3097; Whistler 2910, 8567!.

Ipomoea pes-caprae (L.) R. Br.
[beach morning-glory] fue moa

Prostrate vine with purple stems, alternate leaves bilobed at the tip, and a showy purple, rotate corolla. Common to abundant on rocky and sandy shores, reported only near sea level. Indigenous, pantropic in distribution. Setchell 89; Wisner 21, 110; Whistler 1425, 8919!.

***Merremia peltata** (L.) Merr.
fue vao; fue lautetele

Sprawling or high climbing vine with alternate peltate leaves, a showy white, rotate corolla, and a 4-seeded capsule. Common in forest clearings and open forest of lowland to montane forest, reported from 100 to 300 m elevation. Indigenous, ranging from Africa to Tahiti. Wisner 103; Whistler 2813, 3118a.

Merremia umbellata (L.) Hall. f.

Vine with alternate, hastate leaves and yellow, campanulate flowers arranged in umbels, locally common around central Tutuila in disturbed places, reported from near sea level to 300 m elevation. A modern introduction, pantropic in distribution. Whistler 324, 2813, 8512!.

***Operculina turpethum** (L.) S. Manso

Prostrate or climbing vine with winged stems, alternate cordate leaves with a mucronate tip, and a white campanulate corolla 2.5–4.5 cm long. Uncommon in disturbed places in plantations and open forest, reported from near sea level to 180 m elevation. Indigenous, widespread in the Old World tropics. Wisner 113.

Operculina ventricosa (Bertero) Peter

Prostrate or climbing vine with unwinged stems, large, alternate, cordate leaves with an acuminate tip, and a white campanulate corolla 5–9 cm long. Occasional to locally common in disturbed places including beaches, and climbing into native forest canopy, reported from near sea level to 300 m elevation. A modern introduction indigenous to the Caribbean, first reported from Polynesia in *ca.* 1939, now found in the Cook Islands, Niue, Tonga, Samoa, and the Marianas. It may hybridize with the preceding species. Whistler 2842, 8476.

Stictocardia tiliifolia (Desr.) Hall. f.
palulu

Climbing vine with large, alternate, cordate leaves finely black-dotted on the lower surface, and a large, showy, lavender, rotate corolla. Occasional climbing in low vegetation in disturbed places, reported from near sea level to 100 m elevation. A modern introduction, native to the Old World tropics. Setchell 248; Whistler 2719.

CUCURBITACEAE

***Cucumis melo** L.
[Polynesian melon] 'atiu

Prostrate vine with rough, alternate leaves, yellow, unisexual flowers solitary in the axils, and a small ovoid melon fruit. Rare in heavily disturbed places, reported only from the lowlands. A Polynesian introduction, native to the Old World tropics. Wilder 42; Wisner 92.

***Luffa cylindrica** (L.) Roemer var. **insularum** (A. Gray) Cogn.

Prostrate or low-climbing vine with alternate leaves, large yellow flowers, and an ellipsoid fruit filled with a spongy material. Uncommon in sunny coastal areas and sometimes weedy in plantations, reported

from near sea level to 400 m elevation. Indigenous or a Polynesian introduction, widespread in the Pacific. Setchell 285; Meebold 16695; Yuncker 9300.

Momordica charantia L.
[balsam pear]

Herbaceous vine with alternate, deeply-palmately lobed leaves, yellow unisexual flowers on long, thin pedicels, fleshy, lumpy, orange, fusiform fruits, and large red seeds. Common in disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Christophersen 989; Yuncker 9348; Whistler 1438, 2840, 8952!, 9158.

Zehneria mucronata (Bl.) Miq.

Herbaceous vine with alternate, thin, mostly deltoid leaves, tiny white axillary flowers, and orange fruits rounded at the ends. Occasional in clearings in the forest, reported from near sea level to 1700 m elevation. Indigenous, ranging from Taiwan to Tahiti. Whistler 2958, 8483, 8486, 8923!.

Zehneria samoensis (A. Gray) Fosb. & Sachet

Prostrate herbaceous vine with alternate, scabrous, deltoid leaves, tiny white axillary flowers, and orange, cylindrical fruits acute at the ends. Occasional in the littoral to coastal forest and sometimes inland as a weed, reported from near sea level to *ca.* 200 m elevation. Indigenous, also found in Tonga and Niue. Lister s.n.; Setchell 290; Whistler 2908, 8431, 8931!.

CUNONIACEAE

Spiraeanthemum samoense A. Gray

Medium-sized tree with simple, opposite leaves and racemes of tiny white flowers. Common to abundant in lowland (uncommonly) or montane to cloud forest, reported from 180 to 1850 m elevation. Endemic. Setchell 404, 549; Christophersen 1048, 1067, 3506, 3576; Long 3063; Whistler 3838, 8518, 8650.

Weinmannia affinis A. Gray

Small tree with simple (rarely 3–7-foliate), opposite leaves, conspicuous stipules, and racemes of tiny white flowers. Common in montane forest and scrub, reported from 300 to 1700 m elevation. Indigenous, also found in Fiji and possibly Rarotonga. USEE s.n.?; Reinecke 487?; Christophersen 1201, 3565; Whistler 2905, 3641!, 9064. *Weinmannia samoensis* A. Gray is also reported from Tutuila, based on two specimens. The main difference between this and *W. affinis* is compound versus simple leaves; however, individuals with both type of leaves have been found. Further field research is needed to sort this out.

EBENACEAE

***Diospyros major** (Forst. f.) Bakh.

Small tree with alternate ovate leaves bright green below and dark above, white, axillary 3-lobed urceolate flowers, and solitary ovoid fruits. Uncommon in native forest, perhaps a relict of cultivation. Similar if not identical to *D. christophersenii* Fosb. of Western Samoa. Probably a Polynesian introduction, indigenous to Fiji and Tonga. Whistler 8948.

Diospyros elliptica (Forst.) P.S. Green
'anume

Small to medium-sized tree with alternate leaves, 3-merous flowers, and red to yellow, ellipsoid fruits. Common to abundant in coastal and lowland forest, reported from 10 to 300 m elevation. Indigenous, ranging from the Lau Islands (Fiji) to Niue. USEE s.n.; Rechinger 3729; Wilder 46; Diefenderfer 11; Wisner 123; Whistler 2881, 2917, 3620.

Diospyros samoensis A. Gray
'au'auli

Medium-sized tree with alternate leaves, white, 4-merous flowers, and a globose fruit with a persistent calyx of four reflexed lobes. Common to abundant in coastal and lowland forest, reported from near sea level to 350 m elevation. Indigenous, also found from the Lau Islands to Niue. Setchell 63, 333; Diefenderfer 16; Christophersen 1000; Yuncker 9378; Wisner 121; Spence 481!; Whistler 2882, 3619.

ELAEOCARPACEAE

Elaeocarpus tonganus Burkill
a'amati'e

Medium-sized tree with alternate, ovate leaves turning red with age, many-petaled white flowers,

and blue spherical fruits. Occasional in lowland to montane forest, reported from 50 to 750 m elevation. Indigenous, ranging from Tonga to the Austral Islands. Whistler 3632, 3849, 9006!.

Elaeocarpus ulianus Christoph.

Medium-sized tree with alternate, ovate leaves, many-petaled white flowers, and large ovoid fruits containing a single irregularly edged seed. Occasional in lowland to montane forest, reported from 100 to 900 m elevation. Endemic. Whistler 2692!, 2794, 2801, 3227, 3603, 8471, 9170.

EUPHORBIACEAE

***Acalypha lanceolata** Willd.

Erect herb with pubescent, alternate leaves and inconspicuous, green, unisexual, axillary inflorescences lacking a stalked, terminal flower. Uncommon in disturbed places, reported only from the lowlands. A Polynesian introduction, native to the Old World tropics. Whistler 2754, 2949.

Aleurites moluccana (L.) Willd.
[candlenut] lama

Medium-sized to large tree with alternate, pale green, palmately lobed leaves, small white flowers, and large green spherical fruits. Occasional in coastal and lowland forest, but most often found in cultivation, reported from 20 to 150 m elevation. A Polynesian introduction, ranging from Asia to Hawai'i. Setchell 199; Yuncker 9396; Whistler 1445.

Antidesma sphaerocarpum Muell. Arg.

Shrub or small tree with alternate leaves, tiny inconspicuous flowers in racemes, and small, spherical, purple berries. Occasional in lowland forest, reported from near sea level to 350 m elevation. Indigenous, also found in Futuna, 'Uvea, and Rotuma. Meebold 26511, 26512; Yuncker 9320, 9335; Long 1961, 1968; Whistler 1483, 2800, 2941, 2942, 8034, 8477, 8494, 8538!, 8587!, 9147.

Baccaurea taitensis Muell. Arg.

Small tree with alternate leaves, tiny white, unisexual flowers in racemes, and brown, spherical fruits. Occasional in lowland to montane, reported from 250 to 720 m elevation. Endemic. Setchell 385; Christophersen 1119!, 1135!, 3522; Rainey 2392; Whistler 2701, 2747, 2956a, 3541, 8744!.

Bischofia javanica Bl.
'o'a

Medium-sized to large tree with alternate trifoliate leaves, tiny greenish flowers, and small, brown spherical fruits. Occasional in disturbed places and secondary to undisturbed forest, reported from near sea level to 850 m elevation. Indigenous or possibly a Polynesian introduction, ranging from India to Rarotonga. Setchell 66; Bryan 984!; Diefenderfer 6; Mitchell 571; Yuncker 9338; Long 3085, 3114; Spence 516!; Whistler 1443.

***Chamaesyce atoto** (Forst. f.) Croizat in Degener
pulu tai?

Prostrate herb or low shrub with milky sap, opposite leaves, and greenish flowers and fruits in cyathia. Uncommon in sunny littoral areas, reported only near sea level. Indigenous, ranging from Ceylon to the Tuamotu Islands. Setchell 235, 304; Garber 871; Whistler 8404.

Chamaesyce hirta (L.) Millsp.
[garden spurge] la'au fai moti

Small succulent herb with milky sap, opposite, pubescent leaves, and tiny green flowers in dense axillary cyathia. Common in disturbed places, reported only from the lowlands. A modern introduction, pantropic in distribution. USEE s.n.? (n.s.); Setchell 48, 56; Garber 800, 825; Lamoureux 3073; Whistler 8915!.

Chamaesyce hypericifolia (L.) Millsp.

Erect herb with milky sap, glabrous, opposite leaves, and tiny white flowers in axillary cyathia. Occasional on roadsides and other disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 8441, 8600!.

Chamaesyce hyssopifolia (L.) Small

Erect delicate herb with milky sap, small, opposite, oblong to linear leaves, and inconspicuous white flowers in leafy cyathia. Common in disturbed places, reported only from the lowlands. A modern introduction, native to tropical and subtropical America. Whistler 8045, 8914!.

***Chamaesyce prostrata** (Ait.) Small
[prostrate spurge]

Small prostrate herb with milky sap, tiny opposite leaves, purple, nearly glabrous stems, and inconspicuous axillary flowers in cyathia. Occasional around houses and in other sunny disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Setchell 504; Garber 950.

Chamaesyce thymifolia (L.) Millsp.

Prostrate herb with milky sap, tiny opposite leaves, pink, pubescent stems, milky sap, and inconspicuous flowers in axillary cyathia. Occasional around houses in in disturbed areas, reported only from the lowlands. A modern introduction, native to tropical America. Lamoureux 3066; Whistler 5185, 8953!.

Drypetes vitiensis Croizat

Small to medium-sized dioecious tree with leathery, alternate leaves, green flowers bearing numerous stamens, and female trees producing ellipsoid fruits. Uncommon to locally common in coastal to lowland forest, reported from near sea level to 200 m elevation. Indigenous, also found in Fiji, Tonga, and Niue. Whistler 3670a, 8069!, 8071!, 8413.

***Euphorbia cyathophora** Murray
[wild poinsettia]

Erect herb with milky sap, alternate to opposite leaves notched on the sides, and red-based floral bracts below the green, and apetalous flowers arranged in cyathia. Occasional in disturbed places and perhaps casually cultivated, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 3535.

***Euphorbia reineckei** Pax

Small, erect, scarcely branching shrub with milky sap, opposite leaves, greenish flowers in axillary cyathia, and green, 3-lobed fruits. Uncommon in lowland to cloud forest, reported from 280 to 1700 m elevation. Endemic. Whistler 3673.

Glochidion cuspidatum Pax
masame

Small to medium-sized tree with alternate leaves pubescent below, tiny yellow, 3-merous flowers, and wheel-like fruits. Occasional in forest clearings, reported from 300 to 750 m elevation. Indigenous, ranging from Melanesia to Samoa. Setchell 388; Christophersen 1028; Long 3051; Whistler 2743, 8514!.

Glochidion ramiflorum Forst.
masame

Small to medium-sized tree with glabrous alternate leaves, tiny yellow, 3-merous flowers, and wheel-like fruits. Common in open and secondary forest, reported from near sea level to 1400 m elevation. Indigenous, ranging from Melanesia to eastern Polynesia. Setchell 220, 537; Bryan 986; Garber 790; Yuncker 9343; Long 3108, 3120a; Spence 475!; Whistler 1472, 2809, 3762.

Macaranga harveyana (Muell. Arg.) Muell. Arg.
lau pata; pata

Small to medium-sized tree with peltate alternate leaves, tiny green flowers in spreading axillary panicles, and soft-spiny fruits. Common in disturbed places and early secondary forest, reported from 10 to 400 m elevation. Indigenous, ranging from Fiji to Tahiti. Setchell 253, 316; Swezey 57; Meebold 21361, 26591; Yuncker 9388; McKee 2940; Comstock 18; Wisner 81; Spence 473; Whistler 1419, 9020!, 9111.

Macaranga stipulosa Muell. Arg.
lau fatu; patafatu

Medium-sized tree with huge peltate, alternate leaves, tiny green flowers in spreading axillary panicles, and small, 3-lobed fruits. Occasional in lowland to montane forest, often in clearings, reported from 30 to 700 m elevation. Endemic. Setchell 206; Diefenderfer 7; Whistler 2733.

Omalanthus nutans (Forst. f.) Guillemin
fogmamala; fanua mamala

Small tree with milky sap, glacous, deltoid, alternate leaves, racemes of tiny cream-colored male flowers, solitary female flowers, and bilobed fruits. Occasional in open forest and disturbed places, reported from 25 to 1500 m elevation. Indigenous, ranging from New Caledonia and the Caroline Islands to Tahiti. Setchell 77, 153, 580; Wilder 31, 92; Bryan 81, 966, 1013; Garber 847; Mitchell 503; Meebold 26566; Yuncker 9434 (n.s.); Wisner 82; Spence 487; Whistler 2862, 8767!, 9165.

Phyllanthus amarus Sch. & Thon.

Erect herb with spirally arranged branches bearing small, alternate, elliptic, round-tipped leaves arranged in one plane, and tiny green flowers and schizocarps on the lower side of the branches at the axils. Common in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Setchell 14, 534; Wilder 19; Garber 951, 955; Diefenderfer 25; Whistler 8954!.

Phyllanthus debilis Klein ex Willd.

Erect herb with longitudinally ridged stems, alternate, acute-tipped, oblanceolate leaves arranged in one plane, and tiny green flowers on the lower side of the branches at the axils. Occasional in disturbed places, reported from near sea level to 250 m elevation. A modern introduction, native to the Old World tropics. Whistler 8521!.

Phyllanthus urinaria L.

Low herb with spirally arranged branches bearing small, alternate leaves arranged in one plane, reddish stems, tiny green, solitary, axillary flowers on the lower side of the branches, and a tiny globose schizocarp. Occasional in lawns and other disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Lamoureux 3083; Whistler 8955!.

Phyllanthus virgatus Forst. f.

Erect herb with spirally arranged branches bearing small alternate leaves, tiny green flowers, and tiny green, spherical fruits. Uncommon in sunny or disturbed places in lowland forest, reported from 40 to 260 m elevation. Indigenous or a Polynesian introduction, ranging from Asia to eastern Polynesia. Setchell 330; Whistler 8694!.

***Ricinus communis** L.

Shrub with large, alternate, purplish, palmately lobed leaves, unisexual flowers with the apetalous male flowers in dense, yellow heads, and soft-spiny fruits containing six mottled seeds that are poisonous. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to Africa. Whistler 8897.

FABACEAE

Abrus precatorius L.
[rosary pea] matamoso

Climbing vine with alternate, pinnately compound leaves, lavender papilionaceous flowers, and red and black seeds in pods. Uncommon in coastal vegetation, reported from near sea level to 100 m elevation. Indigenous or possibly a Polynesian introduction, widespread in the tropics. Setchell 312; Wilder 18; Whistler 1484, 2952, 9030!.

Adenanthera pavonina L.
lopa

Medium-sized tree with pinnately compound leaves, small yellow flowers in spikes, and red seeds in long, twisted (when open) pods. Occasional in disturbed forest and casually cultivated, reported from near sea level to 200 m elevation. A modern introduction, widespread in cultivation in the tropics. Diefenderfer 17.

Alysicarpus vaginalis (L.) DC.

Prostrate herb with simple, alternate, oblong leaves, red papilionaceous flowers in racemes, and narrow, cylindrical pods. Common in lawns and sunny disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Lamoureux 3076; Whistler 8972!.

Caesalpinia major (Medic.) Dandy & Exell
[yellow nickers] 'anaoso

Scandent to climbing shrub with thorny stems, bipinnately compound leaves, distinct stipules, yellow flowers, and yellow-gray seeds in spiny pods. Occasional in littoral habitats to montane forest, reported from near sea level to 650 m elevation. Indigenous, pantropic in distribution. Setchell 363; Whistler 2814?, 8932!. *Caesalpinia bonduc* Roxb., which is present on 'Aunu'u, is hard to distinguish from this species, and may also be present on Tutuila. It has conspicuous leafy stipules, which are lacking in *C. major*.

Calopogonium muconoides Desv.

Vine with stiffly hairy foliage and stems, alternate trifoliate leaves, and stalked, short racemes of lavender flowers. Locally common in disturbed places, reported from near sea level to *ca.* 600 m

elevation. A modern introduction, native to tropical America. Whistler 8569!.

Canavalia cathartica Thou.

Creeping or climbing vine with alternate, trifoliate, acute-tipped leaves, and mauve, papilionaceous flowers. Common climbing in trees of coastal and littoral forest, sometimes weedy farther inland, reported from near sea level to 340 m elevation. Indigenous, widespread in the tropics. Wisner 107, 108; Whistler 8938.

Canavalia rosea (Sw.)DC.
fue fai va'a

Creeping vine with alternate, trifoliate, notched or round-tipped leaves, and mauve, papilionaceous flowers. Occasional on sandy beaches, reported only near sea level. Indigenous, widespread in the tropics. Setchell 194; Whistler 8920!.

***Crotalaria pallida** Ait.
[rattlepod]

Shrub with alternate, trifoliate leaves, dense terminal racemes of yellow papilionaceous flowers marked with red lines, and glabrous inflated pods. Common in disturbed places, reported only from the lowlands. Setchell 57.

***Crotalaria retusa** L.

Subshrub with simple, alternate, oblanceolate leaves, yellow and reddish papilionaceous flowers, and inflated pods. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to Asia. (Whistler).

Dendrolobium umbellatum (L.) Benth.
lala

Shrub with alternate trifoliate leaves, small white papilionaceous flowers, and small, jointed, several-seeded pods. Common in the littoral strand, reported from near sea level to 260 m elevation. Indigenous, ranging from Mauritius to Niue. Setchell 287; Garber 820; Bryan 979 (n.s.), 1375; Wilder 224; Meebold 8242, 26584; Comstock s.n.; Wisner 17; Long 3092; Spence 500; Whistler 2855.

Derris trifoliata Lour.
fue o'ona

Climbing woody vine with alternate trifoliate leaves, small mauve, papilionaceous flowers, and a flattened, suborbicular pod. Uncommon in littoral and coastal forest, reported from near sea level to 130 m elevation. Indigenous, widespread in the Pacific as far east as Rarotonga. Garber 853; Whistler 3539, 8748!, 9172.

***Desmanthus virgatus** (L.) Willd.

Erect subshrub with alternate, bipinnately compound leaves, globose heads of flowers having showy white stamens, and a long narrow pod. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 5186, 8445.

***Desmodium heterocarpon** (L.) DC.

Small shrub with alternate trifoliate leaves, lavender papilionaceous flowers, and jointed fuzzy pods. Occasional in sunny disturbed areas and fernlands, reported from near sea level to 175 m elevation. A Polynesian introduction or perhaps indigenous, ranging from Southeast Asia to Hawai'i. USEE s.n. (n.s.); Wilder 13; Whistler 1486, 2933.

Desmodium incanum DC.

Herb with alternate, trifoliate leaves, variegated, oblong, leaflets, mauve papilionaceous flowers, and fuzzy, jointed pods. Occasional to common in lawns and sunny disturbed areas, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 329, 1452, 8956!.

Desmodium tortuosum (Sw.) DC.

Tall, erect, somewhat woody herb with alternate trifoliate leaves, mauve papilionaceous flowers, and twisted, jointed pods. Occasional in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 303, 1454, 8911!.

Desmodium triflorum (L.) DC.

Prostrate herb with alternate trifoliate leaves, short racemes of mauve, papilionaceous flowers, and a

papery, jointed pod. Occasional in disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Setchell 233; Eames T2; Garber 799, 945; Lamoureux 3056; Whistler 8959!.

***Entada phaseoloides** (L.) Merr.
[St. Thomas bean] fue inu

High-climbing woody vine with alternate, pinnately compound leaves, small, dense racemes of flowers bearing showy white stamens, and large woody pods containing large, flat round seeds. Occasional in coastal to lowland forest, reported from near sea level to 180 m elevation. Indigenous, ranging from east Africa to the Austral Islands. Whistler 3624, 3746, 8485, 9138.

***Erythrina fusca** Lour.
lalapa

Thorny, medium-sized tree with alternate trifoliate leaves, oval leaflets, and large showy red papilionaceous flowers. Occasional in swampy coastal places, reported only near sea level. A modern introduction or possibly indigenous, pantropic in distribution. Christophersen 1035; Whistler 8061.

***Erythrina subumbrans** (Hassk.) Merr.
[dadap] gatae palagi

Medium-sized tree with alternate, trifoliate leaves, racemes of reddish orange flowers, and long pods. Occasional in disturbed places, planted as a nitrifying plant for cacao and escaping, reported from near sea level to *ca.* 600 m elevation. A modern introduction, native from Southeast Asia to Malaysia. Whistler 3082.

Erythrina variegata L.
[coral tree] gatae

Large thorny tree with alternate trifoliate leaves, broadly ovate leaflets, large showy red papilionaceous flowers in racemes, and large, black, cylindrical pods. Occasional in littoral to lowland forest, reported from near sea level to 125 m elevation. Indigenous, ranging from tropical Asia to the Marquesas. Setchell 197, 302; Mitchell 587; Comstock 20, 21, 27; Yuncker 9352; Wisner 112; Dutton 112; Whistler 2834.

***Indigofera hirsuta** L.

Small subshrub with alternate, pinnately compound leaves, small, racemes of salmon-colored papilionaceous flowers, and cylindrical pods. Rare in lawns and other disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Whistler 2969.

***Indigofera suffruticosa** Miller
[indigo]

Widely branching shrub with alternate, pinnately compound leaves, racemes of small, salmon-colored papilionaceous flowers, and short, cylindrical pods. Occasional to common in disturbed places, reported from near sea level to *ca.* 200 m elevation. A modern introduction, native to tropical America. USEE s.n.? (n.s.); Wilder 49.

Inocarpus fagifer (Parkinson) Fosb.
[Tahitian chestnut] ifi

Large tree with a fluted trunk, large simple, alternate leaves, tiny white flowers, and a large, thick-shelled fruit containing a large edible seed. Occasional to common in coastal to lowland forest, reported from near sea level to 350 m elevation. A Polynesian introduction, ranging from tropical Asia to the Marquesas. Graeffe 1386; Setchell 84, 355; Christophersen 893; Diefenderfer 12; Yuncker 9331; Whistler 3286.

Intsia bijuga (Colebr.) Kuntze
ifilele

Large tree with alternate, pinnately compound leaves, showy red and white flowers, and a large woody pod. Uncommon to occasional in coastal to lowland forest, reported from near sea level to 200 m elevation. Indigenous, ranging from East Africa to Samoa. Setchell 129a; Whistler 8046, 8664!.

Leucaena leucocephala (Lam.) de Wit
[wild tamarind] fuapepe

Shrub or small tree with alternate, bipinnately compound leaves, globose heads of flowers having showy white stamens, and flattened pods. Occasional to locally abundant in dry, disturbed places, reported from near sea level to *ca.* 250 m elevation. A modern introduction, native to tropical America. Setchell 180; Yuncker 9395; Whistler 8604!.

Macroptilium lathyroides (L.) Urb.

Erect to ascending, scarcely branching herb with alternate, trifoliate leaves, maroon papilionaceous flowers, and long, narrow, cylindrical pods. Occasional in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Lamoureux 3051; Whistler 3611, 9018!.

Mimosa invisa Mart. ex Colla
vao fefe Palagi

Scrambling, thorny shrub with alternate, bipinnately compound leaves with the pinnae arranged pinnately, and pink flowers in globose heads. Common in disturbed places such as roadsides, reported from near sea level to 600 m elevation. A modern introduction, native to tropical America. Whistler 8602!.

Mimosa pudica L.
[sensitive plant] vao fefe

Somewhat woody herb with thorny stems, alternate, bipinnately compound leaves with palmately arranged pinnae, and pink flowers in dense globose heads. Common in lawns, croplands, and waste places, reported only from the lowlands. A modern introduction, native to tropical America. Setchell 33; Whistler 8974!.

Mucuna gigantea (Willd.) DC.
fue inu

High-climbing woody vine with alternate trifoliate leaves, hanging racemes of showy white papilionaceous flowers, and smooth pods. Occasional to common in littoral to lowland forest, reported from near sea level to 200 m elevation, rarely up into cloud forest at 1200 m. Indigenous, ranging from India to Hawai'i. Setchell 322; Yuncker 9389; Wisner 129; Whistler 2884.

Paraserianthes falcataria (L.) I. Nielsen
tamaligi

Large tree with alternate, bipinnately compound leaves with small leaflets (*ca.* 5 mm wide), short spikes of flowers with showy white stamens, and a flattened pod. Occasional in disturbed areas, reported from 200 to 350 m elevation. A modern introduction, native to Melanesia. Whistler 8605!.

***Pongamia pinnata** (L.) Merr.

Large tree with alternate, pinnately compound leaves, racemes or panicles of white to pink, papilionaceous flowers, and woody pods. Rare in littoral to coastal forest, reported only near sea level. Indigenous, ranging from the Seychelle Islands to Samoa. Setchell 311.

Pueraria lobata (Willd.) Ohwi
[kudzu] a'a

Hairy vine with large, alternate, lobed, trifoliate leaves, violet papilionaceous flowers with a blotch of yellow, and a long, hairy pod. Occasional in disturbed places, reported only from near sea level to 350 m elevation. A Polynesian introduction, native to Asia. Garber 849; Whistler 1288, 9010.

***Senna alata** (L.) Roxb.
[candelabra plant] la'au fai lafa

Shrub with alternate, pinnately compound leaves bearing oval leaflets, showy orange and yellow flowers, and a black, winged pod. Uncommon in disturbed places and sometimes in wetlands, reported from near sea level to *ca.* 300 m elevation. A modern introduction, native to tropical America. Whistler 2837, 3288.

***Senna sophera** (L.) Roxb.

Subshrub with alternate, pinnately compound leaves, ovate leaflets, yellow, 5-merous flowers, and narrow, flattened pods. Rare in disturbed places, perhaps no longer found in Samoa, reported only from the lowlands. A Polynesian introduction, native to the Old World tropics. Setchell 293.

***Senna tora** (L.) Roxb.
[peanut weed] vao pinati

Subshrub with alternate, pinnately compound leaves, obovate leaflets, yellow, 5-merous flowers, and long, linear pods. Uncommon in pastures and other disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Setchell 529.

***Sophora tomentosa** L.

Shrub with silvery, alternate, pinnately compound leaves, showy yellow papilionaceous flowers, and narrow pods constricted between the seeds. Uncom-

mon on sandy beaches and spits, reported only near sea level. Indigenous, pantropic in distribution. Setchell 127; Whistler 3531.

***Uraria lagopodoides** (L.) Desv. ex. DC.

Low subshrub with alternate, trifoliate leaves and purple, papilionaceous flowers in a dense, hairy, terminal raceme. Uncommon in lawns and other disturbed places, reported only in the lowlands. A Polynesian introduction, native to South Asia. Setchell 350; Wilder 11.

***Vigna adenantha** (G. F. W. Meyer) Maréchal, Mascherpa, & Stainier

Prostrate vine with alternate, trifoliate leaves, lavender and white, contorted papilionaceous flowers, and cylindrical pods. Uncommon in coastal areas and plantations, reported only from the lowlands. Probably indigenous, pantropic in distribution. Mitchell 538; Wisner 91; Whistler 308, 8733.

Vigna marina (Burm.) Merr.
[beach pea] fue sina

Prostrate vine with alternate trifoliate leaves, yellow, papilionaceous flowers, and black cylindrical pods. Common to abundant on the littoral strand, occasionally inland on roadsides, reported from near sea level to *ca.* 300 m elevation. Indigenous, pantropic in distribution. Setchell 101, 559; Wilder 28; Garber 954; Comstock s.n.; Yuncker 9360; Wisner 133; Whistler 1428, 3293, 9022!.

FLACOURTIACEAE

Casearia sp. nova

Small tree with alternate leaves, white flowers, and an ovoid capsule. Occasional in lowland forest, reported from 10 to 400 m elevation. Endemic. Setchell 282; McKee 2957; Kuruc 122, 153; Whistler 1463, 2723, 2868, 8584!, 9166.

Erythrospermum acuminatissimum (A. Gray) A. C. Smith

Small tree with alternate leaves, racemes of white or pink flowers, and a 3-valved capsule. Occasional in lowland to montane forest, reported from 20 to 600 m elevation. Indigenous, also found in Fiji. Setchell 267, 278; Christophersen 999, 3487, 3542; Whistler 2892, 5726, 8050, 8462, 8669!.

Flacourtia rukam Zoll. & Mor. ex Mor.
filimoto

Medium-sized tree with alternate leaves having toothed margins, small, white, apetalous flowers bearing many stamens, and a red spherical edible fruit. Occasional in lowland to montane forest, reported from *ca.* 50 to 500 m elevation. Indigenous, also found in Tonga and westward (excluding Fiji). Setchell 262, 573; Garber 920; Bryan 982 (n.s.); Mitchell 570; Comstock 1; Yuncker 9401a; Wisner s.n.; Spence 466!; Whistler 1474, 2781, 3114, 3633, 8617!.

Homalium whitmeeanum St. John

Small tree with alternate, toothed leaves and white, many-petaled flowers in dense, hanging racemes. Uncommon in open forest on lava flows and in scrub forest, reported from near sea level to 550 m elevation. Indigenous, also found in Tonga. Christophersen 3491; Whistler 2976, 8454, 8694!.

GESNERIACEAE

***Cyrtandra geminata** Reinecke

Shrub with opposite leaves, large, showy white flowers, and a pair of terminal bracts on the peduncle. Occasional in montane scrub, reported from 450 to 600 m elevation. Endemic to Tutuila. Reinecke 477; Setchell 548; Christophersen 1041, 3563; Long 3069; Whistler 3669, 9068.

***Cyrtandra longipedunculata** Rechinger

Shrub with opposite ovate to elliptic, cymes of showy white flowers on long peduncles, and ovoid fleshy fruits. Uncommon in lowland to montane forest, reported from 250 to 910 m elevation. Endemic. Bryan 83.

Cyrtandra pulchella A. Gray

Shrub with opposite, elliptic to falcate, glabrous leaves, large, 1–7-flowered cymes with very small bracteoles, and large, showy white flowers. Occasional in lowland to montane forest, reported from 200 to 800 m elevation. Endemic. USEE s.n.; Setchell 340, 553; Bryan 78; Yuncker 9413; Wisner 153; Christophersen 983, 1266, 1818!, 1829!; Spence 512!; Whistler 2709.

Cyrtandra samoensis A. Gray
momolea?

Shrub with large elliptic to ovate, opposite leaves, small white sympetalous flowers in axillary cymes, and fleshy orange berries. Occasional in littoral to montane forest, reported from near sea level to 850 m elevation. Indigenous, also found in Tonga and Niue. Graeffe 493, 496; Setchell 9; Bryan 75, 957; Christophersen 981; Mitchell 577; Meebold 8258, 16724, 26513; Bayliss s.n.; Wisner 155; Lamoureux 3019; Long 3088, 3099, 3113; Spence 478!; Clay s.n.; Fosberg 54920; Whistler 2859, 2878, 3118, 8609!.

***Cyrtandra** sp. nova

Shrub with large opposite leaves, cymes of small white flowers subtended by sheathing bracts, and orange berries. Occasional in lowland forest, reported from 250 to 450 m elevation. Endemic to Tutuila. Setchell 368, 567; Christophersen 3583?; Long 1962, 3071, 3078, 3110; Whistler 2731.

GOODENIACEAE

Scaevola taccada (Gaertn.) Vahl
to'ito'i

Shrub with waxy, opposite, spathulate leaves, white one-sided flowers, and white fleshy fruits. Abundant on the seaward margin of littoral forest and sometimes inland up to 300 m elevation. Indigenous, widespread throughout the tropical Pacific. Setchell 116, 229, 346; Garber 947; Diefenderfer 6; Wisner 20; Long 2600; Lamoureux 3022; Whistler 1426, 2854.

HERNANDIACEAE

Hernandia moerenhoutiana Guillemin
pipi

Large, soft-wooded tree with alternate leaves, small white flowers, and a reddish, lantern-like fruit enclosing the single large black seed. Occasional in lowland to cloud forest, reported from 100 to 1300 m elevation. Indigenous, ranging from the Solomon Islands to the Tahiti. Setchell 365, 445; Christophersen 1058, 3523; Spence 469!(n.s.); Whistler 2803, 2964, 3124, 8661.

Hernandia nymphaeifolia (Presl) Kub.
[Chinese lantern tree] pu'a

Large, spreading tree with alternate, peltate leaves, small white flowers, and a green to white or pink, lantern-like fruit enclosing a single black marble-like seed. Common in littoral forest, particularly on sandy shores, reported only near sea level. Indigenous, ranging from East Africa to the Marquesas. Setchell 143; Garber 961; Mitchell 531; Wisner 96, 105; Whistler 2946, 9021!.

ICACINACEAE

Citronella samoensis (A. Gray) Howard

Small tree with glossy, alternate leaves, racemes of small white flowers, and large, ellipsoid fruits. Occasional in lowland to cloud forest, reported from 50 to 1600 m elevation. Indigenous, also found in Tonga. Setchell 217, 261, 443; Wilder 36; Garber 899; Mitchell 522; Yuncker 9409; Whistler 1462, 2702, 2865, 8706!.

***Medusanthera samoensis** (Reinecke) Howard
matamo

Small to medium-sized tree with oblong, alternate leaves, white flowers with hairy, protruding stamens, and a flattened-ellipsoid fruit with a pink, fleshy protuberance on one side. Occasional in lowland to cloud forest, reported from 60 to 1400 m elevation. Endemic. Garber 919; Whistler 2961.

LAMIACEAE

***Pogostemon cablin** (Blanco) Benth.
[patchouli] patiale

Subshrub with opposite, toothed, ovate, fragrant leaves and verticils of bilabiate flowers in spicate racemes or panicles (but uncommonly flowering). Uncommon to locally abundant in disturbed places and along trails, reported from near sea level to 200 m elevation. A modern introduction, native to South Asia. Whistler 8493.

LAURACEAE

Litsea samoensis (Christoph.) A. C. Smith
papaono

Medium-sized to large tree with alternate, reddish-tomentose young leaves, orange flowers, a persistent, cup-like calyx, and an ovoid fruit. Occasional

in lowland to cloud forest, reported from 100 to 1200 m elevation. Indigenous, also found on Niue. Graeffe s.n.; Setchell 286, 448, 462, 571; Long 3052; Whistler 2782, 3647, 8642!.

LOGANIACEAE

Fagraea berteroana A. Gray ex Benth.
pualulu

Large tree with glossy opposite leaves, large, showy, tubular, white to pale orange flowers, and a large orange fruit containing many black seeds. Common in lowland to montane forest, reported from *ca.* 50 to 930 m elevation. Indigenous, ranging from Fiji to the Marquesas. Setchell 367; Garber 882; Christophersen 1208; Meebold 21415; Yuncker 9341, 9392; Lamoureux 3009; Long 3105; Whistler 2804, 8987!.

Geniostoma rupestre Forst.
taipoipo; lau mafatifati

Small tree with simple, opposite leaves, tiny white flowers, and a small greenish capsule containing many red seeds. Common in coastal to cloud forest, reported from near sea level to 1600 m elevation. Indigenous, ranging from Taiwan and the Celebes to the Cook Islands. Setchell 117, 264, 578; Seale s.n.; Diefenderfer 29; Yuncker 9336; Kuntze 23007; Meebold 12646; Whistler 1272, 1480, 2766!, 2850, 2940, 3645, 8670!, 9067.

LORANTHACEAE

Decaisnina forsteriana (J. A. & J. H. Schultes) Barlow
tapuna

Hemiparasitic shrub with opposite leaves, long, narrow red, erect flowers with a flared calyx, and a small, ellipsoid, fleshy red fruit. Occasional in littoral to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from Fiji to the Cook Islands. Reinecke 159a; Setchell 372, 575; Wilder 227; Mitchell 569; Spence 491!; Whistler 2783, 2965.

LYTHRACEAE

Cuphea carthagenensis (Jacq.) Macbr.

Sticky herb with opposite leaves, purple, 6-parted axillary flowers, and small ovoid capsules surrounded by the longitudinally ribbed calyx. Occasional in pastures and wet, sunny places, reported only from near sea level to 650 m elevation. A modern introduction, native to tropical America. Setchell 542a; Lamoureux 3069; Whistler 3234, 8621!.

MALVACEAE

***Gossypium hirsutum** L.
[native cotton] vavae

Shrub with alternate, palmately lobed leaves, white monadelphous flowers, and a splitting capsule filled with cotton. Occasional on open coastal slopes of tuff-cone islets, reported only from the lowlands. Indigenous, widespread from Samoa to South America. Whistler 8393.

***Hibiscus abelmoschus** L.
fau Tagaloa

Small hairy subshrub with alternate, palmately lobed leaves, large showy yellow, monadelphous flowers with purple at the base, and a hairy ovoid capsule. Uncommon to occasional in disturbed (often wet) places, reported from near sea level to 350 m elevation. A Polynesian introduction, probably native to tropical Asia. Setchell 59, 241a, 525.

Hibiscus tiliaceus L.
[beach hibiscus] fau

Medium-sized, scrambling tree with alternate cordate leaves, yellow flowers purple at the base, and a 5-celled capsule. Common to abundant in littoral forests, mangrove swamp margins, and disturbed and secondary forest, reported from near sea level to 650 m elevation. Indigenous, pantropic in distribution. Setchell 53, 242; Eames T30; Diefenderfer 15; Comstock 30; Mitchell 534; Yuncker 9399; Wisner 15; Dutton 6; Long 2596; Herbst 6564; Whistler 2812, 3285, 8612!.

Sida rhombifolia L.
mautofu

Erect subshrub with ovate, alternate leaves, pale orange, monadelphous flowers on long axillary pedicels, and a beaked, wheel-shaped, 9–12-merous schizocarp. Common in disturbed places, reported from near sea level to 600 m elevation. A Polynesian introduction, native to the Old World tropics but now pantropical. Setchell 8; Wilder 23; Garber 815; Diefenderfer 8; Whistler 8618!.

Thespesia populnea (L.) Sol. ex Corr.
[Pacific rosewood] milo

Medium-sized tree with glossy, alternate, cordate leaves, yellow flowers purple at the base, and a subglobose, non-splitting fruit. Occasional to common in littoral forest, reported only near sea level. Indigenous, ranging from tropical Africa to eastern Polynesia. Setchell 95; Christophersen 1206; Yuncker 9372; Whistler 1449, 3283, 3763, 8918!.

***Urena lobata** L.
mautofu

Erect subshrub with alternate leaves, pink monadelphous flowers, and a subglobose, bur-like fruit. Uncommon in disturbed places, reported only from the lowlands. A Polynesian introduction, probably native to tropical Asia. Garber 897; Diefenderfer 19; Whistler 3235.

MELASTOMACEAE

***Astronidium navigatorum** Christoph.

Small tree with opposite leaves 3–5-veined from the base, petioles of mature leaves orange and less than 2 cm long, small white, 4-merous flowers with geniculate stamens, and tiny capsules. Occasional in lowland to montane forest, reported from 250 to 900 m elevation. Endemic. Reinecke 473; Christophersen 1059, 1070, 3509, 3534; Whistler 2710, 3649, 3839, 8937.

Astronidium pickeringii (A. Gray) Christoph.

Small tree with opposite leaves 3–5-veined from the base, petioles of mature leaves red and more than 2 cm long, calyx entire to shallowly lobed, and 5-merous white flowers with geniculate stamens. Occasional to common in lowland to montane forest, reported from 130 to 900 m elevation. Plants found on trachyte soil have a distinctly lobed calyx and more compact inflorescence, and may represent a separate endemic species. Endemic. USEE s.n. (n.s.); Powell s.n.; Graeffe s.n.; Reinecke 572?; Setchell 341, 401; Bryan 92; Christophersen 1047, 1064, 3507; Mitchell 567; Long 2607, 3005, 3072; Spence 471!; Whistler 2712, 2748, 2977, 3758, 3840, 8721!.

Clidemia hirta (L.) D. Don
[Koster's curse]

Shrub with opposite, hispid leaves palmately veined from the base, small white flowers in axillary clusters, geniculate stamens, and purple fruits. Common to abundant in sunny disturbed places and native forests and scrub, reported from near sea level to 900 m elevation. A modern introduction, native to tropical America. Wisner 5; Long 1966, 2604, 3048; Whistler 311.

Dissotis rotundifolia (Sm.) Triana

Low herb with opposite, ovate leaves, 4-merous flowers with showy purple-pink petals, and yellow, geniculate stamens. Uncommon but sometimes locally common in coconut plantations and other disturbed places, reported only from the lowlands. A modern introduction, native to tropical Africa. Whistler 8480, 8968!.

Medinilla samoensis (Hochreut.) Christoph.

Woody climber with opposite, 3–5-veined leaves, pink 4-merous flowers with geniculate stamens, and a subglobose capsule. Occasional in montane forest, reported from 350 to 700 m elevation. Indigenous, probably also found on Futuna. Graeffe s.n.; Christophersen 1141!, 3571; Yuncker 9404; Lamoureux 3006; Long 1952; Whistler 2779.

Melastoma denticulatum Labill.
fua lole

Shrub with opposite pubescent leaves 3–5-veined from the base, white flowers with geniculate stamens, and a scaly fruit opening to expose the red pulp. Common in forest clearings and disturbed places, reported from near sea level to 900 m elevation. Indigenous, ranging from New Caledonia to Tahiti. Reinecke 529; Setchell 30, 378, 524; Eames T4; Bryan 82; Wilder 1, 14, 81; Christophersen 1060, 3492, 3568, 3578; Mitchell 507; Wisner 76, 137; McKee 2942; Long 2602, 3117; Whistler 2927, 8613!.

MELIACEAE

Aglaia samoensis A. Gray
laga'ali

Small tree with alternate, pinnately compound leaves, tiny fragrant flowers in long panicles, and an

ellipsoid drupe. Occasional in lowland to cloud forest, reported from 20 to 1030 m elevation. Endemic. USEE s.n.; Setchell 156; Garber 879, 914; Diefenderfer 8; Mitchell 502; Meebold 25571, 26590; Yuncker 9403; Wisner 151; Lamoureux 3004; Whistler 2870, 8470, 9168.

Dysoxylum huntii Merr.
maota mea

Large tree with alternate, pinnately compound leaves, 4–6 pairs of leaflets, white tubular flowers in short panicles, and subglobose fruits containing 4 red seeds. Common in montane forest, rarely in lowland forest, reported from 150 to 1750 m elevation. Endemic. Setchell 366, 435, 438; Christophersen 3537; Spence 507!; Whistler 2763!, 2776!.

Dysoxylum maota Reinecke
maota

Large tree with alternate, pinnately compound leaves, more than 6 pairs of leaflets, white tubular flowers with a whorl of bracts below the calyx, and wrinkled, yellow-brown, subglobose fruits containing 4 red seeds. Common in coastal to montane forest, reported from near sea level to 450 m elevation. Indigenous, also found in 'Uvea and Futuna. Setchell 434; Bryan 1006; Wisner 50, 51; Kuruc 105; Whistler 3536, 8397, 8568!, 9135.

Dysoxylum samoense A.Gray
mamala; maota mamala

Large tree with alternate, pinnately compound leaves, more than 6 pairs of leaflets, white tubular flowers lacking bracts, and brown, subglobose fruits containing four red seeds. Common to abundant in lowland to montane forest, reported from near sea level to 750 m elevation. Endemic. Setchell 150, 358, 424, 433; Garber 916; Meebold 16720, 26595; Whistler 2843, 5732.

***Xylocarpus moluccensis** (Lam.) Roemer
[puzzlenut] le'ile'i

Small to medium-sized tree with alternate, pinnately compound leaves, tiny white flowers in long panicles, and large green globose fruits containing several large tan seeds packed tightly together. Uncommon in littoral forest and mangrove swamp margins, reported only near sea level. Indigenous, ranging from Madagascar to Samoa. Setchell 439; Garber 1118; Christophersen 1177; Yuncker 9380; Whistler 2810, 2811.

MONIMIACEAE

Hedycarya denticulata (A. Gray) Perk. & Gilg

Small tree with alternate, dark green leaves, head-like inflorescences of tiny sessile yellow flowers, and glossy red fruits. Common in the lowland to cloud forest, reported from 150 to 1550 m elevation. Endemic. Setchell 384, 566; Wilder & Swezey 229; Garber 846, 910; Christophersen 1140!; Mitchell 568; Yuncker 9351; Long 3065, 3090; Spence 506; Whistler 2736.

MORACEAE

***Castilla elastica** Sessé
pulu mamoe

Large tree with milky sap, large, oblong, alternate leaves, and inconspicuous flowers forming a sessile, cauliflorus aggregate fruit. Uncommon in disturbed forest, noted so far only on the western portion of the island (where it is locally common at Maloata) and 'Ili'ili (where it is rare), reported from *ca.* 100 to 700 m elevation (in Western Samoa). A modern introduction, native to tropical America. Whistler 8449.

Ficus godeffroyi Warb.
mati

Small to medium-sized tree with milky sap, glabrous alternate leaves having a rounded base, and fig-like, often clustered fruits. Occasional in lowland to montane forest, reported from 20 to 900 m elevation. Endemic. Reinecke 76b; Setchell 68; Garber 936; Christophersen 982, 998, 1143!; Meebold 26517; Yuncker 9337; Spence 498, 499; Whistler 1282, 2726, 3602, 8589!, 8992!.

Ficus obliqua Forst. f.
[banyan] aoa

Large banyan tree with relatively few hanging roots, milky sap, alternate lanceolate leaves, and subglobose red fruits subtended by caducous bracts. Occasional to common in lowland to montane forest, reported from 30 to 700 m elevation. Indigenous, ranging from Australia and the Celebes to Samoa. Setchell 198, 315, 422; Swezey s.n. (n.s.); Whistler 1467, 2923, 3671.

Ficus prolixa Forst. f.
[banyan] aoa

Large banyan tree with milky sap, alternate lanceolate leaves, and yellow subglobose fruits subtended by persistent bracts. Occasional to common in lowland forest, reported from 20 to 150 m elevation. Indigenous, ranging from New Caledonia to the Marquesas. Swezey s.n.; Whistler 3671, 8467.

Ficus scabra Forst. f.

Small to medium-sized tree with milky sap, alternate scabrous leaves, and red to yellow fig-like fruits. Common to abundant in littoral forest, less so in lowland forest, reported from near sea level to 300 m elevation. Indigenous, ranging, from New Caledonia to Niue. Setchell 148, 314, 421, 427, Meebold 8250, 16732; Comstock 31; Yuncker 9437; Wisner 11; McKee 2954; Whistler 1286, 2914, 8598!, 9114.

Ficus tinctoria Forst. f.
[dyer's fig] mati

Small tree with milky sap, glossy alternate leaves, bracts at the base of the peduncle, and red to orange, subglobose fruits. Common in lowland to montane forest, reported from 30 to 600 m elevation. Indigenous, ranging from India to the Marquesas. Graeffe 1318; Bryan 76, 1010; Diefenderfer 13, 18; Swezey s.n. (2); Mitchell 510, 574; Yuncker 9382; McKee 2955; Wisner 54, 120; Whistler 1441, 2856, 2857, 8551!, 9143.

Ficus uniauriculata Warb.

Small to medium-sized tree with milky sap, alternate leaves having a one-sided auriculate base, scabrous surfaces, and fig-like fruits. Occasional in coastal to montane forest, reported from near sea level to 800 (1600?) m elevation. Endemic. Setchell 69; Swezey 7; Christophersen 998; Meebold 16732; Mitchell 509; Whistler 2879, 8981!, 9079, 9112.

MYRISTICACEAE

Myristica fatua Houtt.
[Samoan nutmeg] 'atone

Medium-sized tree with alternate leaves pale beneath, tiny yellow flowers, and a tan, ellipsoid fruit containing a large seed surrounded by a red aril. Common to abundant in lowland to montane forest, reported from near sea level to 600 m elevation. Indigenous, ranging from Vanuatu to Samoa. Setchell 1, 67; Wilder 91; Bryan 73; Garber 908; Christophersen 984, 985; Meebold 21351; Yuncker 9326; Wisner 59, 66; Long 1976, 3084; Spence 470!; Whistler 2721, 2872, 8585!.

Myristica hypargyraea A. Gray
'atone

Medium-sized tree with alternate leaves gray-green beneath, tiny yellow flowers, and a reddish-brown subglobose fruit containing a large seed surrounded by a yellow aril. Common to abundant in lowland to montane forest, reported from near sea level to 930 m elevation. Indigenous, also found on Futuna, Alofi, and possibly Rotuma. Reinecke 445; Setchell 342; Garber 917, 918, 928; Swezey & Wilder 58; Christophersen 996; Yuncker 9419; Wisner 58; Whistler 2744, 8659!.

MYRSINACEAE

Embelia vaupelii Mez

Woody climber with alternate leaves, white-dotted stems, and small white flowers. Uncommon in lowland to cloud, reported from near sea level to 1750 m elevation. Indigenous, also found in Tonga. Setchell 569; Wisner 56; Whistler 9149.

Maesa tabacifolia Mez

Shrub with alternate leaves, white-dotted stems, tiny white flowers in racemes or panicles, and small, flesh-colored fruits. Occasional in lowland to montane forest, reported from near sea level to 1000 m elevation. Indigenous, also found in Tonga and Fiji. Lister s.n.; Setchell 581; Diefenderfer 3; Seale s.n.; Christophersen 3522; Yuncker 9359; Wisner 154; Lamoureux 3003; Spence 505!; Whistler 2762!, 2887, 8815!.

***Rapanea myricifolia** (A. Gray) Mez

Small tree with alternate coriaceous leaves, tiny white cauliflorus flowers, and small subglobose fruits. Occasional in coastal to cloud forest, reported from 5 to 1500 m elevation. Indigenous, also found in Fiji. Setchell 382; Christophersen 1024, 1053, 1065, 1202, 3547; Whistler 3851.

MYRTACEAE

Decaspermum fruticosum Forst.
nu'anu'a

Shrub or small tree with opposite leaves, white 5-merous flowers bearing numerous stamens, and a capsule fruit. Uncommon in fernlands, disturbed places, and montane scrub, reported from 100 to 500 m elevation. Indigenous, ranging from Futuna to the Society Islands. Christophersen 1183, 3511, 3575; Whistler 3660, 8689!.

***Eugenia reinwardtiana** (Bl.) DC.
unuoi

Shrub or small tree with opposite leaves, white flowers bearing many stamens, and red succulent fruits. Uncommon in littoral and coastal forest, reported only from the lowlands. Indigenous, ranging from Micronesia and Fiji to Hawai'i. Powell s.n.; Whistler 3353, 8401.

Metrosideros collina A. Gray

Medium-sized tree with opposite leaves, clusters of flowers with showy red stamens, and capsules containing numerous tiny seeds. Occasional to common in montane scrub, reported from 100 to 1500 m elevation. Indigenous, ranging from Vanuatu to Hawai'i. Reinecke 643; Setchell 266; Christophersen 988, 1184, 1188, 1194, 1197, 1198, 1205, 3494, 3500, 3569, 3577, 3585!; Spence 497!; Whistler 3662, 8687!, 8723!.

Psidium guajava L.
[guava] ku'ava

Small tree with flaky bark, opposite leaves, white flowers bearing many stamens, and a yellow, pink-fleshed, many-seeded fruit. Occasional in pastures and other disturbed places, reported from near sea level to 600 m elevation. A modern introduction, native to tropical America. Setchell 55; Whistler 1485, 8960!.

Syzygium brevifolium (A. Gray) C. Muell.

Medium-sized tree with subsessile opposite leaves, terminal clusters of flowers bearing numerous white stamens, and small ovoid fruits. Occasional in montane scrub to cloud forest, reported from 235 to 1300 m elevation. Endemic. USEE s.n.; Christophersen 1025, 1051, 1071; Whistler 3850, 8620!.

Syzygium carolinense (Koidz.) Hosokawa

Small to medium-sized tree with opposite leaves, loosely branching inflorescences, and small white flowers bearing numerous stamens. Occasional in lowland to montane forest, reported from 100 to 700 m elevation. Indigenous, ranging from Micronesia to Samoa. Yuncker 9428!?; Spence 472!; Whistler 2773!, 2780, 2796a, 3543, 3651, 8484.

Syzygium clusiifolium (A. Gray) C. Muell.
asi vai

Medium-sized tree with finely veined opposite leaves, widely branching, cauliflorus inflorescences of white flowers, and purple ellipsoid fruits. Common to abundant in coastal to lowland forest, reported from near sea level to 200 m elevation. Indigenous, also found in Tonga, Niue, Wallis, and the Horne Islands. Lamoureux 3024a; Whistler 1280, 3755, 8469, 8954!, 9107!.

Syzygium dealatum (Burkill) A. C. Smith
asi vai

Medium-sized tree with opposite leaves, terminal inflorescences of white flowers bearing many stamens, and purple ovoid fruits. Occasional in coastal to lowland forest, reported from near sea level to 310 m elevation. Indigenous, also found in Tonga, Niue, and Uvea. Whistler 2886, 3750, 8588!.

Syzygium inophylloides (A. Gray) C. Muell.
asi

Large tree with finely veined leaves having a twisted attenuate tip, white flowers bearing numerous stamens, and yellowish ovoid fruits. Common in lowland to cloud forest, reported from near sea level to 750 m elevation. Indigenous, also found in Niue and Futuna. USEE s.n.; Setchell 337, 570; Bayliss s.n.; Wilder 93; Diefenderfer 14; Christophersen 1255; Whistler 2802, 8955!.

***Syzygium neurocalyx** (A. Gray) Christoph.
'oli; fena

Small tree with long, sessile, opposite leaves, large terminal sessile flowers bearing numerous white stamens, and large edible fruits. Rare in montane forest (in Western Samoa at least) and formerly cultivated, perhaps no longer found on Tutuila, reported from near sea level to 750 m elevation. A Polynesian introduction or perhaps indigenous, also

found in Tonga, Futuna, and Fiji. Setchell 295, 298b, 514; Mitchell 562.

Syzygium samarangense (Bl.) Merr. & Perry
nonu vao?

Small to medium-sized tree with opposite, subsessile leaves, showy white flowers with numerous stamens, and large red fruits. Common in coastal to montane forest, reported from 20 to 1500 m elevation. Probably a modern introduction, native to Indo-Malaysia. Kuruc 107; Whistler 1461, 2871, 9173.

Syzygium samoense (Burkill) Whistler
fena vao?

Medium-sized tree with opposite leaves, inflorescences with small bracts, white flowers bearing numerous stamens, and ovoid fruits. Occasional to common in lowland to cloud forest, reported from 180 to 1200 m elevation. Endemic. Christophersen 1008, 1199, 3482, 3498; Rainey 2394; Whistler 2688, 2749, 2957, 8658!, 9096!, 9341!.

NYCTAGINACEAE

Boerhavia albiflora Fosb.

Prostrate herb with alternate leaves, stalked clusters of tiny white flowers, and tiny sticky cylindrical seeds. Uncommon on rocky sea cliffs, reported only in coastal areas. Indigenous, widespread in the tropical Pacific. Whistler 8909!, 9026!

Boerhavia repens L.
ufi 'atuli

Prostrate herb with alternate leaves, reddish stems, tiny pink flowers in stalked clusters, and tiny sticky fruits. Occasional as a weed in coastal habitats and villages, reported only from the lowlands. Indigenous or possibly a Polynesian introduction, widespread in the Pacific. Garber 861; Wisner 45; Whistler 1465.

Pisonia grandis R. Br.
pu'a vai

Large tree with a white trunk, alternate to whorled leaves, small white flowers in terminal clusters, and sticky cylindrical fruits. Common on undisturbed sandy shores, reported only near sea level. Indigenous, ranging from Madagascar to Hawai'i. Setchell 313; Whistler 2953, 9019!.

Pisonia umbellifera (Forst.) Seem.

Small tree with leaves somewhat whorled, pink or white flowers, and sticky, long-cylindrical fruits. Occasional to common in lowland to montane forest, reported from near sea level to 900 m elevation. Indigenous, ranging from Madagascar to Hawai'i. Wisner 52; Whistler 2966, 8597!, 9159.

OLACACEAE

***Anacolosa insularis** Christoph.

Small tree with alternate leaves, tiny white, axillary subsessile flowers, and small ovoid fruits. Rare in lowland to montane forest, reported from near sea level to 450 m elevation. Endemic. Whistler 3348.

***Ximenia americana** L.
moli tai

Thorny shrub with small alternate leaves, white flowers hairy inside, and orange, globose, large-seeded fruits. Rare at the seaward margin of littoral forest, reported only near sea level. Indigenous, ranging from India to the Tuamotu Islands. Whistler 4661, 8074.

OLEACEAE

Chionanthus vitiensis (Seem.) A. C. Smith

Medium-sized tree with opposite leaves, small yellow flowers bearing two stamens, and large, single-seeded, spindle-shaped fruits. Rare in coastal and lowland forest, reported only from the lowlands. Indigenous, also found in Fiji, Tonga, and Niue. Whistler 8650!.

***Jasminum betchei** F. Muell.

Thin, climbing vine with opposite leaves, showy white sympetalous flowers containing two stamens, and dark subglobose fruits. Uncommon in coastal to montane forest, reported from near sea level to 450 m elevation. Indigenous, also found in Fiji, Tonga, and Niue. Wisner 57; Whistler 3609, 9175.

Jasminum didymum Forst. f.

Thin climbing vine with opposite, trifoliate leaves, white flowers with two stamens, and black, subglobose fruits. Occasional in coastal to cloud forest, reported from near sea level to 1500 m elevation. Indigenous, ranging from Australia to the Society

Islands. Setchell 289, 348; Christophersen 149, 1262; Whistler 9029!, 9116.

ONAGRACEAE

Ludwigia hyssopifolia (G. Don) Exell

Erect, red-stemmed herb with alternate leaves, small, yellow, 4-merous flowers, and a linear, longitudinally ribbed capsule. Occasional in disturbed wet places, reported from near sea level to 240 m elevation. A modern introduction, now pantropic in distribution. Lamoureux 3052; Whistler 3233, 8961!.

Ludwigia octovalvis (Jacq.) Raven
[primrose willow]

Tall, erect herb with alternate leaves, 4-parted flowers with yellow, notched petals, and a cylindrical, many-seeded, longitudinally ribbed capsule. Common in wet, disturbed places, reported from near sea level to 900 m elevation. A modern introduction, now pantropic in distribution. Setchell 6, 24, 361, 521; Eames T29; Garber 989; Lamoureux 3053; Whistler 8929!.

OXALIDACEAE

***Oxalis barrelieri** L.
vine

Erect herb with opposite or alternate, trifoliate leaves, long-stalked axillary inflorescences of pink, 5-merous flowers, and a ribbed, cylindrical fruit with an acute tip. Occasional in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. (Whistler).

Oxalis corniculata L.
[wood sorrel] 'ii

Low, often prostrate herb with alternate, long-petiolate, trifoliate leaves having obcordate leaflets, yellow, 5-merous flowers, and a capsule that bursts open to expel the seeds. Occasional in lawns, pastures, and other sunny, disturbed places, reported from near sea level to 550 m elevation. A Polynesian introduction, cosmopolitan in distribution. Setchell 323, 520; Garber 819, 946; Whistler 9036!.

PASSIFLORACEAE

Passiflora foetida L.
[love-in-a-mist] pasio vao

Hairy, herbaceous vine with alternate, palmately 3-lobed leaves, coiled tendrils, showy white flowers, and a small, globose, edible fruit surrounded by branching calyx lobes. Common in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 1464, 8951!.

***Passiflora maliformis** L.

Climbing vine with large, alternate, ovate to elliptic leaves, coiled tendrils, showy white and purple flowers, and a globose, hard-shelled fruit. Uncommon in secondary forest, perhaps an escape from cultivation, reported from near sea level to 300 m elevation. A modern introduction, native to tropical America. Whistler 3606, 9152.

PIPERACEAE

***Macropiper puberulum** Benth.
'ava'ava aitu

Shrub with alternate, cordate leaves, white, solitary male spikes, and solitary female spikes bearing numerous tiny red fruits. Occasional in lowland to cloud forest, reported from near sea level to 1500 m elevation. Indigenous, ranging from Fiji and Futuna to Rapa. USEE s.n.; Whistler 2792.

***Peperomia leptostachya** Hooker & Arn.

Small terrestrial herb with puberulent opposite leaves and long terminal spikes of minute green flowers. Occasional in coastal forest, rarely in montane forest, reported from near sea level to 500 m or more elevation. Indigenous, widespread from Australia to Hawai'i. Setchell 288; Whistler 2950.

***Peperomia lonchophylla** C. DC.

Epiphytic herb with relatively large, alternate leaves over 2.7 times longer than wide and spikes (2 or more per axil) of minute green flowers. Occasional in lowland to cloud forest, reported from 40 to 1500 m elevation. Endemic. Graeffe s.n.; Long 3049; Whistler 2985, 3615.

Peperomia pellucida (L.) Kunth

Weak-stemmed herb with alternate, cordate to ovate leaves and terminal spikes of minute green flowers. Occasional in croplands and disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Yuncker 9397; Lamoureux 3075; Whistler 2756.

Peperomia tutuilana Yuncker

Small erect herb with alternate leaves and solitary axillary spikes (usually solitary in the upper axils) of minute green flowers. Occasional on rocks or trees in the coastal to lowland forest, reported from near sea level to 400 m elevation. Indigenous, also found in Tonga ('Eua). Reinecke 40a?; Garber 863; Yuncker 9386; Whistler 1274, 2797, 8590!, 9333!.

Piper graeffei Warb.
fue manogi; 'ava'avaaitu sosolo

Climbing vine with alternate, palmately veined leaves, long, hanging unisexual spikes of minute green flowers, and tiny red fruits. Common to abundant in coastal to montane forest, reported from 20 to 600 m elevation. Indigenous, also found on Futuna. Setchell 96, 463; Wilder 84; Garber 912; Christophersen 985, 1260, 3566; Diefenderfer 15; Meebold 16730; Mitchell 582; Yuncker 9317, 9357; Spence 489!; Whistler 1422, 1470, 3122.

PLANTAGINACEAE

***Plantago lanceolata** L.
[narrow-leaved plantain]

Rosette-forming herb with parallel-veined lanceolate leaves, narrow scapose spikes, and inconspicuous flowers with exserted stamens. Rare in disturbed places and perhaps not persisting in Samoa, reported only from the lowlands. A modern introduction, native to the Old World but now cosmopolitan. Rechinger 3702.

***Plantago major** L.
[plantain]

Rosette-forming herb with broad, parallel-veined leaves, a narrow scapose spike, and inconspicuous flowers with exserted stamens. Uncommon on roadsides and in other disturbed places, reported only from the lowlands. A modern introduction, native to the Old World, but now cosmopolitan. Setchell 126; Whistler 319.

POLYGALACEAE

Polygala paniculata L.
pulunamulole

Small herb with fragrant roots, alternate leaves, and tiny white flowers in terminal and axillary racemes. Occasional in disturbed places, reported from sea level to 700 m elevation. A modern introduction, native to tropical America. Setchell 16, 563; Eames T10; Wilder 10; Garber 795; Lamoureux 3070; Long 2599; Whistler 1439, 8910!.

PORTULACACEAE

***Portulaca lutea** Sol. ex Forst. f.
tamole

Prostrate succulent herb with spirally arranged, glabrous leaves, large, showy yellow solitary flowers, and a capsule opening by the top splitting off. Occasional on coastal rocks, reported only from near sea level. Indigenous, ranging from New Caledonia to Pitcairn Island. Setchell 52, 414.

***Portulaca oleracea** L.
[purslane] tamole

Succulent prostrate to ascending herb with glabrous, spirally arranged leaves, yellow flowers in terminal clusters, and a capsule opening by the top splitting off. Common on rocky and sandy shores and often weedy, reported only from the lowlands. A Polynesian or early European introduction, now cosmopolitan in distribution. Setchell 113; Garber 821, 970; Whistler 1431.

***Portulaca quadrifida** L.

Tiny prostrate herb with opposite leaves, small yellow, 4-merous flowers, and a capsule opening by the top splitting off. Uncommon in sunny littoral habitats and occasionally weedy in villages, reported only from the lowlands. Probably a Polynesian introduction, pantropic in distribution. Garber 816, 822; Whistler 2947.

Portulaca samoensis Poelln.

Prostrate, hairy herb with small, spirally arranged leaves, small yellow, 5-merous flowers and a capsule opening by the top splitting off. Occasional on coastal rocks, reported only near sea level. Indigenous, ranging from New Guinea to Niue. Setchell 232, 347, 357; Long 2598; Whistler 2912.

RHAMNACEAE

Alphitonia zizyphoides (Spreng.) A. Gray
toi

Tall tree with alternate lanceolate leaves gray beneath, clusters of small white flowers, and purple globose fruits. Common in secondary forest and lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from Southeast Asia to eastern Polynesia. Setchell 214, 456; Wilder 94; Wisner 10, 10a, 104; Spence 465!; Whistler 2778, 2938, 8603!, 9142.

Colubrina asiatica (L.) Brongn.
fisoa

Spreading shrub with glossy alternate leaves, small white flowers, and green globose fruits. Occasional to common on the seaward margins of littoral forest, reported only near sea level. Indigenous, ranging from tropical East Africa to the Marquesas. Setchell 310, 321; Wilder 22, 71, 75, 89; Mitchell 584; Yuncker 9303; Wisner 83; Whistler 1469, 8559!.

RHIZOPHORACEAE

***Bruguiera gymnorrhiza** (L.) Lam.
[Oriental mangrove] togo

Large tree with glossy opposite leaves, a calyx of many linear lobes, orange petals, and a cigar-shaped fruit. Locally abundant in mangrove swamps, reported only near sea level. Indigenous, ranging from tropical Asia to Samoa. Setchell 31; Garber 953; Yuncker 9371; Bryan 963; Whistler 2816.

Crossostylis biflora Forst.
saitamu

Medium-sized tree with stilt roots, opposite leaves, and greenish flowers bearing many stamens. Occasional in lowland to cloud forest, reported from 200 to 1300 m elevation. Indigenous, ranging from Tahiti to the Marquesas. USEE s.n.; Setchell 554; Bryan 93; Christophersen 1038, 1045, 3512; Mitchell 575; Yuncker 9407; Wisner 152; Long 1963, 1974; Spence 477!; Whistler 2700, 8520!, 9342!.

***Rhizophora mangle** L.
[red mangrove] togo

Small to medium-sized tree with stilt roots, glossy opposite leaves, small cream-colored flowers, and a long pendulous fruit. Common in estuaries and mangrove swamps, reported only near sea level. Indigenous, native to the New World tropics, New Caledonia, Fiji, Tonga, and Samoa. Setchell 98, 309, 532; Christophersen 3479; Yuncker 9370; Whistler 2817, 3284.

RUBIACEAE

***Aidia cochinchinensis** Lour.
ola mea

Shrub or small tree with opposite leaves, white flowers in dense clusters, and small red fruits. Occasional in coastal to lowland forest, reported from near sea level to 400 m elevation. Indigenous, ranging from tropical Asia to western Polynesia. (Rechinger); Whistler 8459.

Calycosia sessilis A. Gray

Unbranched shrub with terminal, subsessile leaves, white flowers in a dense, flattened, sessile terminal head, and small red fruits. Occasional in montane to cloud forest, reported from 300 to 1300 m elevation. Endemic. Setchell 386; Christophersen 1123!; Whistler 2738.

Canthium merrillii (Setchell) Christoph.
ola sina

Medium-sized tree with opposite leaves, white axillary flowers, and bluish, laterally compressed, subglobose fruits in axillary clusters. Occasional in coastal to montane forest, reported from 20 to 700 m elevation. Indigenous, also found in Tonga (the Niuas). Setchell 423, 442, 518; Diefenderfer 13; Long 1989; Whistler 3672. This should be transferred to the genus *Psydrax*.

Cyclophyllum barbatum (Forst. f.) Hallé & Florence
ola?

Small tree with small opposite leaves, small white flowers, and a red, irregularly subglobose pyrene. Occasional to common in montane scrub and coastal forest, reported from near sea level to 450 m elevation. Indigenous, ranging from Fiji to the Marquesas. Christophersen 1004, 3528; Whistler 2891, 3665, 8050, 8458, 8656!, 8678!.

***Gardenia taitensis** DC.
[Tahitian gardenia] pua Samoa

Shrub with glossy opposite leaves, large showy white flowers, and a green, ribbed capsule. Uncommon in coastal forest and on coastal rocks, reported only near sea level but formerly commonly cultivated. Probably a Polynesian introduction, ranging from Vanuatu to Hawai'i. USEE s.n.; Graeffe 227; Setchell 131, 236; Garber 95, 1117; Amerson s.n.; Whistler 3855, 8421.

Geophila repens (L.) I. M. Johnston
tono

Prostrate herb with kidney-shaped leaves, small white flowers, and a red globose fruit. Occasional in coastal to montane forest, reported from near sea level to 700 m elevation. Indigenous, pantropic in distribution. Setchell 41, 81; Garber 894; Wisner 1; Long 1957; Whistler 2943, 8639!.

Guettarda speciosa L.
puapua

Medium-sized tree with opposite obovate leaves, showy white, long-tubed, fragrant flowers, and a brown, globose fruit. Common in littoral to lowland forest, reported from near sea level to 250 m elevation. Indigenous, ranging from east Africa to the Marquesas. Whistler 9015!.

Gynochtodes epiphytica (Rechinger) A. C. Smith & S. Darwin

Woody climber with opposite leaves, small axillary flowers, and greenish, marble-like fruits. ccasional to common in coastal to lowland forest, reported from 20 to 400 m elevation. Indigenous, also found in Fiji, Niue, and Tonga. Whistler 2874, 3618, 8482, 9150.

Hedyotis biflora (L.) Lam.

Small herb with opposite leaves, tiny white flowers, and a papery, subglobose capsule. Occasional on coastal rocks, rarely inland and weedy, reported from near sea level to 350 m elevation. Indigenous, ranging from Mauritius to the Cook Islands. Lister s.n.; Setchell 120, 320; Garber 969; Diefenderfer 4; Whistler 2922, 8399, 8692!.

***Hedyotis corymbosa** (L.) Lam.

Small herb with opposite, narrowly elliptic leaves and thin, axillary peduncles bearing 2 or 3 tiny white flowers. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to Africa. Sykes 17; Whistler 5817.

Ixora samoensis A. Gray
filofiloa

Shrub with opposite leaves, long, tubular, white to pink flowers in 3s, and a small globose fruit. Occasional in coastal to cloud forest, reported from near sea level to 1200 m elevation. Endemic. Wilder & Swezey 58; Garber 835, 925; Christophersen 1005, 1132!, 3481, 3535, 3549, 3554; Spence 509!; Whistler 2885, 3297,ä 3621, 3663, 8053, 8460, 8633!, 8682!.

Morinda citrifolia L.
[Indian mulberry] nonu

Shrub or small tree with large, glossy dark green, opposite leaves, small white flowers, and a large yellowish, irregularly shaped, fleshy, compound fruit. Common in coastal forest and disturbed places, reported from near sea level to 500 m elevation. Probably a Polynesian introduction, ranging from India to Hawai'i. Setchell 34, 572; Whistler 1440, 3120, 9024!, 9144.

Morinda myrtifolia A. Gray

Woody climbing vine with opposite, round-tipped leaves, small white flowers, and a subglobose, compound fruit. Occasional in coastal to lowland forest, reported from near sea level to 200 m elevation. Indigenous, ranging from New Caledonia to the Marquesas. Whistler 3670, 8541!.

Mussaenda raiateensis J. W. Moore
aloalo vao

Terrestrial or epiphytic shrub with opposite leaves, yellow flowers subtended by a white, leaf-like bract, and a brown, ovoid fruit. Occasional in lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from Vanuatu to the Society Islands. Veitch s.n.; Reinecke 475; Wilder s.n.; Garber 791; Bryan 981!; Yuncker 9355; Long 2601; Whistler 8536!.

Neonauclea forsteri (Seem.ex Havil.) Merr.
afa

Large tree with opposite leaves, conspicuous oval stipules on the terminal bud, and white flowers in a terminal head. Common in lowland to cloud forest, reported from 15 to 1050 m elevation. Indigenous, ranging from the Solomon Islands to Tahiti. Lister s.n.; Setchell 565; Christophersen 1811; Wisner 86; Spence 501!?; Whistler 1284, 2956, 3841, 9016!.

Psychotria forsteriana A. Gray

Small tree with opposite leaves, many tiny white flowers, and red subglobose fruits 2-lobed when dry. Common in lowland to montane forest, reported from near sea level to 1000 m elevation. Indigenous, also found in Fiji. Graeffe 37b, s.n.; Garber 841; Meebold 8253; Long 3061; Whistler 2730, 8495, 8990!, 9338!.

Psychotria insularum A. Gray
matalafi

Small tree with opposite leaves, small white flowers, and glossy, globose, red fruits. Common in coastal to cloud forest, reported from near sea level to 1400 m elevation. Indigenous, also found in Tonga, Futuna, 'Uvea, Rotuma, and Niue. Graeffe s.n.; Setchell 82, 256, 572; Wilder 17, 47, 78; Garber 792, 932; Bryan 85; Diefenderfer 11; Christophersen 1009, 1043, 1820, 1826, 3485, 3521, 3550, 3557, 3558; Mitchell 506, 517; Yuncker 9350; Wisner 61 (n.s.), 67, 130; Lamoureux 3007, 3012; Long 1966, 1983, 1990, 1994, 3065a, 3068, 3086, 3102; Spence 484!; Whistler 1437, 2737, 2767!, 3542, 3638!, 3666, 3667, 8634!.

***Psychotria pacifica** K. Schum.

Small tree with opposite leaves, panicles terminating in umbels, white sessile flowers, and red subglobose fruits. Common in montane to cloud forest, reported from 350 to 1500 m elevation. Endemic. Graeffe 1383. A questionable record.

Sarcopygme pacifica (Reinecke) Setchell & Christoph.
u'unu

Medium-sized, scarcely branched tree with large opposite leaves, long showy white flowers in heads, and a large pendulous compound fruit. Common in lowland to cloud forest, reported from 50 to 1400 m elevation. Endemic. Setchell 362, 419, 450; Bryan 88; Christophersen 1136!, 1264, 1807!, 1808!, 1809!, 1810!, 3586!, 3587!, 3588!; Mitchell 580; Long 3064; Whistler 2732, 8742!.

Spermacoce assurgens Ruiz and Pavon

Erect herb with opposite, lanceolate to narrowly elliptic leaves, unwinged stems, and tiny white flowers in sessile, axillary clusters. Common in croplands and disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Lamoureux 3071; Fosberg 54926; Whistler 2755, 9009!.

Spermacoce mauritiana Gideon

Small herb with smooth stems, opposite, mostly glabrous leaves, and tiny white flowers in sessile, axillary clusters. Uncommon in lawns and other sunny, disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 317, 2867, 5731, 8524!.

Tarenna sambucina (Forst. f.) Durand in Drake
ma'anunu

Small tree with opposite leaves, dense inflorescences of white flowers bearing exserted stamens, and small globose fruits. Occasional in open forest and disturbed places, reported from near sea level to 200 m elevation. Indigenous, ranging from the Vanuatu to the Marquesas. Rechinger 3791; Setchell 83, 528; Bryan 983! (n.s.); Meebold 16871; Whistler 1479, 2925, 3775.

RUTACEAE

Acronychia heterophylla A. Gray

Shrub or small tree with opposite, simple or trifoliate leaves, small white flowers, and a 4-lobed fruit containing 4 shiny black seeds. Occasional in lowland to montane forest, reported from 100 to 800 m elevation. This species should be transferred to the genus *Melicope*. Endemic. USEE s.n.; Setchell 329, 429; Wilder 34; Garber 909; Christophersen 1137!; Yuncker 9426!?.

***Acronychia richii** A. Gray

Shrub or small tree with simple leaves, tiny white flowers, and a 4-lobed splitting fruit containing 4 shiny black seeds. Uncommon in montane scrub and cloud forest, reported from 500 to 1700 m

elevation. This species should be transferred to the genus *Melicope*. Endemic. Christophersen 1052, 1066, 3532, 3556; Whistler 3664.

***Citrus macroptera** Montr.
moli u'u

Small to medium-sized thorny trees, alternate leaves, white 5-merous flowers, and small sour oranges. Uncommon in coastal to lowland forest, formerly cultivated but now apparently disappearing. A Polynesian introduction, widespread in the Pacific. Setchell 136; Yuncker 9429.

Euodia hortensis Forst.
usi

Shrub with opposite, simple or trifoliate, aromatic leaves, small white flowers in panicles, and 4-lobed fruits splitting to release the four shiny black seeds. Uncommon in disturbed places, mostly as a relict of cultivation, and perhaps not truly naturalized, reported from near sea level to 300 m elevation. A Polynesian introduction, native to Melanesia. USEE s.n. (n.s.); Veitch s.n.; Garber 931, 960; Wilder 83; Christophersen 961; Whistler 1475, 2896, 8654!.

Euodia samoensis Christoph.
so'opine

Small tree with opposite, trifoliate leaves, small white flowers, and a 4-lobed fruit splitting to release four shiny black seeds. Occasional in lowland to montane forest, reported from 10 to 550 m elevation. Endemic. Whistler 8660!.

Micromelum minutum (Forst. f.) Seem.
talafalu

Small tree with alternate, pinnately compound leaves, small white flowers, and red fruits. Occasional in coastal to foothill forest, reported from near sea level to 300 m elevation. Indigenous, ranging from the Philippines and Australia to Niue. Setchell 257; Christophersen 1012; Meebold 26569; Wisner 94; Whistler 2944, 3607, 8461, 8553!, 8560!, 9167.

SAPINDACEAE

Allophylus timoriensis (DC.) Bl.

Small to medium-sized tree with trifoliate leaves, small white flowers in racemes, and red, globose fruits. Occasional in littoral to montane forest, reported from near sea level to 650 m elevation. Indigenous, ranging from Malaysia to the Marquesas. Rechinger 3730; Yuncker 9365; Whistler 1273, 8070!, 8571!.

Arytera brackenridgei (A. Gray) Radlk.
taputo'i

Medium-sized tree with alternate, pinnately compound leaves, lanceolate leaflets, and tiny white flowers. Occasional to common in lowland forest, reported from near sea level to 500 m elevation. Indigenous, also found in Fiji. Setchell 517; Christophersen 1142!; Spence 517!; Whistler 8073, 8533!.

Elattostachys falcata (A.Gray)Radlk.
taputo'i

Medium-sized to large tree with pinnately compound leaves, inconspicuous flowers with red stamens, and small 3-lobed capsules. Occasional in lowland to cloud forest, reported from 30 to 1450 m elevation. Indigenous, also found in Vanuatu, Fiji, Tonga, and Niue. Whistler 3650, 8068.

***Guioa rhoifolia** (A. Gray) Radlk.

Medium-sized tree with pinnately compound leaves having small domatia at the base of the lower surface of the subfalcateä leaflets, and tiny apetalous flowers. Rare in lowland to montane forest, reported from 250 to 750 m elevation. Indigenous, also found in Fiji. Christophersen 3483; Whistler 9065.

***Pometia pinnata** Forst.
tava

Large buttressed tree with alternate, pinnately compound leaves, dense panicles of apetalous flowers, and edible, large, subglobose fruits. Common to abundant in lowland to lower montane forest, reported from 10 to 500 m elevation. Indigenous, ranging from Ceylon to Samoa. Whistler 9177.

Sapindus vitiensis A. Gray

Large tree with alternate, pinnately compound leaves, winged petioles (at least in saplings), apetalous flowers in a large panicle, and 2-lobed or subglobose, red fruits. Occasional in coastal forest, reported only in the lowlands. Indigenous, also found in Fiji and Tonga. Whistler 8066!, 9056!.

SAPOTACEAE

Manilkara dissecta (L. f.) Dubard
pani

Medium-sized tree with glossy, alternate, obovate leaves and solitary axillary 6-merous flowers. Rare in coastal forest, reported from near sea level to 200 m elevation. Indigenous, ranging from Vanuatu to Samoa. Guest s.n.; Whistler 8466, 8679!.

Palaquium stehlinii Christoph.
nasu (Western Samoa)

Large tree with ovate leaves, milky sap, small flowers with at least twice as many stamens as petals, and a large, single-seeded, curved-oblong fruit. Occasional in lowland to montane forest, reported from 150 to 750 m elevation. Endemic. Whistler 8655!, 8747!, 9339!.

Planchonella garberi Christoph.
'ala'a

Medium-sized to large tree with milky sap, lanceolate leaves, small axillary flowers, and a subglobose fruit red to black at maturity and containing one or more shiny black seeds. Occasional in coastal to foothill forest, reported from near sea level to 500 m elevation. Indigenous, ranging from Fiji to Niue. Setchell 291; Wisner 46, 47, 48; Whistler 2690!, 2864, 3298, 3302, 3349, 3537, 8504, 8673!, 8718!.

Planchonella grayana St. John
'ala'a

Large tree with milky sap, elliptic leaves, small axillary flowers, and a flesh-colored, globose fruit containing several shiny black seeds. Uncommon in littoral and coastal forest, reported from near sea level to 185 m elevation. Indigenous, ranging from Fiji to the Tuamotu Islands (Makatea). Whistler 2945, 8430.

Planchonella samoensis H. J. Lam ex Christoph.
mamalava

Large tree with milky sap, large alternate leaves, small axillary flowers, and an ellipsoid, red to yellow fruit containing a single shiny black, compressed-fusiform seed. Common to abundant in lowland to montane forest, reported from 20 to 900 m elevation. Indigenous, also found in Tonga (the Niuas) and Niue. Setchell 259; Wisner 80; Whistler 1442, 2875, 2963, 3627.

SCROPHULARIACEAE

***Limnophila fragrans** (Forst. f.) Seem.
tamole vai

Prostrate herb with fragrant, opposite leaves and small sympetalous, white to pale-blue flowers. Rare in wet places such as taro patches, streambeds, and crater lake margins, reported from near sea level to 650 m elevation. Indigenous, ranging from Australia and Melanesia to the Society Islands. USEE s.n. (n.s.); Setchell 370; Whistler 8044, 9034.

***Limnophila rugosa** (Roth) Merr.

Erect herb with opposite, oblong leaves, axillary, sessile flowers, and a lavender and yellow campanulate corolla. Uncommon in wet disturbed areas, reported only from the lowlands. A modern introduction, native to tropical Asia. Whistler 3228.

***Lindernia antipoda** (L.) Alston in Trimen

Small prostrate herb with opposite sessile leaves, small lavender flowers oppositely arranged in terminal racemes, and linear capsules. Uncommon or rare in disturbed places, reported only from the lowlands. A modern introduction, native to tropical Asia. Whistler 8934.

Lindernia crustacea (L.) F. Muell.

Small herb with opposite leaves, purple-blue flowers, and a tiny, many-seeded capsule. Occasional in wet places such as streambeds, reported from near sea level to 600 m elevation. Indigenous, pantropic in distribution. Setchell 76, 327; Whistler 2770!, 8640!.

SOLANACEAE

***Capsicum frutescens** L.
[chili pepper] polo feu

Subshrub with alternate leaves, cream-colored, rotate flowers reflexed at anthesis, and a bright red, cylindrical berry. Occasional in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Setchell 5; Garber 802; Diefenderfer 19; Christophersen 1014; Whistler 9162.

***Physalis angulata** L.
[wild cape gooseberry] vivao

Erect herb with alternate leaves, pale yellow, rotate flowers, and a bladder-like calyx enclosing a small edible berry. Common in croplands and other disturbed places. Apparently a Polynesian introduction, native to tropical America. USEE s.n. (n.s.); Lamoureux 3059; Whistler 321, 1468, 8437.

***Solanum americanum** Mill.
[black nightshade] mgalo

Erect herb with alternate leaves, small white flowers bearing yellow stamens and reflexed petals, and a shiny black, globose berry. Occasional in disturbed places, reported from near sea level to 1750 m elevation. Apparently a Polynesian introduction, or perhaps indigenous, native to tropical or subtropical America. USEE s.n.; Wilder 45; Whistler 8436.

***Solanum viride** Forst. f. ex Spreng.
polo

Shrub with alternate, mostly pubescent leaves, many-flowered inflorescences of white flowers, and small red, tomato-like fruits. Rare in coastal forest, reported only from the lowlands. Indigenous or possibly a naturalized Polynesian introduction, but now rare. Wilder 20?; Meebold 8236?; Whistler 8067.

STERCULIACEAE

Kleinhovia hospita L.
fu'afu'a

Medium-sized tree with alternate cordate leaves, pink flowers, and an inflated capsule. Common in disturbed places and secondary forest, reported from near sea level to 500 m elevation. Indigenous, ranging from tropical Asia to western Polynesia. Setchell 373; Mitchell 537; Yuncker 9358; Wisner 94; Whistler 9017!.

***Melochia aristata** A. Gray
ma'o

Shrub with alternate cordate leaves, pink flowers, and a small ovoid capsule. Occasional in disturbed places and secondary forest, reported from near sea level to 700 m elevation. Indigenous, also found in Tonga and the Tuamotu Islands. Setchell 512; Whistler 8443.

Sterculia fanaiho Setchell
fana'io

Medium-sized tree with alternate leaves having the blade angled to the petiole, small reddish flowers, and a large reddish-brown capsule containing a few large seeds. Occasional in coastal to montane forest, reported from near sea level to 600 m elevation. Indigenous, also found in Tonga, Niue, Rotuma, and Futuna. Setchell 103, 147, 426, 436, 577; Christophersen 1134!.

THEACEAE

Eurya pickeringii A. Gray

Shrub with toothed, alternate leaves, small cream-colored flowers, and a subglobose fruit. Occasional in montane scrub to cloud forest, reported from 100 to 1700 m elevation. This identification needs verification, since several questionable species names have been used in Samoa. Indigenous, also found on Rapa. USEE s.n. (n.s.); Christophersen 1049, 1069, 3510, 3513, 3530; Whistler 2711, 2769!, 3347, 3350, 8688, 9004!.

THYMELAEACEAE

***Phaleria disperma** (Forst. f.) Baill.
suni

Shrub or small tree with opposite leaves, fragrant, long, white, tubular flowers, and red subglobose fruits. Occasional in littoral and coastal forest, reported from near sea level to 100 m elevation. Indigenous, also found in Fiji, Tonga, and the Horne Islands. Whistler 2848, 3856, 8434.

Phaleria glabra (Turrill) Domke
suni vao

Shrub with opposite leaves, long tubular white flowers, and red fruits. Occasional in coastal to montane forest, reported from near sea level to 900 m elevation. Indigenous, also found in Fiji. Reinecke 171; Christophersen 1001; Wisner 119; Kuruc 118; Whistler 2866, 3608, 3644, 8478, 8653!.

Wikstroemia foetida (L. f.) A. Gray

Shrub with opposite leaves, small yellow flowers in few-flowered clusters, and a fleshy orange, subglobose fruit. Occasional in sunny disturbed forest and scrub, reported from 75 to 1530 m elevation. Indigenous, ranging from Fiji to Tahiti. Setchell

331; Garber 786, 878; Christophersen 3555; Yuncker 9345, 9418; Sledge s.n.; Whistler 2907, 2928, 8711!, 8999!.

TILIACEAE

Grewia crenata (Forst.) Schinz & Guillaumin
fauui

Small tree with alternate leaves, white 5-merous flowers with many stamens, and a 2- to 4-lobed fruit. Uncommon in coastal forest, reported only from the lowlands. Indigenous, ranging from New Caledonia to the Society Islands. Setchell 149; Bryan 969, 1015; Meebold 8212, 21350, 26579; Spence 494; Whistler 1451, 1471, 2839.

Trichospermum richii (A. Gray) Seem.
ma'o sina

Medium-sized tree with alternate leaves having a pair of basal glands, stellate pubescent, white flowers with many stamens, and a flattened, winged, obovate fruit. Occasional in lowland to montane forest, reported from 100 to 910 m elevation. Indigenous, also found in Fiji. Christophersen 3570; Meebold 21350; Whistler 2777, 2959.

***Triumfetta procumbens** Forst. f.
mautofu tai

Prostrate shrub with alternate leaves, showy yellow flowers having numerous stamens, and a bur-like fruit. Uncommon on sandy beaches, reported only from near sea level. Indigenous, ranging from Malaysia to the Tuamotu Islands. Setchell 409; Whistler 9178.

***Triumfetta rhomboidea** Jacq.
mautofu

Shrub with alternate, palmately lobed leaves, small, sessile, axillary, yellow flowers bearing many stamens, and a small, globose, bur-like fruit. Occasional to common in disturbed places, reported only in the lowlands. A modern introduction, native to the Old World tropics. Setchell 338; Wilder 37.

ULMACEAE

Trema cannabina Lour.
magele

Small tree with coarse lanceolate leaves, tiny greenish white flowers, and dense clusters of drupes. Occasional in disturbed forest and clearings, reported from near sea level to 300 m elevation. Indigenous, ranging from India to Niue and perhaps farther eastward. Setchell 263; Wilder 25; Garber 902; Wisner 18; Whistler 3115, 8982!.

URTICACEAE

***Boehmeria virgata** (Forst. f.) Guillemin

Small tree with coarse, ovate to elliptic, mostly glabrous, serrate to crenate leaves, and tiny inconspicuous flowers in long spikes. Uncommon in disturbed forests and clearings, reported from 200 to 1400 m elevation. Indigenous, ranging from Vanuatu and the Caroline Islands to the Marquesas. Christophersen 987; Whistler 9080.

Cypholophus macrocephalus Wedd.
faupata

Shrub with ovate, rugose leaves, tiny greenish flowers in dense, sessile axillary clusters, and tiny orange drupes. Occasional in montane forest, reported from 240 to 900 m elevation. Indigenous, ranging from Fiji to the Society Islands. Setchell 44, 79; Bryan 80; Mitchell 576; Yuncker 9435!; Whistler 8977!.

Dendrocnide harveyi (Seem.) Chew
[stinging-nettle tree] salato

Medium-sized to large, soft-wooded tree with ovate leaves 3-5-veined from the base, stinging hairs, tiny green flowers, and tiny green achenes. Rare in lowland to montane forest on Tutuila, reported from near sea level to 800 m elevation. Indigenous, ranging from Fiji to Niue. Christophersen 3583!; Whistler 8065, 9169.

***Elatostema grandifolium** Reinecke

Large herb with large alternate leaves having crenate margins, and tiny green to white flowers. Occasional to common in montane forest, reported from 400 to 890 m elevation. Endemic. Graeffe 1334.

***Elatostema samoense** Reinecke

Small herb with alternate leaves, serrate leaf margins, variable appearance, and tiny greenish flowers. Rare in montane forest, reported from 550 to 700 m elevation. Endemic. Reinecke 503.

***Elatostema scabriusculum** Setchell

Small herb with alternate leaves, long stipules, and tiny green flowers. Uncommon in montane forest, reported from 30 to 600 m elevation. Endemic. Setchell 375; Yuncker 9410; Long 1961, 1963.

***Elatostema tutuilense** Whistler

Small herb with alternate leaves, deeply pinnately toothed leaf margins, and tiny greenish flowers. Rare in montane forest, no elevation reported (but over 200 m). Endemic to Tutuila (and collected only once). Reinecke 590.

***Laportea interrupta** (L.) Chew
ogoogo

Erect herb with toothed, ovate, alternate leaves, mildly stinging hairs, and a long, loose, axillary inflorescence of greenish, apetalous flowers. Uncommon in disturbed places, reported only from the lowlands. A Polynesian introduction, possibly native to Southeast Asia. Setchell 145, 533; Whistler 8487.

Leucosyke corymbulosa (Wedd.) Wedd.
'ala'alatoa

Small tree with alternate, palmately veined leaves gray on the lower surface, tiny greenish flowers, and a white fleshy compound fruit. Uncommon in lowland forest, reported from 100 to 250 m elevation. Indigenous, ranging from Vanuatu to the Cook Islands. Setchell 258; Wilder 86; Garber 809, 922; Yuncker 9340, 9412; Long 1981, 3104; Spence 510!; Whistler 2689!, 2890, 8608!, 8980!.

***Maoutia australis** Wedd.

Small tree with alternate serrate leaves white beneath, and tiny green flowers in axillary inflorescences. Uncommon in lowland to montane forest, reported from 200 to 900 m elevation. Indigenous, ranging from Fiji to the Society Islands. Reinecke 522 ("Tutuila and the Manu'a Islands!"). This record is questionable.

Pilea microphylla (L.) Liebm.

Small prostrate, somewhat succulent herb with tiny leaves and greenish, inconspicuous flowers. Occasional in sunny disturbed areas and especially on rock walls, reported only from the lowlands. A modern introduction, native to tropical America. Diefenderfer 24; Yuncker 9373; Long 3096; Whistler 2759, 9035!.

Pipturus argenteus (Forst. f.) Wedd.
soga; fau soga

Small tree with alternate leaves gray beneath, tiny flowers in branching inflorescences, and white, fleshy compound fruits. Common in disturbed places and early secondary forest, reported from near sea level to 700 m elevation. Indigenous, ranging from Vanuatu to the Marquesas. Reinecke 506; Setchell 85, 122, 544; Bryan 974; Garber 813; Wilder 90 (n.s.); Christophersen 1073; Mitchell 565; Meebold 26589; Yuncker 9375; McKee 2941; Comstock 2; Wisner 59; Long 3095, 3096, 3103; Spence 479!; Whistler 2861, 8572!, 9145.

Procris pedunculata (Forst.) Wedd.
fua lole

Terrestrial or epiphytic herb with tiny white flowers and red, strawberry-like aggregate fruits. Occasional in littoral to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from Malaysia to the Marquesas. Graeffe s.n.; Setchell 7, 212, 513; Garber 859, 869, 934; Bryan 932; Christophersen 986; Mitchell 573; Yuncker 9405; Whistler 2704, 2725, 2768, 8473, 8996!, 9115.

VERBENACEAE

Clerodendrum chinense (Osbeck) Mabberly
losa Honolulu

Large shrub with opposite, cordate leaves and showy white, many-petaled flowers in dense clusters. Occasional in plantations and along roadsides, reported only from the lowlands. A modern introduction, native to tropical Asia. Whistler 8898, 8967!.

Clerodendrum inerme (L.) Gaertn.
aloalo tai

Sprawling shrub with opposite leaves and showy white flowers having exserted stamens. Common in the littoral strand and sometimes as a scandent shrub in littoral forest, reported only in coastal areas. Indigenous, ranging from tropical Asia to Niue. Setchell 97, 292; Wilder 74; Garber 963; Diefenderfer

14; Yuncker 9369; Long 2595; Whistler 2836, 9027!.

Faradaya amicorum Seem.
mamalupe

High-climbing vine with opposite leaves, white tubular flowers having exserted stamens, and a large red, curved-ellipsoid fruit. Common in lowland to cloud forest, reported from 50 to 1700 m elevation. Indigenous, also found in Tonga. Lister s.n.; Kuntze 23001, s.n.; Seal s.n.; Setchell 64, 539; Garber 913; Diefenderfer 1 (n.s.), 12, 28 (n.s.); Christophersen 990, 3478; Bryan 956; Mitchell 504; Meebold 8230 (n.s.), 16485, 21356 (n.s.), 26582; Yuncker 9301, 9387; Wisner 53, 128; McKee 2945; Wisner 69; Long 3116; Spence 490!; Whistler 1482, 2951, 8641!, 9163.

Premna serratifolia L.
aloalo

Shrub or small tree with broad leaves marked with leaf miners, tiny greenish flowers, and a small black, globose fruit having a persistent calyx. Common in littoral strand and scrub vegetation, rarely inland, reported from near sea level to 500 m elevation. Indigenous, ranging from tropical Asia to the Marquesas. Setchell 155, 564; Garber 789, 901; Comstock s.n., 5, 31a; Meebold 8239; Long s.n.; Whistler 2774, 9100!.

***Stachytarpheta jamaicensis** Vahl
[Jamaica vervain]

Low shrub with glabrous, opposite leaves and lavender sympetalous flowers embedded in long, thickened spikes. Uncommon on roadsides and other disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Wisner 116; Lamoureux 3054; Whistler 315, 8439.

Stachytarpheta urticaefolia (Salisb.) Sims
mautofu [blue rat's-tail]

Coarse shrub with opposite, rugose, toothed leaves and long, narrow, terminal spikes of purple, sympetalous flowers. Common in disturbed places, reported from near sea level to 650 m elevation. A modern introduction, native to tropical America. Setchell 23, 558; Lamoureux 3055; Whistler 8973!.

***Vitex trifolia** L.
namulega

Small tree with opposite, palmately compound leaves gray beneath, tiny purple flowers, and black, globose fruits. Occasional in the littoral strand, and sometimes cultivated, reported only from the lowlands. Indigenous, ranging from tropical East Africa to the Marquesas. Setchell 531; Wilder 48; Whistler 1450, 8403.

MONOCOTYLEDONAE

AGAVACEAE

Cordyline fruticosa (L.) Chev.
[ti plant] ti; lau ti

Shrub with parallel-veined leaves, pink flowers in branching panicles, and bright red berries. Common in cultivation and naturalized in lowland to cloud forest, reported from near sea level to over 1100 m elevation. A Polynesian introduction, widespread from tropical Asia to Hawai'i. Setchell 75, 121 137, 138, 139, 140, 141, 142, 332; Garber 808, 870; Bryan 74, 1017, 1018; Wisner 55, 60; Long 1965, 3074; Whistler 1433, 2724, 2849, 8552.

AMARYLLIDACEAE

***Zephryanthes rosea** (Spreng.) Lindl.
[zephyr lily]

Stemless herb with strap-shaped leaves arising from an underground bulb, and showy, pink, scapose flowers. Occasional in lawns, reported only from the lowlands. A modern introduction, native to tropical America. (Setchell).

ARACEAE

Amorphophallus paeoniifolius (Dennst.) Nicholson
teve

Stemless herb with large deeply divided leaves arising from an underground rhizome, and a large, purple, bell-shaped spathe surrounding the thick cylindrical spadix. Uncommon in secondary forest and plantations, reported only from the lowlands. A Polynesian introduction, widespread from tropical Asia to Hawai'i. Diefenderfer 17; Whistler 8579!, 9332!.

Epipremnum pinnatum (L.) Engl.

High-climbing vine with fenestrate leaves and flowers in a fleshy cylindrical spadix surrounded by a spathe. Common in lowland to foothill forest, reported from near sea level to 200 m elevation. Indigenous, widespread in the Pacific to eastern Polynesia. Setchell 203; Diefenderfer 2?, 5?

Rhapidophora graeffei Engl.
fue laufao

High-climbing vine with entire leaves and an inflorescence of flowers in a fleshy cylindrical spadix surrounded by a spadix. Common in lowland to cloud forest, reported from near sea level to 1400 m elevation. Endemic. Setchell 86; Meebold 8209; Whistler 3615A, 9148, 9354!.

ARECACEAE

Cocos nucifera L.
[coconut] niu

Large palm with pinnately divided fronds, thick panicles of unisexual flowers, and large fruits with a thick fibrous husk. Common in coastal areas, mostly cultivated, reported from near sea level to 500 m elevation. Probably indigenous, originating somewhere in the Old World tropics, but now pantropic in distribution. (Whistler).

CANNACEAE

***Canna indica** L.
[canna] fanamanu

Tall erect herb with large ovate to lanceolate leaves, showy red flowers, and a soft-spiny fruit containing pea-like seeds. Occasional in disturbed places, especially in wet areas, reported only from the lowlands. A modern introduction, native to tropical America. Christophersen 1003; Whistler 2786.

COMMELINACEAE

***Aneilima vitiense** Seem.

Herb with alternate lanceolate leaves, white 3-merous flowers, and a fuzzy fruit. Occasional in coastal to montane forest, reported from near sea level to 750 m elevation. Indigenous, also found in Fiji and Tonga. (Whistler).

***Commelina benghalensis** L.

Weak-stemmed herb with alternate, ovate leaves and blue, 3-merous flowers enclosed within a folded bract. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to tropical Asia. Yuncker 9402; Whistler 8036.

Commelina diffusa Burm. f.
mau'utoga

Weak-stemmed herb with alternate, lanceolate leaves and blue 3-merous flowers enclosed within a folded bract. Common in disturbed places, especially in wet areas, reported from near sea level to 650 m elevation. A Polynesian introduction, native to the Old World tropics. Setchell 216, 318.

CYPERACEAE

Cyperus compressus L.

A small sedge with a terminal cluster of green, flattened-lanceolate spikelets subtended by several linear bracts. Occasional in disturbed areas, reported only from the lowlands. A modern introduction, now pantropic in distribution. Eames T1; Whistler 8962!.

***Cyperus rotundus** L.
[nut sedge]

Sedge with swollen tubers, creeping rhizome, basal leaves, and terminal, flattened, red-brown spikelets on several spreading rays. Apparently uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics and now cosmopolitan. Graeffe 1227.

***Cyperus stoloniferus** Retz.

Sedge with thick bulb-like tubers, basal linear leaves, and terminal clusters of brown, flattened-cylindrical spikelets. Common on rocky coasts, reported only on the coast. Indigenous, native to the Old World Tropics. Whistler 8349.

***Eleocharis dulcis** (Burm. f.) Hens.
[water chestnut] 'utu'utu

Leafless sedge with tall cylindrical stems bearing a brown, terminal, cylindrical inflorescence as wide as the stem. Locally abundant in coastal and montane marshes, reported from near sea level to 900 m elevation. Indigenous, ranging from West Africa to Samoa. Whistler 8895.

Fimbristylis autumnalis (L.) Roemer & Schultes

Small to medium-sized sedge with three short, terminal bracts subtending clusters of small, brown, flattened-ellipsoid spikelets. Occasional in disturbed wet places, reported only from the lowlands. A modern introduction, native to tropical Asia. Lamoureux 3088; Whistler 323, 1285, 8035, 8963!.

Fimbristylis cymosa R. Br.

Small clump-forming sedge with linear leaves and subglobose clusters of spikelets born atop a short scape. Locally abundant on rocky shores, reported only from coastal areas. Indigenous, ranging from Malaysia to Hawai'i. USEE s.n.; Garber 807; Wisner 37; Lamoureux 3087, 3089; Whistler 1429, 2851, 8566!.

Fimbristylis dichotoma (L.) Vahl

Clump-forming, thin-stemmed sedge with basal leaves and long stalks bearing brown ellipsoid spikelets in terminal corymbs. Common in disturbed places, reported from near sea level to 900 m elevation. A Polynesian, or perhaps a modern introduction, now pantropic in distribution. USEE s.n. (n.s.); Eames T7; Garber 887; Christophersen 993; Whistler 8966!.

Kyllinga brevifolia Rottb.

Small sedge with creeping rhizomes, long, narrow stems, and small green, globose, head-like clusters of spikelets subtended by 3 linear, leaf-like bracts. Common in lawns and other sunny, disturbed places, reported from near sea level to 700 m elevation. A modern introduction, now pantropic in distribution. Setchell 583; Whistler 2978, 8965!.

Kyllinga nemoralis (Forst.) Dandy ex Hutch. & Dalziel

Small sedge with creeping rhizomes and small white, globose, head-like clusters of spikelets subtended by three leaf-like bracts. Common in lawns and other sunny, disturbed places, reported only from the lowlands. A Polynesian introduction, native to the Old World tropics. Setchell 111, 511; Eames T4; Bryan 79; Garber 866, 888; Whistler 9106!.

***Macharina falcata** (Nees) Koyama

Large sedge with basal, lanceolate leaves and an erect panicle of brown spikelets. Uncommon in montane scrub and along streams in montane to cloud forest, reported from 450 to 1100 m elevation. Indigenous, ranging from the Philippines and Malaysia to Samoa. Setchell 379; Christophersen 1023, 3490; Whistler 2972, 3668.

Mapania macrocephala (Gaud.) K. Schum.

Large sedge with basal leaves and a large, brown, irregularly lobed subglobose inflorescence. Occasional in lowland to montane forest, reported from near sea level to 800 m elevation. Indigenous, ranging from the Philippines to Samoa, but not found in Fiji. Graeffe 1222; Setchell 397; Christophersen 1122!, 3508, 3584!; Mitchell 520; Whistler 3653, 5727.

***Mapania vitiensis** (Uittien) T. Koyama

Large sedge with flat, strap-like basal and cauline leaves and terminal corymbs of small ovoid spikelets. Rare in montane scrub, reported from 500 m elevation. Indigenous, also found in Fiji. Christophersen 1209, 3484.

Mariscus cyperinus (Retz.) Vahl

Erect sedge with basal leaves with green spikelets in a dense, head-like cluster surrounded by leaf-like bracts. Uncommon to occasional in disturbed places, reported from near sea level to 650 m elevation. Indigenous or perhaps a Polynesian introduction, originally native to tropical Asia. Setchell 582; Eames T15; Christophersen 992; Meebold 8216; Yuncker 9438; Whistler 8628!.

Mariscus javanicus (Houtt.) Merr. & Metcalfe selesele

Large sedge with narrow, sharp-edged basal leaves and a dense terminal inflorescence of numerous dull-brown spikelets. Occasional on rocky or sandy shores and in coastal taro patches, reported only from coastal areas. Indigenous, widespread from tropical Africa to Hawai'i. Graeffe 1233; Setchell 507; Eames T20; Garber 832; Bryan 961; Wisner 39; Whistler 1423, 9023!.

Mariscus seemannianus (Boeck.) Palla

Medium-sized sedge with basal leaves and terminal inflorescences of brown spikelets borne on several rays. Occasional in lowland to montane forest, reported from near sea level to 600 m elevation. Indigenous, ranging from Fiji to Tahiti. Setchell 26, 506; Bryan 989; Eames T22; Christophersen 1819 (n.s.); Long 3060; Whistler 2806, 2860, 2900, 2916, 3648, 8414, 8415?, 9032!.

***Mariscus sumatrensis** (Retz.) Raynal

Medium-sized sedge with green spikelets in several cylindrical spikes borne on spreading rays and subtended by several, long, leaf-like bracts. Uncommon to occasional in disturbed places, reported only from the lowlands. Indigenous or perhaps a Polynesian introduction, originally native to the Old World tropics. Eames T12; Wilder 40, 72; Garber 831; Whistler 2930.

Pycreus polystachyos (Rottb.) Beauv.

Small, erect sedge with basal leaves and brown spikelets in irregular, head-like terminal clusters. Common on roadsides and disturbed places, reported only from the lowlands. A modern introduction, now pantropic in distribution. Lamoureux 3080; Whistler 8964!.

***Rhynchospora corymbosa** (L.) Britten
selesele

Coarse sedge with long, sharp-edged leaves and branching terminal corymbs bearing red-brown spikelets. Common in coastal and montane marshes, reported from near sea level to 950 m elevation. Indigenous, pantropic in distribution. USEE s.n.; Wilder 253; Kuruc 44; Whistler 3232.

***Scirpodendron ghaeri** (Gaertn.) Merr.

Large pandanus-like sedge with basal, spine-edged leaves and large, irregularly globose inflorescences. Rare on Tutuila in mangrove forest at Tafuna, elsewhere in Samoa occurring in coastal marshes, estuaries, montane craters, and swamp forests, reported from near sea level to *ca.* 400 m elevation. Indigenous, ranging from Ceylon to Samoa. USEE s.n. (n.s.); Whistler 8056, 8506.

Scleria lithosperma (L.) Sw.

Medium-sized sedge with thin, erect stems and few-flowered inflorescences bearing tiny, hard, white, globose fruits. Occasional in coastal to lowland forest, reported from near sea level to 300 m elevation. Indigenous, pantropic in distribution. Garber 828, 875; Wisner 146; Whistler 1478, 2846, 8510!.

Scleria polycarpa Boeck.
tafatolu; selesele

Coarse sedge with triangular stems, sharp-edged leaves, and branching inflorescences bearing tiny, hard, white globose fruits. Occasional in lowland to montane forest, reported from near sea level to 650 m elevation. Indigenous, ranging from Australia to Samoa. USEE s.n. (n.s.); Graeffe 1230; Reinecke 484; Setchell 224, 527; Wilder 82; Garber 874; Christophersen 1030, 1261, 3572; Meebold 17007; McKee 2947; Whistler 2888, 2898, 3289, 8631!.

***Torulinium odoratum** (L.) S. Hooper

Medium-sized sedge with basal leaves and a terminal inflorescence bearing numerous linear spikelets arranged perpendicular to the spreading rays. Occasional in coastal marshes, on streamsides, and in montane marshes, reported from near sea level to 950 m elevation. Probably indigenous, pantropic in distribution. Setchell 94, 523; Yuncker 9401; Whistler 2858, 3604, 8450, 8896.

DIOSCOREACEAE

Dioscorea bulbifera L.
[bitter yam] soi

Herbaceous climbing vine with bulbils born on the stem, alternate cordate leaves, tiny flowers in hanging in racemes, and longitudinally winged, oblong fruits. Common in disturbed places and secondary forest, reported from near sea level to 400 m elevation. A Polynesian introduction, widespread from Africa to Hawai'i. Setchell 100; Garber 823; Christophersen 1016; Whistler 1421, 3303, 8398, 8444.

***Dioscorea pentaphylla** L.
[five-fingered yam] pilita

Vine with alternate, palmately divided leaves and tiny flowers in hanging racemes (but flowering

rarely). Uncommon in disturbed places and secondary forest, reported from near sea level to 350 m elevation. A Polynesian introduction, widespread from tropical Asia to Hawai'i. Diefenderfer 5; Whistler 8052, 8057, 8472.

FLAGELLARIACEAE

***Flagellaria gigantea** Hook. f.
lafo

High-climbing cane with large grass-like leaves modified at the tips into tendrils, and tiny white flowers in a branching terminal inflorescence. Uncommon to occasional in lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, also found in Fiji and Niue. Whistler 3837, 8947, 9070.

HELICONIACEAE

Heliconia laufao Kress
laufao

Large herb with large, banana-like leaves, orange flowers borne in a large bract, and orange to red, fleshy fruits. Occasional in lowland to montane forest, reported from near sea level to *ca.* 900 m elevation. Endemic. Setchell 371; Garber 943; Diefenderfer 4; Whistler 9171.

HYDROCHARITACEAE

***Halophila minor** (Zoll.) Den Hartog

Creeping marine herb with small, alternate, elliptic to obovate bullate leaves and inconspicuous axillary flowers. Common in shallow sandy lagoons. Indigenous, ranging from East Africa to Samoa. Setchell 114, 181.

***Halophila ovalis** (R. Br.) Hook. f.

Creeping marine herb with alternate, elliptic to oblong-elliptic leaves and inconspicuous axillary flowers. Locally common in shallow sandy lagoons. Indigenous, widespread from Africa to Samoa. Tsuda 262, 310; Whistler 3857; Cox 1128.

ORCHIDACEAE

Appendicula bracteosa Reichenb. f.

Small, erect, laterally compressed epiphytic orchid with small white pendulous flowers in a terminal raceme. Occasional in montane to cloud forest, reported from 300 to 1200 m elevation. Indigenous, also found in Fiji. Christophersen 1138!; Whistler 8740!.

***Bulbophyllum atrorubens** Schlechter

Small epiphytic orchid with basal, obovate leaves arising from a bulb-like base, and tiny white flowers on a long stalk. Uncommon in montane forest, reported from 225 to 700 m elevation. Indigenous, also found in New Caledonia and the Solomon Islands. Christophersen 1185; Whistler 2902.

Bulbophyllum longiscapum Rolfe

Epiphytic orchid with acute-tipped leaves arising from a bulb-like base, and white flowers spotted with red, borne atop a long stalk. Occasional in coastal to montane forest, reported from near sea level to 500 m elevation. Indigenous, ranging from the Solomon Islands to Niue. Setchell 274; Christophersen 1037; Whistler 2827, 8059, 8724!, 9003!.

***Bulbophyllum pachyanthum** Schlechter

Somewhat succulent epiphytic orchid with thick leaves arising from a bulb-like base, and large white flowers mottled red, borne atop a long stalk. Uncommon in montane forest, reported from 300 to 600 m elevation. Indigenous, ranging from New Caledonia to Tonga and Samoa. Christophersen 1044, 1179, 1212; Whistler 3344.

Bulbophyllum polypodioides Schlechter

Small creeping epiphytic orchid with leaves arising from a bulb-like base, and a raceme of small white flowers. Common in lowland to montane forest, reported from near sea level to 950 m elevation. Indigenous, ranging from New Caledonia to Samoa. Setchell 383; Christophersen 1063, 1181; Whistler 8503, 8539!, 8726!, 8737!, 9005!.

Bulbophyllum rosticeps Reichenb. f.

Small creeping, epiphytic orchid with ovate leaves arising from a bulb-like base, and small, short-stalked, red solitary or paired flowers. Occasional to locally common from mangrove to montane forest, reported from near sea level to 820 m elevation. Indigenous, ranging from Vanuatu to Samoa. Wisner 140; Whistler 2901, 8695!, 8946!.

***Bulbophyllum samoanum** Schlechter

Small epiphytic orchid with leaves arising from bulb-like base, and solitary yellowish flowers tinged red, borne atop a long stalk. Occasional in montane forest, reported from 300 to 800 m elevation. Indigenous, ranging from New Caledonia to Samoa. Whistler 2787, 8496.

Bulbophyllum sp. nova

Prostrate epiphytic orchid with leaves arising from a bulb-like base, and a solitary yellow flower on a thin scape. Uncommon in lowland forest, reported from *ca.* 150 to 270 m elevation. Indigenous, also found in Niue. Whistler 3757!, 8714!, 9348!.

***Calanthe hololeuca** Reichenb. f.

Large ground orchid with basal, plicate leaves, and a tall raceme of showy white, spurred flowers. Occasional in montane to cloud forest, reported from 300 to 1200 m elevation. Indigenous, ranging from New Caledonia to Samoa. Setchell 376, 546; Garber 783, 785; Christophersen 1020; Whistler 2980, 9183.

Calanthe triplicata (Wille. f.) Ames

Large ground orchid with plicate leaves and tall racemes of showy white, spurred flowers marked with yellow. Common in lowland to cloud forest, reported from near sea level to 1600 m elevation. Indigenous, ranging from southern China to the Marquesas. Setchell 408; Christophersen 1126!, 1827!; Mitchell 561; Long 3050.

Coelogyne lycastoides F. Muell. and Kraenzl.

Large epiphytic orchid with large plicate leaves arising from a bulb-like base, cream colored flowers marked with brown, and a large, pendulous, winged capsule. Common in montane to cloud forest, reported from 300 to 1550 m elevation. Indigenous, ranging from New Caledonia to Samoa. Garber 788; Christophersen 1021, 1068; Whistler 2796, 8648!.

Dendrobium biflorum (Forst. f.) Sw.

Epiphytic orchid with stiff stems bearing grass-like leaves and paired white flowers with long-attenuate tepals. Common to abundant in lowland to montane forest, reported from near sea level to 600 m elevation. Indigenous, ranging from Vanuatu to Tahiti. Garber 935; Whistler 2696, 2791, 9051!.

Dendrobium calcaratum A. Rich.

Epiphytic orchid with long, longitudinally striate stems and short-stalked, axillary clusters of orange flowers borne on the leafless part of the stem. Occasional in lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from the Solomon Islands to Samoa. Whistler 2830, 3623, 8708!.

***Dendrobium catillare** Reichenb. f.

Small epiphytic orchid with thick, longitudinally striate stems, scattered leaves, and clusters of white or pink flowers in the axils of leafless stems. Uncommon in montane forest, reported from 250 to 500 m elevation. Indigenous, also found in Fiji. Whistler 2903, 8945.

Dendrobium dactylodes Reichenb. f.

Epiphytic orchid with lanceolate leaves, and paired, axillary, pale orange to white flowers. Common to abundant in lowland to montane forest, reported from near sea level to 800? m elevation. Indigenous, ranging from Vanuatu to Samoa. Setchell 205, 205a, 247; Diefenderfer 21; Bryan 960; Christophersen 1190, 1252; Yuncker 9441, 9442; Whistler 2695, 2751, 2831, 2919, 5734, 8058.

Dendrobium goldfinchii F. Muell.

Erect, laterally compressed epiphytic orchid with tiny white flowers in a terminal raceme. Occasional in coastal to lowland forest, reported from near sea level to 300 m elevation. Indigenous, ranging from New Guinea to Samoa. Whistler 2895, 3346, 3622, 8060, 8668!, 9103!.

Dendrobium samoense Cribb

Epiphytic orchid with somewhat succulent, purple-edged leaves and showy cream-colored flowers in a large terminal raceme. Occasional in lowland to montane forest, reported from near sea level to 600 m elevation. Endemic. Setchell 354; Yuncker 9304; Whistler 2795, 8667!.

Dendrobium sladei J. J. Wood and Cribb

Epiphytic orchid with ovate leaves, flowering branches arising above the leaf sheath, yellow stems, and

paired white flowers marked with red. Occasional in montane forest, reported from *ca.* 30 to *ca.* 600 m elevation. Indigenous, ranging from Vanuatu to Samoa. Christophersen 1256?; Yuncker 9391; Whistler 2694, 8497, 9038!, 9088.

Didymoplexis micradenia (Reichenb. f.) Hemsley

Leafless, purple-stemmed, saprophytic ground orchid with one or a few white flowers in a terminal raceme. Occasional in lowland to foothill forest, reported from 20 to 450 m elevation. Indigenous, ranging from New Caledonia to Niue. Whistler 2847, 2924, 3656 9330!, 9345!.

Diplocaulobium fililobum (F. Muell.) Kraenzl.

Epiphytic orchid with long stems bearing a single leaf on top, and with long-stalked, cream-colored flowers bearing long-attenuate tepals. Occasional in montane to cloud forest, reported from 400 to 1550 m elevation. Endemic. Christophersen 1203, 1213; Kuruc 10; Whistler 8788!, 9196.

Eria robusta (Bl.) Lindl.

Medium-sized epiphytic or ground orchid long, fleshy, imbricate leaves and a dense raceme of numerous, cream-colored flowers borne perpendicular to the rachis. Uncommon in lowland to cloud forest, reported from 240 to 1550 m elevation. Indigenous, ranging from India to Samoa. Wisner 145; Whistler 8722!, 8936.

***Erythrodes purpurascens** Schlechter

Small ground orchid with white flowers in a terminal raceme. Uncommon in montane forest, reported from 300 to 890 m elevation. Indigenous, also found in Fiji and Tonga. Whistler 2741.

Flickingeria comata (Bl.) A. Hawkes

Epiphytic orchid with large thick, oval leaves, and white flowers mottled red and bearing a yellow "beard." Occasional in mangrove to montane forest, reported from near sea level to 500 m elevation. Indigenous, ranging from Taiwan and Malaysia to Samoa. Setchell 335; Garber 933; Bryan 973; Christophersen 1186, 3526; Whistler 2697, 2829, 2894, 9041!.

Glomera montana Reichenb. f.

Long-stemmed epiphytic orchid with a dense terminal head-like cluster of white flowers pink inside. Occasional in lowland to cloud forest, reported from 50 to 1000 (1200?) m elevation. Endemic. Christophersen 1040, 3527; Long 2606, 3070.

***Habenaria monogyne** Schlechter

Large ground orchid with lanceolate leaves and green, spurred flowers in a terminal raceme. Uncommon in lowland to montane forest, reported from 300 to 900 m elevation. Endemic. Setchell 547.

***Liparis caespitosa** (Thou.) Lindl.

Small epiphytic orchid with leaves arising from a bulb-like base, and white flowers in short, few-flowered racemes. Uncommon in montane scrub, reported from 500 m elevation. Indigenous, ranging from East Africa to the Austral Islands. Christophersen 1182, 1200.

Liparis condylobulbon Reichenb. f.

Medium-sized epiphytic orchid with leaves arising from a bulb-like stem base, and small white flowers in several terminal racemes. Occasional to common in lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from Southeast Asia to Samoa. Garber 848; Wilder 15; Christophersen 1263; Wisner 138; Whistler 2699, 2739, 9040!.

***Liparis gibbosa** Finet

Small epiphytic orchid with leaves arising from a bulb-like base and a long-stalked raceme of small yellow to orange flowers. Uncommon in montane scrub, reported from 500 to 600 m elevation. Indigenous, ranging from India to Samoa. Christophersen 1062, 1187, 1191.

***Malaxis reineckeana** (Schlechter) Kores

Medium-sized ground orchid with plicate leaves and a terminal raceme of spurred, yellow flowers. Occasional in lowland to montane forest, reported from 300 to 750 m elevation. Endemic. Reinecke 620?; Long 3062.

Malaxis resupinata (Forst. f.) Kuntze

Medium-sized ground orchid with plicate ovate leaves and a narrow raceme of dark maroon flowers. Occasional in lowland to montane forest, reported from 250 to 500 m elevation. Indigenous, ranging from Vanuatu to Tahiti. Setchell 387; Bryan 91; Christophersen 1128!, 3582!; Yuncker 9431!?; Wisner 141; Whistler 2727.

Malaxis samoensis (Schlechter) Whistler

Small ground orchid with subfalcate leaves and small pale yellow flowers on a few-flowered scape. Occasional in lowland to montane forest, reported from 300 to 800 m elevation. Endemic. Christophersen 3567; Yuncker 9431!? (n. s.); Whistler 2742, 5725, 8507!, 8716!, 8994!.

***Mediocalcar paradoxum** (Kraenzl.) Schlechter

Creeping epiphytic orchid with leaves arising from bulb-like bases and short racemes of yellow flowers. Occasional in lowland to montane forest, reported from near sea level to 700 m elevation. Indigenous, ranging from the Santa Cruz Islands to Samoa. Setchell 402; Christophersen 3488; Whistler 3853, 9187.

Moerenhoutia heteromorpha (Reichenb. f.) Benth. & Hook. f.

Medium-sized ground orchid with a terminal raceme of pubescent white flowers. Occasional in lowland to montane forest, reported from 300 to 750 m elevation. Endemic. Christophersen 1822!; Whistler 2729, 2775!.

***Nervilia aragoana** Gaud.

Small ground orchid with cordate leaves arising from the ground and yellowish green flowers on a flowering scape that appears after the leaves die back. Uncommon in lowland to montane forest, reported from 180 to 500 m elevation. Indigenous, ranging from India to eastern Polynesia. Whistler 3776.

Oberonia equitans (Forst. f.) Mutel

Small, laterally compressed epiphytic orchid with tiny white flowers in a dense terminal raceme. Common in lowland to cloud forest, reported from near sea level to 1550 m elevation. Indigenous, ranging from New Caledonia to the Tuamotu Islands. Rechinger 16, 1281; Setchell 210, 336; Garber 880; Christophersen 1039; Long 3087?; Whistler 2906, 8666!.

Oberonia heliophila Reichenb. f.

Small to medium-sized, laterally compressed epiphytic orchid with long strap-shaped leaves, and tiny white flowers in long, narrow terminal racemes. Occasional in lowland to montane forest, reported from near sea level to 550 m elevation. Indigenous, ranging from the Solomon Islands to Samoa. Reinecke 615; Diefenderfer 22; Yuncker 9307; Long 3100; Whistler 2790, 9039!.

***Peristylus tradescantifolius** (Reichenb. f.) Kores

Small erect ground orchid with lanceolate leaves and small greenish flowers in a terminal raceme. Occasional in lowland to cloud forest, reported from 200 to 1000 m elevation. Indigenous, also found in Fiji and Tonga. Long 3120; Whistler 2686.

***Phaius amboinensis** Bl.

Large ground orchid with basal, plicate leaves and tall racemes of large, showy white flowers yellow within. Occasional in lowland to montane forest, reported from 50 to 800 m elevation. Indigenous, also found in Fiji. Whistler 2687.

Phreatia matthewsii Reichenb. f.

Small, laterally compressed orchid with linear leaves and several basal, pedunculate racemes mostly shorter than the leaves and bearing tiny white flowers. Common to abundant in mangrove to montane forest, reported from near sea level to 800 m elevation. Indigenous, ranging from New Caledonia to Tahiti. Setchell 238; Garber 938; Christophersen 1057, 1193, 1211, 1259, 1821!, 3573; Yuncker 9305; Wisner 140; Long 1951a; Whistler 2698, 9004!.

Phreatia micrantha (A. Rich.) Schlechter

Medium-sized, laterally compressed epiphytic orchid with several basal racemes of tiny white flowers. Common in mangrove to cloud forest, reported from near sea level to 1030 m elevation. Indigenous, also found in Fiji and Tonga. Setchell 400; Christophersen 1133!, 1189, 3503, 3538; Mitchell 581; Long 3018; Whistler 2740, 9002!.

Phreatia obtusa Schlechter

Medium-sized epiphytic orchid with a swollen base and small white flowers borne in a long raceme. Uncommon in montane forest, reported from 400 to 740 m elevation. Indigenous, also found in Fiji. Whistler 9000!.

***Pseuderia ramosa** L. O. Williams

Scrambling, epiphytic or terrestrial orchid with a raceme bearing several greenish flowers. Occasional in montane scrub and montane forest, reported from 270 to 700 m elevation. Indigenous, also found on Futuna. Christophersen 1190a, 3533; Whistler 3345.

Spathoglottis plicata Bl.

Large ground orchid with basal plicate leaves and showy pink flowers on a long scape. Common in disturbed sunny places and fernlands, reported from 100 to 700 m elevation. Indigenous, ranging from Vanuatu to Samoa. Setchell 193; Mitchell 514; Yuncker 9416; Whistler 8558!.

Taeniophyllum fasciola (Forst.) Reichenb. f.

Tiny leafless and stemless epiphytic orchid, consisting of flattened photosynthetic roots, short racemes of tiny white flowers, and a cylindrical fruit. Common in lowland forest, reported from near sea level to 300 m elevation. Indigenous, ranging from Guam and New Caledonia to Tahiti. Whistler 2918, 2984, 3117, 3117a, 3343, 8657!.

Taeniophyllum gracile (Rolfe) Garay

Tiny leafless and stemless epiphytic orchid consisting of flattened photosynthetic roots, tiny white flowers on a long scape, and an ellipsoid fruit. Uncommon in lowland forest, reported from 150 to 250 m elevation. Indigenous, also found in Fiji. Whistler 3117, 9102!.

Thrixspermum graeffei Reichenb. f.

Small epiphytic orchid with small white flowers borne on several long, spreading scapes. Occasional in montane forest, reported from 400 to 725 m elevation. Indigenous, also found in Fiji. Christophersen 1180, 1192; Whistler 3749!, 3852.

***Vrydagzenea vitiensis** Reichenb. f.

Small ground orchid with ovate leaves bearing a silvery median strip, and small white flowers in a terminal raceme. Occasional in lowland to montane forest, reported from 175 to 700 m elevation. Indigenous, also found in Vanuatu, Tonga, and Fiji. USEE s.n.; Lister s.n.? (no locality listed).

***Zeuxine stenophylla** (Reichenb. f.) Benth. & Hook. f. ex Drake

Medium-sized ground orchid with a terminal raceme of white flowers with rounded sepals. Occasional in lowland to montane forest, reported from 170 to 900 m elevation. Indigenous, also found in Tonga and Fiji. USEE s.n.; Whistler 2747?.

***Species indet.**

An unidentified, leafless orchid with a raceme of white (?) flowers was collected by W. Sykes (no. 36, 27 Sept. 1974), at Malaeimi on Tutuila, and P. Kores was unable to identify it even to genus (pers. comm.). This may be *Stereosandra javanica* Bl.

PANDANACEAE

Freycinetia reineckei Warb.
'ie'ie

Coarse climber with pandanus-like leaves 2.5–5 cm wide, auricles up to 13 cm long, unisexual inflorescences, ovaries with 2 stigmas, large oblong compound fruits 5.5–11 cm long, numerous tiny fruitlets up to 13 mm long, and the fruit stalk smooth. Common in lowland to cloud forest, reported from 180 to 1200 m elevation. Endemic. Garber 906, 907; Long 3013, 3076?, 3077; Whistler 2772!, 8935!, 8993!.

Freycinetia storckii Seem.
'ie'ie

Coarse climber with pandanus-like leaves 1.8–2.8 cm wide, unisexual inflorescences, ovaries with 4–6 stigmas, and a large cylindrical compound fruit 4–7 cm long by 1.5–2.3 cm wide on a scabrid stalk. Common to abundant in lowland to cloud forest, reported from near sea level to 1600 m elevation. Indigenous, also found in Fiji. Reinecke 355c; Garber 930; Christophersen 3495; Long 3017; Whistler 2750, 2983, 3548, 3640!, 3661, 9136, 9137. Another species was reported from Tutuila,

F. hombronii Mart.; it differs from *F. storckii* in having narrower leaves (1–2 cm wide) and shorter compound fruits (2.5–5 cm long). However, the specimen identified as *F. hombronii*, Garber 930, is sterile, and is likely to be just a juvenile form of *F. storckii*. The two species may, in fact, be one in the same.

***Pandanus reineckei** Warb.
fasa

Dioecious tree-like plant with prop roots, long tough leaves spiny on the margins and lower midrib, and compound fruits bearing 1–3-lobed keys. Common in montane scrub, reported from 450 to 1000 m elevation. Endemic. Reinecke 459; Setchell 72a, 407; Christophersen 1022, 1219; Whistler 2713, 3659.

Pandanus tectorius Parkinson
fasa

Dioecious tree-like plant with prop roots, long tough leaves spiny on margins and lower midrib, and compound fruits bearing 4–9-lobed keys. Common on exposed shores, reported from near sea level to 100 m elevation. Indigenous, widespread throughout the tropical Pacific. Reinecke 459; Setchell 32, 412; Garber 984; Whistler 1427, 3617, 3754.

***Pandanus whitmeeanus** Mart.
paogo

Dioecious tree-like plant with prop roots, long tough leaves spiny on the margins and midribs, and compound fruits bearing long keys with stigmas lateral on the tip. Commonly cultivated and sometimes found in montane scrub, reported from near sea level to 550 m elevation. Probably a Polynesian introduction, ranging from Vanuatu to the Cook Islands. Setchell 300; Christophersen 3580; Whistler 3778.

POACEAE

Axonopus compressus (Sw.) Beauv.
[carpet grass]

Mostly prostrate, mat-forming grass with narrow inflorescences bearing 3 spikes (a terminal pair and a lower one). Common in lawns and sunny, disturbed places, reported from near sea level to 650 m elevation. A modern introduction, native to tropical America. Whistler 3231, 8627!, 8899!.

Bothriochloa bladhii (Retz.) S.T. Blake

Medium-sized to tall grass with a branched panicle bearing awned, purple spikelets. Uncommon in dry, sunny, disturbed places, reported only from the lowlands. A modern introduction, native to Asia. Whistler 2971, 9014!, 9160.

Brachiaria mutica (Forssk.) Stapf
[California grass]

Large, soft-hairy grass with a branching inflorescence bearing awnless spikelets with conspicuous black stigmas. Common to abundant in disturbed areas, particularly in wet places, reported from near sea level to 300 m elevation. A modern introduction, probably native to north Africa, but now pantropic in distribution. Whistler 8969!, 9346!.

Brachiaria paspaloides (Presl) C. E. Hubb.

Erect, medium-sized grass with branching panicles of awnless, ovoid, acute-tipped spikelets. Occasional in disturbed places, reported from near sea level to 550 m elevation. Probably a Polynesian introduction, native to the Old World tropics. Setchell 509; Eames T24; Wilder 50; Whistler 327, 1283, 8561!.

Brachiaria subquadripara (Trin.) Hitchc.

Low grass with awnless, obovoid spikelets blunt at the tip, borne on several spreading branches of the rachis. Occasional in lawns and other sunny, disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Whistler 8624!.

***Cenchrus calyculatus** Cav.

Medium-sized to tall grass with softly spiny subglobose spikelets in a terminal spike. Rare in coastal areas and perhaps now extinct in Samoa, reported only from the lowlands. Indigenous, ranging from New Caledonia to the Society Islands. Powell s.n.

***Cenchrus echinatus** L.
[bur grass] vao tuitui

Medium-sized grass with unbranched spikes of bur-like fruits bearing hard spines. Common in disturbed places, reported only from coastal areas.

A modern introduction, native to tropical America. Setchell 502; Garber 830.

Centosteca lappacea (L.) Desv.
sefa

Erect grass with broad leaves and tiny awnless spikelets in a large panicle. Occasional to common in shady disturbed places and along forest trails, reported from near sea level to 650 m elevation. Possibly indigenous, or a Polynesian introduction, ranging from tropical Africa to the Marquesas. Graeffe s.n.; Setchell 78, 516; Garber 867, 889; Yuncker 9439; Wisner 161, 162; Long 3046; Whistler 2974, 3230, 8474, 8599!, 9181.

Chloris barbata (L.) Sw.
[fingergrass]

Erect grass with digitately arranged panicle branches of awned, purple spikelets. Common in dry disturbed places, reported only from coastal areas. A modern introduction, native to tropical America. Setchell 508; Eames T17; Wilder 21; Garber 801; Christophersen 980; Whistler 9011!.

***Chloris radiata** (L.) Sw.

Erect grass with digitately arranged spikes of awned, silvery spikelets. Rare in pastures, reported only from the lowlands. Perhaps no longer found in American Samoa. A modern introduction, native to to tropical America. Whistler 305.

***Chrysopogon aciculatus** (Retz.) Trin.

Low, mat-forming grass with awned, purplish spikelets borne in erect, scapose panicles. Common in lawns, streambeds, and fernlands, reported only from the lowlands. A Polynesian introduction, native to the Old World tropics. Setchell 500; Eames T17; Garber 798; Lamoureux 3077.

Coix lacryma-jobi L.
[Job's tears] sagasaga

Tall, robust grass with large leaves and spikelets that form white to gray, bead-like spikelets. Occasional to common in wet, disturbed places, reported only from the lowlands. A Polynesian introduction, native to Asia. Setchell 296; Garber 896; Diefenderfer 23; Christophersen 1207; Whistler 8616!.

***Cynodon dactylon** (L.) Pers.
[Bermuda grass]

Prostrate, mat-forming grass with erect inflorescences usually bearing four digitately arranged, spicate branches. Common in lawns and in sunny, disturbed places, reported only from the lowlands. A modern introduction, possibly native to tropical Africa. Whistler 3300.

Cyrtococcum oxyphyllum Stapf

Medium-sized grass with lanceolate leaves and awnless spikelets borne on fine stalks in narrow panicles. Locally common in shady forest areas and disturbed places, reported from near sea level to 830 m elevation. Indigenous or a Polynesian introduction, ranging from Malaysia to Niue. Christophersen 3559; Whistler 2845, 8511!, 8939?.

***Cyrtococcum trigonum** (Retz.) A. Camus

Small, somewhat prostrate grass with pubescent awnless spikelets in a short, narrow panicle. Common in lawns and other sunny, disturbed places, reported from near sea level to 550 m elevation. A modern introduction, native to Southeast Asia. Lamoureux 3068; Long 2603; Whistler 1432.

Dactyloctenium aegyptium (L.) Willd.

Low grass with a short inflorescence stalk bearing 1–5 thick, digitately arranged branches of purplish, bristly spikelets. Occasional in disturbed dry places, reported from near sea level to 240 m elevation. A modern introduction, native to the Old World tropics. Wisner 26; Whistler 8623!.

Digitaria ciliaris (Retz.) Koel.

Medium-sized to tall grass with multiple whorls of digitately arranged panicle branches bearing awnless spikelets. Common in plantations and sunny, disturbed places, reported from near sea level to 600 m elevation. A modern introduction, native to Asia. Whistler 306, 8925!, 9013!.

***Digitaria henryi** Rendle

Small grass with spikelets in a short panicle whose branches do not spread or extend much out of the sheath at maturity. Uncommon in disturbed places, reported only in coastal areas. Some authors include

this in *D. ciliaris*, but the two have entirely different growth forms. A modern introduction, native to tropical Asia. Whistler 3760, 8416.

Digitaria horizontalis Willd.

Erect grass with awnless spikelets in digitately arranged panicle branches bearing scattered hairs. Occasional in disturbed places, reported from near sea level to 350 m elevation. A modern introduction, native to tropical America. Whistler 8913!.

***Digitaria radicosa** (Presl) Miq.

Small grass with awnless spikelets in 2–4 digitately arranged panicle branches. Occasional in disturbed places in coastal areas, reported from near sea level to *ca.* 300 m elevation. Probably a Polynesian introduction, native to the Old World tropics. Whistler 302.

Digitaria setigera Roth ex Roemer & Schultes

Medium-sized grass with paired spikelets on long branches arranged subdigitately and spreading little at maturity. Common along the coast and in sunny disturbed places, reported from near sea level to 950 m elevation. Indigenous or a Polynesian introduction, ranging from India to Hawai'i. Garber 797; Wilder 30; Wisner 27; Lamoureux 3079; Whistler 8924!, 8927!.

Digitaria violascens Link

Medium-sized grass with shiny black inner glumes and awnless spikelets on digitately arranged panicle branches. Uncommon to occasional in disturbed places, reported from near sea level to 600 m elevation. A modern introduction, native to tropical Asia. Whistler 301, 8629!.

Echinochloa colona (L.) Link.
[barnyard grass]

Erect grass with awnless spikelets closely packed on several short panicle branches. Common in sunny, disturbed places, reported only from near sea level to 300 m elevation. A modern introduction, native to the Old World tropics. Setchell 503; Eames T26; Wilder 21a; Garber 966; Lamoureux 3086; Whistler 8625!.

Eleusine indica (L.) Gaertn.
[goosegrass] ta'ata'a

Medium-sized grass with shortly awned spikelets in thick panicle branches (usually 2 or 3 of them terminal with one lower). Common in sunny disturbed places, especially along dirt roads, reported from near sea level to 300 m elevation. A Polynesian introduction, native to the Old World tropics. Reinecke 268; Setchell 510; Garber 794, 810; Whistler 8620!.

***Eragrostis pilosa** L.

Delicate grass with fine, spreading panicle branches and tiny, flattened spikelets. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to Southern Europe. Lamoureux 3065.

***Eragrostis tenella** (L.) Beauv. ex Roemer & Schultes
[lovegrass]

Delicate grass with narrow panicle branches bearing tiny flattened spikelets. Common in lawns and in sunny, disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Setchell 157, 505; Eames T6; Garber 796; Christophersen 1178.

Eriochloa procera (Retz.) C. E. Hubb.

Narrow grass with a panicle of small awnless spikelets having a conspicuous purple ring at the base. Occasional in disturbed places, reported only from the lowlands. A modern introduction, native to the Old World tropics. Lamoureux 3081; Whistler 326, 2920, 3290, 8970!.

***Imperata conferta** (Presl) Ohwi

Medium-sized grass with silky spikelets arranged in a narrow, plumose inflorescence. Uncommon on Tutuila in sunny disturbed places, elsewhere in Samoa also found on montane lava and ash flows and fernlands, reported from near sea level to 1500 m elevation. Indigenous, ranging from Southeast Asia to Samoa. USEE s.n. (n.s.); Whistler 2931.

***Ischamemum indicum** (Houtt.) Merr.

Small grass with a pair of terminal, spreading racemose branches of long-awned spikelets. Common

as a pasture grass and sometimes escaping in disturbed places and roadsides, reported only from the lowlands. A modern introduction, native to tropical Asia. Whistler 310, 313, 375.

Ischaemum murinum Forst. f.

Small clump-forming grass with awned spikelets borne in paired spikes. Occasional to locally common on rocky shores, reported only near the coast. Indigenous, also found in Tonga and Niue. USEE s.n.; Garber 806; Whistler 2911, 8072, 8409, 8411, 8417, 8429, 8564!, 8684!.

***Ischaemum** sp.

Tall grass with awned spikelets in a long pair of spikes. Uncommon in the montane scrub of Matafao and Le Pioa Mountains of Tutuila, reported from *ca.* 450–650 m elevation. Endemic to Tutuila? Setchell 405?; Christophersen 3545; Whistler 5704, 9182. This species has not been identified with certainty yet, but was reported by Setchell to have been introduced by Mrs. Robert Louis Stevenson–which is doubtful.

***Lepturopetium** sp.

Small grass with a pair of terminal spikes with embedded spikelets. Rare on coastal rocks, reported only on the coast at the east end of the island. Two species have been named in this recently recognized genus, but these may be formed from an intergeneric hybrid (Fosberg, pers. comm.). Probably indigenous, the same as or similar to other individuals found on several other tropical Pacific islands. Whistler 5728, 8395.

Lepturus repens (Forst. f.) R. Br.

Small grass with narrow leaves and spikelets embedded in a corky rachis. Common on rocky and sandy sea coasts, reported only along the coast. Indigenous, ranging from Ceylon to Hawai'i. USEE s.n. (n.s.); Setchell 415; Whistler 2852, 8565!.

***Melinus minutiflora** Beauv.

Tall, hairy, strong-smelling grass with a dense panicle of awned spikelets. Uncommon in disturbed places or perhaps just escaping from pastures, reported only from the lowlands. A modern introduction, native to Africa. Whistler 5729

***Microstegium glabratum** (Brongn.) A. Camus

Small grass with several unjointed racemes of long-awned spikelets. Uncommon in montane forest, reported from 150 to 450 m elevation. Probably a recent introduction, but indigenous from the Philippines to Tahiti. Whistler 9193.

Miscanthus floridulus (Labill.) Warb.

Tall grass with large plumose inflorescence bearing silky, windborne spikelets. Common in sunny places in the lowlands and on fernlands, reported from near sea level to 100 m elevation. Indigenous, ranging from at least Micronesia to eastern Polynesia. Setchell 252; Eames T19; Garber 793; Whistler 1448, 9109!.

Oplismenus compositus (L.) Beauv.

Medium-sized grass with awned spikelets on several branches from the rachis. Common in disturbed shady places, reported from near sea level to 1750 m elevation. Probably a Polynesian introduction, now pantropic in distribution. USEE s.n. (n.s.); Wisner 60; Whistler 8475, 8586!, 8719!, 9141.

Oplismenus hirtellus (L.) Beauv.
[basket grass]

Small grass with awned spikelets in short clusters on the rachis. Common in shady lowland forest and disturbed areas, reported from near sea level to 250 m elevation. Probably a Polynesian introduction, native perhaps from Australia to Southeast Asia. Long 3079; Whistler 2897, 8509!, 8728!, 9199.

Paspalum conjugatum Bergius
[T- grass] vaolima

Creeping grass with flat, round spikelets on a pair of spreading, terminal inflorescence branches. Common to abundant in sunny disturbed places, reported from near sea level to 740 m elevation. A modern introduction, native to tropical America. Setchell 550; Eames T25; Garber 964; Whistler 8912!.

***Paspalum dilatatum** Poiret

Erect grass with several spreading panicle branches bearing 2 rows of flattened, round, hairy spikelets. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to South America. Sykes 75.

Paspalum orbiculare Forst. f.

Medium-sized grass with several branches of flattened spikelets on the main axis. Common in wet places, reported from near sea level to 1650 m elevation. Indigenous, widespread from Southeast Asia to Hawai'i. Garber 805; Eames T8; Christophersen 3560; Whistler 2716, 2932, 2973, 8908!, 9063, 9179.

Paspalum paniculatum L.

Erect grass with numerous long panicle branches bearing small, round, flattened spikelets. Common to abundant in sunny disturbed places and forest clearings, reported from near sea level to 200 m elevation. A modern introduction, native to tropical America. Whistler 8622!.

***Paspalum setaceum** Michx.

Small grass with a solitary inflorescence branch on the apex of the rachis, and round, flattened spikelets. Uncommon to locally common in lawns and sunny disturbed places, reported only from the lowlands. A modern introduction, native to North America. Whistler 4987.

***Paspalum urvillei** Steud.

Tall grass with several long panicle branches bearing round, flattened, hairy spikelets. Uncommon in disturbed places, reported only from the lowlands. A modern introduction, native to tropical America. Whistler 325, 1453, 8418.

Paspalum vaginatum Sw.

Medium-sized grass spreading by means of underground rhizomes and bearing spikelets on two terminal inflorescence branches. Common along estuaries and on rocky or sandy shores, reported only on the coast. Probably an early European introduction, pantropic in distribution. Whistler 8921!.

***Pennisetum purpureum** Schumacher

Robust grass with bristly spikelets in large yellow, cylindrical panicles. Occasional in clumps or thickets in disturbed places such as roadsides, reported from near sea level to 650 m elevation. A modern introduction, native to tropical Africa. Whistler 1424.

***Sacciolepis indica** (L.) Chase

Small grass with a long scape bearing a dense, narrow, cylindrical spike of short-awned spikelets. Uncommon in disturbed places, reported from 350 to 650 m elevation. A modern introduction, native to the Old World tropics. Whistler 9180.

***Setaria glauca** (L.) Beauv.

Small grass with a dense, yellow, cylindrical inflorescence bearing spikelets subtended by basal bristles. Occasional in disturbed places, reported from near sea level to 600 m elevation. A modern introduction, native to the Old World tropics. Whistler 2815, 9161.

***Sorghum sudanense** (Piper) Stapf

Tall, erect, annual grass with leaves spotted with purple, and large, brown, awned or awnless spikelets. Occasional to common in sunny, disturbed places, reported only from the lowlands. A modern introduction, native to the Mediterranean area. Whistler 9008.

Sporobolus diander (Retz.) P. Beauv.

Clump-forming grass with linear leaves and a narrow cylindrical panicle with short ascending branches bearing awnless spikelets from which the brown seed drops. Common in lawns and disturbed places, reported from near sea level to 240 m elevation. A modern introduction, native to India. Lamoureux 3064, 3084; Whistler 8971!.

Stenotaphrum micranthum (Desv.) C. E. Hubb.

Medium-sized grass with spikelets embedded in a thickened rachis that does not break apart at maturity. Uncommon on sandy shores, reported from near sea level to 260 m elevation. Indigenous, widespread from Southeast Asia to the Society Islands. USEE s.n.; Rechinger 3703; Whistler 8420, 8691!, 9025!.

***Stenotaphrum secundatum** (Walter) Kuntze

Low, mat-forming grass with a spicate inflorescence with the spikelets embedded in the thick rachis. Uncommon in lawns and sunny disturbed places, reported only near the coast. A modern introduction, perhaps native to both Africa and tropical America. Setchell 201, 501; Whistler 1289, 8438.

Thuarea involuta (Forst. f.) Roemer & Schultes

Prostrate grass with lanceolate leaves and a fruit which at maturity is enclosed within a subtending bract to make a water-tight case. Occasional to locally abundant on sandy shores, reported only on the coast. Indigenous, ranging from Southeast Asia to the Tuamotu Islands. USEE s.n.; Whistler 2948, 8922!.

***Zoysia tenuifolia** Willd. ex Trin.
[Japanese temple grass]

Small, mat-forming grass with narrow, involute leaves and a short spike bearing tiny awnless spikelets. Locally common in villages in coastal areas, sometimes in littoral habitats, reported only from the lowlands. A modern introduction, native to Southeast Asia? (Whistler).

TACCACEAE

Tacca leontopetaloides (L.) Kuntze
[Polynesian arrowroot] masoa

Erect stemless herb with tall, deeply lobed, long-stalked basal leaves and green flowers and fruits borne atop a long, longitudinally grooved scape. Common in littoral to lowland forest, reported from near sea level to 200 m elevation. Indigenous or a Polynesian introduction, ranging from India to Hawai'i. Setchell 129, 185; Meebold 26510; Whistler 2844, 9029!.

ZINGIBERACEAE

Costus speciosa (Koenig) Sm.
[crepe ginger]

Coarse unbranched herb up to 2 m or more in height with alternate leaves, terminal inflorescences bearing reddish bracts, and large, showy white, crepe-like flowers. Uncommon in disturbed places, probably an escape from cultivation, reported from near sea level to *ca.* 300 m elevation. A modern introduction, indigenous from the Himalayas eastward to perhaps New Guinea. Whistler 8706!.

Etlingera cevuga (Seem.) R.M. Smith
'avapui vao?

Tall herb 2 or more m in height with very short, leafless inflorescences of orange flowers. Occasional to locally abundant in lowland to montane forest, especially along streams, reported from 300 to 800 m elevation. Indigenous, or perhaps a Polynesian introduction, ranging from Fiji to the Society Islands. Christophersen 1124!.

Zingiber zerumbet (L.) Smith
[shampoo ginger] 'avapui

Medium-sized ginger with white fragrant flowers borne among bracts of an ovoid terminal inflorescence on a leafless stalk. Occasional in secondary forest and plantations, reported from near sea level to 600 m elevation. A Polynesian introduction, widespread from tropical Asia to Hawai'i. Setchell 37; Garber 900; Diefenderfer 1; Wisner 68; Whistler 1275; Whistler 3848, 8986!.

APPENDIX B: PLOT DATA

(Basal area is measured in square inches.)

PLOT 1: MATAPAI POINT LOWLAND COASTAL FOREST (50 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Garuga floribunda	12	12	1466	23%
2. Dysoxylum maota	3	3	1157	18%
3. Planchonella garberi	8	3	924	14%
4. Terminalia catappa	2	1	710	11%
5. Planchonella grayana	26	8	571	9%
6. Barringtonia asiatica	5	5	416	7%
7. Diospyros samoensis	14	3	320	5%
8. Erythrina variegata	2	2	249	4%
9. Guettarda speciosa	2	1	115	2%
10. Myristica fatua	3	2	98	2%
11. Cocos nucifera	1	1	95	1%
12. Diospyros elliptica	10	0	81	1%
13. Sterculia fanaiho	1	1	50	1%
14. Syzygium clusiifolium	2	1	41	1%
15. Polyscias samoensis	4	0	20	+
16. Meryta macrophylla	1	0	20	+
17. Morinda citrifolia	1	0	20	+
18. Ficus tinctoria	1	0	13	+
19. Buchanania merrillii	1	0	7	+
	100	43	6373	100%

PLOT 2: SAUMA LOWLAND COASTAL FOREST (185 m elev.)

	Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1.	Diospyros samoensis	16	9	2358	31%
2.	Barringtonia asiatica	4	3	1268	17%
3.	Canarium harveyi	37	8	978	13%
4.	Garuga floribunda	2	2	784	10%
5.	Myristica fatua	9	6	369	5%
6.	Planchonella garberi	2	2	354	5%
7.	Elattostachys falcata	1	1	346	5%
8.	Guettarda speciosa	2	2	304	4%
9.	Canarium vitiense	1	1	201	3%
10.	Macaranga stipulosa	3	3	166	2%
11.	Planchonella samoensis	1	1	133	2%
12.	Calophyllum neo-ebudicum	1	1	95	1%
13.	Aglaia samoensis	6	1	62	1%
14.	Syzygium clusiifolium	2	1	45	1%
15.	Casearia sp. nova	6	1	44	1%
16.	Planchonella grayana	1	1	38	+
17.	Ficus scabra	1	0	20	+
18.	Polyscias samoensis	3	0	13	+
19.	Citronella samoensis	2	0	6	+
		100	43	7604	100%

PLOT 3: TUFANUA LOWLAND RIDGE FOREST (60 m elev.)

	Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1.	Calophyllum neo-ebudicum	29	8	593	30%
2.	Intsia bijuga	9	3	362	18%
3.	Calophyllum inophyllum	3	1	310	15%
4.	Garcinia vitiensis	13	3	242	12%
5.	Syzygium inophylloides	2	2	145	7%
6.	Metrosideros collina	2	1	71	4%
7.	Glochidion ramiflorum	5	0	56	3%
8.	Homalium whitmeeanum	10	0	54	3%
9.	Diospyros elliptica	7	0	37	2%
10.	Manilkara dissecta	2	0	33	2%
11.	Elattostachys falcata	3	0	31	2%
12.	Erythrospermum acuminatissimum	6	0	26	1%
13.	Planchonella garberi	2	0	20	1%
14.	Syzygium clusiifolium	2	0	10	+
15.	Eurya pickeringii	1	0	7	+
16.	Chionanthus vitiensis	1	0	3	+
17.	Psychotria insularum	1	0	3	+
18.	Alstonia pacifica	1	0	3	+
19.	Canarium harveyi	1	0	3	+
		100	19	2009	100%

PLOT 4: MULIULU LOWLAND RIDGE FOREST (190 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Intsia bijuga	10	7	1457	20%
2. Canarium harveyi	31	14	1377	19%
3. Syzygium inophylloides	9	8	1283	17%
4. Canarium vitiense	4	3	904	12%
5. Buchanania merrillii	10	8	635	9%
6. Calophyllum neo-ebudicum	2	2	629	8%
7. Hibiscus tiliaceus	6	4	289	4%
8. Diospyros samoensis	4	1	194	3%
9. Myristica fatua	6	3	160	2%
10. Rhus taitensis	2	2	100	1%
11. Elaeocarpus ulianus	1	1	95	1%
12. Alphitonia zizyphoides	2	2	95	1%
13. Hernandia moerenhoutiana	2	1	71	1%
14. Syzygium dealatum	2	1	57	1%
15. Fagraea berteroana	1	1	28	+
16. Glochidion ramiflorum	2	0	20	+
17. Barringtonia samoensis	1	0	13	+
18. Polyscias samoensis	1	0	7	+
19. Citronella samoensis	1	0	7	+
20. Flacourtia rukam	1	0	7	+
21. Garuga floribunda	1	0	3	+
22. Planchonella garberi	1	0	3	+
	100	58	7431	100%

PLOT 5: SAUMA LOWLAND RIDGE FOREST (320 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Diospyros samoensis	37	29	2486	27%
2. Syzygium dealatum	8	7	1533	17%
3. Syzygium inophylloides	11	10	1476	16%
4. Calophyllum neo-ebudicum	7	5	1022	11%
5. Canarium vitiense	2	2	769	8%
6. Planchonella garberi	4	4	676	7%
7. Rhus taitensis	3	2	415	5%
8. Myristica fatua	7	3	312	3%
9. Aglaia samoensis	5	2	119	1%
10. Elattostachys falcata	2	1	92	1%
11. Citronella samoensis	2	2	88	1%
12. Sterculia fanaiho	2	1	70	1%
13. Garcinia vitiensis	1	1	38	+
14. Meryta macrophylla	4	0	30	+
15. Diospyros elliptica	1	1	28	+
16. Buchanania merrillii	2	0	20	+
17. Ixora samoensis	2	0	20	+
	100	70	9194	100%

PLOT 6: TIATAUALA LOWLAND RIDGE FOREST (180 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Buchanania merrillii	21	9	2450	31%
2. Calophyllum neo-ebudicum	10	8	1843	23%
3. Syzygium inophylloides	5	4	921	11%
4. Canarium vitiense	7	6	524	7%
5. Hibiscus tiliaceus	6	5	485	6%
6. Diospyros samoensis	7	4	404	5%
7. Myristica fatua	15	5	326	4%
8. Rhus taitensis	2	2	314	4%
9. Hernandia moerenhoutiana	2	1	184	2%
10. Diospyros elliptica	1	1	177	2%
11. Myristica hypargyraea	1	1	154	2%
12. Canarium harveyi	5	1	67	1%
13. Syzygium samoense	2	2	66	1%
14. Ixora samoensis	3	0	20	+
15. Aglaia samoensis	5	0	19	+
16. Elattostachys falcata	1	0	19	+
17. Syzygium samarangense	1	0	7	+
18. Glochidion ramiflorum	1	0	7	+
19. Cerbera manghas	1	0	7	+
20. Cyathea vaupelii	2	0	6	+
21. Citronella samoensis	1	0	6	+
22. Cyclophyllum barbatum	1	0	3	+
	100	49	8019	100%

PLOT 7: FAIGA LOWLAND RIDGE FOREST (260 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Syzgium inophylloides	7	7	1420	22%
2. Calophyllum neo-ebudicum	3	3	1144	17%
3. Canarium vitiense	5	4	804	12%
4. Buchanania merrillii	11	6	707	11%
5. Myristica fatua	32	10	668	10%
6. Diospyros samoensis	9	4	638	10%
7. Terminalia catappa	1	1	572	9%
8. Canarium harveyi	16	3	236	4%
9. Hernandia moerenhoutiana	1	1	113	2%
10. Ficus tinctoria	1	1	64	1%
11. Syzygium samoense	1	1	50	1%
12. Glochidion ramiflorum	2	1	45	1%
13. Myristica hypargyraea	3	0	29	+
14. Hibiscus tiliaceus	1	0	20	+
15. Aglaia samoensis	3	0	16	+
16. Planchonella garberi	1	0	13	+
17. Flacourtia rukam	1	0	13	+
18. Polyscias samoensis	2	1	10	+
19. Crossostylis biflora	1	0	3	+
	101	42	6565	100%

PLOT 8: OLO LOWLAND RIDGE FOREST (250 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Syzygium inophylloides	10	8	1077	25%
2. Rhus taitensis	1	1	615	15%
3. Canarium vitiense	4	3	467	11%
4. Diospyros samoensis	5	2	420	10%
5. Canarium harveyi	6	3	359	9%
6. Hibiscus tiliaceus	2	2	215	5%
7. Bischofia javanica	2	1	201	5%
8. Planchonella samoensis	2	1	136	3%
9. Planchonella garberi	1	1	133	3%
10. Calophyllum neo-ebudicum	1	1	133	3%
11. Aglaia samoensis	12	0	75	2%
12. Sterculia fanaiho	3	1	52	1%
13. Planchonella grayana	4	0	43	1%
14. Flacourtia rukam	4	0	23	1%
15. Meryta macrophylla	1	0	20	+
16. Guettarda speciosa	1	0	20	+
17. Citronella samoensis	4	0	20	+
18. Elaeocarpus ulianus	1	0	13	+
19. Myrtistica fatua	1	0	6	+
20. Diospyros elliptica	2	0	6	+
21. Psychotria insularum	1	0	3	+
	69	24	4037	100%

PLOT 9: AMALAU LOWLAND RIDGE FOREST (280 m elev.)

	Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1.	Canarium vitiense	9	7	2532	25%
2.	Buchanania merrillii	18	13	1843	18%
3.	Calophyllum neo-ebudicum	2	2	1270	12%
4.	Canarium harveyi	9	5	1026	10%
5.	Myristica fatua	23	10	857	8%
6.	Dysoxylum samoense	1	1	660	6%
7.	Syzygium dealatum	1	1	615	6%
8.	Cananga odorata	2	2	428	4%
9.	Syzygium inophylloides	2	1	366	4%
10.	Hibiscus tiliaceus	2	1	230	2%
11.	Myristica hypargyraea	3	2	148	1%
12.	Macaranga stipulosa	2	2	114	1%
13.	Planchonella garberi	1	1	50	+
14.	Flacourtia rukam	2	1	41	+
16.	Crossostylis biflora	4	0	26	+
17.	Syzygium samarangense	2	0	10	+
18.	Canthium merrillii	1	0	7	+
19.	Aglaia samoensis	1	0	7	+
20.	Planchonella samoense	1	0	7	+
21.	Planchonella grayana	1	0	7	+
22.	Antidesma sphaerocarpum	1	0	3	+
23.	Meryta macrophylla	1	0	3	+
24.	Hedycarya denticulata	1	0	3	+
		102	49	10328	100%

PLOT 10: AMALAU LOWLAND VALLEY FOREST (50 m elev.)

	Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1.	Dysoxylum maota	12	10	5282	46%
2.	Planchonella samoensis	15	7	2010	17%
3.	Inocarpus fagifer	23	15	1053	9%
4.	Canarium vitiense	3	3	906	8%
5.	Kleinhovia hospita	2	2	663	6%
6.	Myristica fatua	21	8	539	5%
7.	Bischofia javanica	1	1	530	5%
8.	Cananga odorata	4	1	184	2%
9.	Elaeocarpus ulianus	1	1	133	1%
10.	Macaranga stipulosa	1	1	113	1%
11.	Ficus scabra	8	0	71	1%
12.	Polyscias samoensis	3	0	17	+
13.	Pisonia umbellifera	1	0	7	+
14.	Aglaia samoensis	1	0	7	+
15.	Buchanania merrillii	1	0	3	+
16.	Barringtonia asiatica	1	0	3	+
17.	Sterculia fanaiho	1	0	3	+
18.	Planchonella garberi	1	0	3	+
		100	39	11527	100%

PLOT 11: VATIA PASS LOWLAND RIDGE FOREST (350 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Calophyllum neo-ebudicum	8	8	1312	29%
2. Syzygium inophyhlloides	15	7	514	11%
3. Syzygium samoense	10	6	458	10%
4. Buchanania merrillii	7	4	424	9%
5. Hernandia moerenhoutiana	3	2	403	9%
6. Myristica fatua	14	7	331	7%
7. Fagraea berteroana	5	3	162	4%
8. Rhus taitensis	1	1	133	3%
9. Elaeocarpus tonganus	4	2	122	3%
10. Canarium harveyi	2	2	117	3%
11. Elatostachys falcata	4	1	117	3%
12. Astronidium pickeringii	2	1	92	2%
13. Garcinia myrtifolia	1	1	79	2%
14. Syzygium samarangense	3	2	76	2%
15. Planchonella garberi	2	1	41	1%
16. Alstonia pacifica	2	0	27	1%
17. Baccaurea taitensis	7	0	25	1%
18. Crossostylis biflora	2	0	23	1%
19. Canthium merrillii	1	0	20	+
20. Cyathea truncata?	1	0	13	+
21. Meryta macrophylla	2	0	10	+
22. Diospyros samoensis	1	0	7	+
23. Dysoxylum huntii	1	0	7	+
24. Palaquium stehlinii	1	0	3	+
25. Psychotria insularum	1	0	3	+
	100	49	4518	100%

PLOT 12: ALAVA MONTANE FOREST* (400 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Dysoxylum huntii	2	2	1118	22%
2. Crossostylus biflora	11	9	889	18%
3. Syzygium samoense	12	8	668	13%
4. Palaquium stehlinii	5	2	475	10%
5. Hedycarya denticulata	24	3	435	9%
6. Diospyros samoensis	1	1	254	5%
7. Myristica hypargyraea	13	4	213	4%
8. Buchanania merrillii	7	1	162	3%
9. Myristica fatua	14	2	157	3%
10. Syzgyium inophylloides	1	1	154	3%
11. Canarium harveyi	4	1	71	1%
12. Hibiscus tiliaceus	1	1	50	1%
13. Fagraea berteroana	1	1	50	1%
14. Calophyllum neo-ebudicum	1	1	50	1%
15. Canthium merrillii	2	0	40	1%
16. Baccaurea taitensis	4	1	37	1%
17. Garcinia myrtifolia	1	1	28	1%
18. Elaeocarpus tonganus	2	0	23	+
19. Syzygium samarangense	4	0	22	+
20. Psychotria insularum	3	0	19	+
21. Ixora samoensis	2	0	13	+
22. Canarium vitiense	1	0	13	+
23. Hernandia moerenhoutiana	2	0	14	+
24. Glochidion cuspidatum	2	0	14	+
25. Aglaia samoensis	1	0	13	+
26. Cyathea vaupelii	2	0	10	+
27. Meryta macrophylla	1	0	7	+
28. Polyscias samoensis	2	0	6	+
	126	39	5005	100%

*Taken from data collected during the Amerson *et al.* survey (1982).

PLOT 13: SUNITAO LITTORAL FOREST (*ca.* 30 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Hernandia nymphaeifolia	10	8	2501	27%
2. Erythrina variegata	5	5	1940	21%
3. Pisonia grandis	5	5	1577	17%
4. Diospyros samoensis	33	13	866	9%
5. Hibiscus tiliaceus	8	6	780	8%
6. Dysoxylum samoense	7	3	509	5%
7. Ficus scabra	12	5	388	4%
8. Guettarda speciosa	5	5	271	3%
9. Syzygium dealatum	7	3	233	2%
10. Sterculia fanaiho	4	2	169	2%
11. Chionanthus vitiensis	1	1	79	1%
12. Planchonella garberi	1	1	50	1%
13. Myrtistica fatua	3	0	33	+
14. Ervatamia obtusiuscula	2	0	10	+
15. Morinda citrifolia	3	0	9	+
	106	57	9415	100%

PLOT 14. OFU LOWLAND DISCLIMAX FOREST* (*ca.* 150 m elev.)

Species	No. trees	No. 6 in. +	Basal Area	Rel. Dom.
1. Hibiscus tiliaceus	26	12	1137	18%
2. Dysoxylum samoense	10	8	1136	18%
3. Terminalia catappa	1	1	864	13%
4. Myristica fatua	24	10	800	12%
5. Neonauclea forsteri	3	3	732	11%
6. Guettarda speciosa	1	1	706	11%
7. Diospyros samoensis	27	4	534	8%
8. Ficus scabra	9	2	209	3%
9. Sterculia fanaiho	4	1	199	3%
10. Planchonella garberi	1	1	50	1%
11. Bischofia javanica	1	1	38	1%
12. Morinda citrifolia	1	0	13	+
13. Geniostoma rupestre	1	0	13	+
14. Barringtonia samoensis	2	0	10	+
15. Psychotria insularum	1	0	7	+
16. Ervatamia obtusiuscula	1	0	7	+
17. Ficus tinctoria	1	0	7	+
	114	44	6462	100%

*Taken from data collected during the Amerson *et al.* survey (1982).

APPENDIX C: SEASONALITY OF IMPORTANT FRUIT-BEARING TREES AND SHRUBS IN THE PARK AREA.

The table below was complied from herbarium specimens at the Bishop Museum and in the personal collection of the author, augmented by notes from Dr. Pepper Trail (pers. comm.). Some of the species include only flowering or fruiting dates; in most of these the mature fruits are small and not always distinguishable from the flowers. Many of the gaps in the data reflect inadequate sampling; most of the trees on Tutuila can be found flowering at anytime of the year. This list should be considered only tentative, because data for many of these species is currently being recorded by Dr. Pepper Trail of the Department of Marine and Wildlife Resources in American Samoa.

SPECIES **FAMILY**	FLOWERING DATES	FRUITING DATES
	DICOTS	
ANACARDIACEAE	- - - - - - - - - -- -- 12	1 2 - - 5 6 7 - 9 -- -- 12
Buchanania merrillii	- - - 4 5 - - 8 - 10 -- --	- - - - 5 6 7 - 9 -- -- 12
Rhus taitensis		
ANNONACEAE		
Cananga odorata	1 2 - - - 6 - 8 9 -- 11 12	1 - - - - 6 - 8 - 10 11 12
APOCYNACEAE		
Alyxia bracteolosa	- - 3 - - - - 8 9 10 11 --	1 - - 4 5 - 7 8 9 10 11 --
Alyxia stellata	1 - 3 - - - 7 - 9 10 11 --	1 - 3 4 5 - 7 8 9 10 -- 12
Cerbera manghas	1 2 - - 5 - 7 8 9 10 11 12	- - - - - 6 7 - - -- -- --
ARALIACEAE		
Meryta macrophylla	- - - - 5 6 7 8 - 10 -- --	1 - 3 - - - - 8 9 10 -- 12
Polyscias samoensis	- - - 4 5 - 7 8 - -- -- --	1 - - 4 - 6 7 8 9 -- -- 12
BARRINGTONIACEAE		
Barringtonia asiatica	- - - - - - 7 8 - -- -- 12	- - - - - 6 7 - - -- -- --
Barringtonia samoensis	1 2 - 4 5 - 7 - 9 10 11 12	- - 3 4 - - 7 8 - 10 11 12
BURSERACEAE		
Canarium harveyi	- - - - - - 7 - - -- 11 --	- - - - - 6 - - - -- -- 12
Canarium vitiense	- - - - - - 7 8 - 10 11 --	1 - 3 - - - - 8 9 10 -- 12
Garuga floribunda	- - - - - - 7 8 - -- -- --	- - - - - - - 8 9 10 11 12
CLUSIACEAE		
Calophyllum inophyllum	1 - - - - 6 7 - 9 -- 11 --	1 - - - - - 7 - - -- 11 12
Calophyllum neo-ebudicum	1 2 - - - - - - 9 10 11 --	1 - 3 - - - 7 8 - 10 11 12
Garcinia myrtifolia	- - - - - - - - - -- -- 12	1 - - 4 - - - 8 9 -- -- --
Mammea glauca	- - - - - - - - - 9 -- 11 12	- - 3 - 5 6 - 8 9 -- -- --
COMBRETACEAE		
Terminalia catappa	- - - - - 6 - 8 - -- 11 --	1 - - - 5 - - 8 - -- 11 12
Terminalia richii	- - - - - - - - 9 10 -- --	- 2 - - - - - - - - -- -- --
Terminalia samoensis	1 - - - - - 7 8 - -- -- 12	1 2 - - 5 - 7 8 9 10 -- 12
CUNONIACEAE		
Spiraeanthemum samoense	1 - - - 5 6 7 8 9 -- 11 12	
Weinmannia affinis	- - - - - 6 - - - -- -- --	
EBENACEAE		
Diospyros elliptica	- 2 3 4 - - - 8 - 10 -- --	- - 3 - - - 7 8 9 10 11 --
Diospyros samoensis	1 - 3 - - - - - 9 -- 11 12	1 - 3 - - - 7 8 9 10 -- --
ELAEOCARPACEAE		
Elaeocarpus tonganus	- 2 3 - - 6 - - 9 -- -- 12	1 2 3 - - 6 - 8 - -- -- 12
Elaeocarpus ulianus	- - - - - - - 8 - 10 -- --	- 2 - 4 5 6 7 8 9 -- -- 12

SPECIES **FAMILY**	FLOWERING DATES	FRUITING DATES
EUPHORBIACEAE		
Aleurites moluccana	- 2 - - - - - - - 10 -- --	- - - - - - - 8 9 10 -- --
Antidesma sphaerocarpum	1 - 3 4 - - 7 8 - -- 11 12	1 - 3 4 5 - 7 8 - -- -- --
Baccaurea taitensis	- 2 - - - - 7 8 9 10 11 12	- 2 - - - 6 7 8 - 10 11 12
Bischofia javanica	1 - 3 - - - - - - 10 -- --	- - - 4 5 6 7 8 9 -- -- --
Drypetes vitiensis	- - 3 - - - - - - -- -- --	- - - 4 - - - - 9 -- -- --
Glochidion cuspidatum	- - - - - 6 7 8 9 10 11 --	- - - - - 6 7 8 9 -- 11 --
Glochidion ramiflorum	1 2 3 - - 6 7 8 - 10 11 --	1 - - - - 6 7 8 - 10 11 12
Macaranga harveyana	1 - 3 - 5 - 7 - 9 10 -- 12	1 - 3 4 - 6 - 8 9 -- 11 12
Macaranga stipulosa	- - - - 5 6 7 - 9 10 -- --	- 2 3 - - - - 8 9 10 -- 12
Omalanthus nutans	1 - 3 4 5 - 7 8 9 -- -- 12	1 - 3 4 - 6 7 8 9 -- -- 12
FABACEAE		
Erythrina variegata	- - - - - - 7 8 - -- -- --	- - - - - - - - 9 10 11 12
Inocarpus fagifer	- - 3 - - - 7 - - 10 -- --	1 - - - - - - - - 10 11 12
Intsia bijuga	- - - 4 - - 7 - - -- 11 --	- - - - - 6 - - - -- -- --
FLACOURTIACEAE		
Casearia sp. nova	1 - - - - 6 7 - - -- 11 --	1 - - 4 - - 7 8 9 10 11 --
Erythrospermum acuminatisimum	- - 3 4 - - - 8 9 -- 11 12	1 - - - - - 7 8 9 10 11 12
Flacourtia rukam	1 - - 4 - - - 8 9 10 11 --	
GESNERIACEAE		
Cyrtandra samoensis	1 - 3 - - 6 7 8 - -- -- 12	- - - 4 - 6 7 8 - 10 -- --
GOODENIACEAE		
Scaevola taccada	1 - - - - 6 7 8 - 10 11 12	1 - - - - - 7 8 - -- -- 12
HERNANDIACEAE		
Hernandia moerenhoutiana	1 - 3 - - 6 7 8 - 10 -- --	- - - - - - - 8 9 -- 11 --
ICACINACEAE		
Citronella samoensis	1 - 3 - - 6 7 8 9 -- -- --	1 - - - - - - 8 9 10 11 12
Medusanthera samoensis	- 2 - - 5 - 7 - - -- -- --	- - - - - - 7 8 - 10 -- --
LAURACEAE		
Litsea samoensis	- - - 4 - 6 7 - 9 -- -- --	- - - - - - - - 8 9 -- -- --
LOGANIACEAE		
Fagraea berteroana	1 - 3 - - - 7 8 - -- -- 12	- - 3 - 5 6 7 8 9 10 11 --
Geniostoma rupestre	1 2 3 - 5 6 7 8 9 10 -- 12	1 2 3 4 5 6 7 8 9 10 11 12
LORANATHACEAE		
Decaisnina forsteriana	- - 3 - - - 7 8 9 -- 11 --	- - - 4 - - 7 8 - -- -- --
MALVACEAE		
Hibiscus tiliaceus	1 2 - - - - 7 8 - 10 -- 12	- 2 - - - - - 8 9 -- -- 12
MELASTOMACEAE		
Clidemia hirta	1 - - - - 6 - 8 - 10 -- 12	
Medinilla samoensis	- 2 - - - - 7 8 9 10 11 --	1 - - - - - 7 8 - 10 11 --
Melastoma denticulatum	1 2 - 4 5 6 7 8 9 10 11 12	1 - - 4 5 6 7 8 9 10 11 --
MELIACEAE		
Aglaia samoensis	- - - - - - 7 8 9 10 11 12	1 - - 4 5 - 7 - - 10 11 12
Dysoxylum huntii	1 2 - 4 5 - - - - 10 11 12	- - - - - 6 7 8 - -- -- --
Dysoxylum maota	1 2 3 4 5 6 - 8 9 10 11 --	1 2 3 - - 6 7 8 9 -- -- 12
Dysoxylum samoense	1 - - - 5 6 - 8 9 -- 11 12	1 - 3 - 5 6 7 8 - -- 11 12
MONIMIACEAE		
Hedycarya denticulata	- - - - - - 7 8 9 10 11 12	- - 3 4 5 6 7 8 9 10 11 12

SPECIES FAMILY	FLOWERING DATES	FRUITING DATES
MORACEAE		
Ficus godeffroyi	1 2 3 4 5 6 7 8 9 10 11 12	
Ficus obliqua	- 2 - - - 6 7 8 9 10 11 12	
Ficus prolixa	- - - - - - - 8 - 10 -- --	
Ficus scabra	1 - 3 4 5 - 7 8 9 10 11 12	
Ficus tinctoria	1 2 3 4 5 6 7 8 9 10 11 12	
Ficus uniauriculata	- - - 4 5 6 7 8 9 10 11 12	
MYRISTICACEAE		
Myristica fatua	- - - 4 - - 7 - 9 10 11 --	1 2 - 4 - 6 7 8 9 10 11 12
Myristica hypargyraea	- - - - - - - 8 9 10 -- --	1 - - - - 6 7 8 9 10 11 12
MYRSINACEAE		
Embelia vaupelii	- - - - - 6 - - - -- -- --	- - - - - - - - - - -- -- --
Maesa tabacifolia	1 2 - - - 6 7 8 9 -- -- --	1 2 - - - 6 7 8 - -- -- 12
MYRTACEAE		
Descaspermum fruticosum	1 - - 4 5 - - 8 9 -- 11 12	1 - - - - - - 8 - -- 11 --
Metrosideros collina	1 - - 4 - - - 8 - 10 11 --	
Psidium guajava	1 - - - - 6 - 8 - 10 11 --	
Syzygium brevifolium	- - - - - - - 8 - -- -- --	- - - - - - - - - - -- 11 --
Syzygium carolinense	- - - 4 - 6 7 - 9 -- -- 12	- - 3 - - - - - 9 -- -- 12
Syzygium clusiifolium	1 - - - - - 7 8 9 10 -- --	1 - 3 - - - - 8 - -- 11 12
Syzygium dealatum	- - - - - - - - 9 10 11 --	- - - - - - - - - -- -- 12
Syzygium inophylloides	1 - - - - - - 8 9 10 11 12	- 2 - 4 5 - 7 - 9 -- -- --
Syzygium samarangense	- 2 - - - 6 - 8 9 10 11 --	1 - - - - - 7 8 - -- -- 12
Syzygium samoense	- - - - - 6 7 8 - -- 11 --	- 2 - - - - 7 8 9 -- -- --
OLEACEAE		
Jasminum betchei	- - - - - - - 8 9 -- -- --	- - - - - - - 8 9 10 -- --
Jasminum didymum	- - 3 - - 6 - 8 - 10 -- --	- - - - - 6 7 8 - -- 11 --
PIPERACEAE		
Macropiper puberulum	1 - 3 - - - 7 8 9 10 11 12	1 - 3 - - - - 8 9 -- 11 12
Piper graeffei	1 2 3 4 - - - 8 9 -- 11 12	1 2 3 4 - - - 8 9 -- -- 12
RHAMNACEAE		
Alphitonia zizyphoides	- - - 4 5 - - - 9 -- 11 --	- - - - 5 - 7 8 9 10 -- --
RHIZOPHORACEAE		
Crossostylis bifora	1 2 3 4 - 6 7 8 - -- 11 12	
RUBIACEAE		
Aidia cochinchinensis	1 - 3 4 - 6 7 - 9 10 11 --	1 - 3 4 - - 7 8 9 10 11 --
Calycosia sessilis	- 2 - - - 6 7 8 - 10 11 --	- - - - - - - 7 8 9 10 11 --
Canthium merrillii	1 2 - - - - - 8 - 10 -- --	1 2 3 - - - - - 9 -- -- --
Cyclophyllum barbatum	1 2 - - - - 7 8 - 10 -- --	1 - - - - - 7 - - 10 -- 12
Geophila repens	1 2 - - 5 6 7 8 9 -- 11 12	1 2 - - 5 6 7 8 9 -- 11 12
Guettarda speciosa	1 - - - - - 7 8 9 -- 11 12	1 - - - - - - 8 9 10 11 12
Gynochtodes epiphytica	- - - - - - - - - 10 -- --	1 - 3 - - - 7 8 - 10 -- --
Ixora samoensis	1 - 3 4 - - 7 8 9 10 11 12	1 - 3 - - - - 8 9 -- -- 12
Morinda citrifolia	1 2 - 4 5 6 7 8 9 10 11 12	1 - - - 5 - - - - 10 11 12
Morinda myrtifolia	- - - - - - - - - -- -- --	- - - - - 6 - - - -- -- --
Mussaenda raiateensis	1 - 3 4 - - - 8 9 10 11 12	- - - - - - - 8 - 10 11 12
Neonauclea forsteri	1 - - - 5 - 7 8 - -- -- 12	
Psychotria forsteriana	1 2 3 4 5 6 7 8 9 10 11 12	- 2 3 4 - 6 - - 9 10 11 12
Psychotria insularum	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12

SPECIES **FAMILY**	FLOWERING DATES	FRUITING DATES
RUBIACEAE (cont'd.)		
Sarcopygme pacifica	1 - 3 4 - 6 7 8 9 10 -- --	1 2 - 4 - 6 7 8 - 10 11 --
Tarenna sambucina	- - - - - - 7 8 9 10 11 12	1 2 - - - - 7 8 - -- -- --
RUTACEAE		
Euodia samoensis	1 - 3 4 - - 7 8 9 10 11 12	- - 3 4 - - - - 9 10 -- --
Micromelum minutum	1 - - - 5 - 7 8 9 -- -- 12	1 - - - - - - - - -- 11 12
SAPINDACEAE		
Allophylus timoriensis	1 - 3 - 5 - - - - 10 11 12	1 - - 4 5 6 7 8 - -- 11 --
Arytera brackenridgei	1 - 3 - - - - - - -- 11 --	1 - - 4 - - - 8 - -- 11 --
Elattostachys falcata	- - - - - 6 - 8 9 10 11 --	1 - 3 - - - - 8 9 10 11 12
Sapindus vitiensis	- - - 4 - - - - - -- -- --	- - - - - - - - - -- 11 12
SAPOTACEAE		
Manilkara dissecta	- - - - - 6 - - - -- -- --	- - - - - 6 - - - -- -- --
Palaquium stehlinii	- - - - - - 7 - - 10 11 --	- - - - - - 7 8 9 10 11 --
Planchonella garberi	1 - - 4 - - - 8 - -- 11 --	- - - 4 - 6 7 8 - -- 11 --
Planchonella grayana	1 - - - - - 7 - - -- 11 --	- - - - - - 7 - - -- -- --
Planchonella samoensis	1 - - - - 6 - - 9 10 11 12	1 - 3 - - 6 7 - 9 -- -- --
SOLANACEAE		
Solanum viride	1 - - - 5 - - - 9 -- 11 --	- - - - - - - - - 9 -- -- --
STERCULIACEAE		
Sterculia fanaiho	1 - - - - - - 8 - -- -- 12	- 2 - - - - 7 8 9 -- 11 12
THEACEAE		
Eurya pickeringii	1 - - - 5 6 7 - 9 -- -- 12	1 - - - - 6 - - 9 -- 11 12
THYMELAEACEAE		
Phaleria disperma	- - 3 - - - 7 8 9 -- -- --	- - - - - - - 8 - -- -- --
Phaleria glabra	1 - 3 - - - - 8 9 10 11 12	1 2 3 - - - 7 8 9 10 11 12
Wikstroemia foetida	1 - - 4 5 - 7 8 9 -- -- 12	1 - - 4 5 - 7 8 9 -- -- --
TILIACEAE		
Grewia crenata	1 - 3 - - - - - - 10 11 --	- - - - - - 7 - - -- -- --
Trichospermum richii	- - 3 4 - 6 7 - - -- -- --	1 - - 4 - 6 7 - - -- -- --
ULMACEAE		
Trema cannabina	- - 3 - - 6 7 8 9 10 11 12	- - 3 - - - - - 9 10 -- 12
URTICACEAE		
Cypholophus macrocephalus	1 - - 4 5 6 7 8 9 10 11 12	
Leucosyke corymbulosa	- 2 3 - - 6 7 8 9 -- -- 12	- - 3 4 - 6 7 - 9 -- -- 12
Pipturus argenteus	1 - 3 4 5 6 7 8 9 10 11 12	1 - - 4 5 - - 8 - -- 11 --
Procris pedunculata	1 - 3 - - 6 7 8 9 10 -- 12	- - 3 - - 6 7 8 9 -- -- 12
VERBENACEAE		
Faradaya amicorum	1 2 3 4 - 6 7 8 9 10 -- 12	1 - - - - - 7 8 - 10 -- 12
Premna serratifolia	1 - 3 - 5 6 7 8 9 10 11 12	1 - 3 - 5 - - - 9 -- -- 12

SPECIES **FAMILY**	FLOWERING DATES	FRUITING DATES
	MONOCOTS	
AGAVACEAE		
Cordyline fruticosa	1 2 - 4 - - - 8 - 10 11 12	1 - - 4 - 6 7 8 - -- 11 12
ARACEAE		
Epipremnum pinnatum	- - - - - - - - - 10 -- --	
Rhaphidophora graeffei	- - - - 5 - 7 8 - 10 -- --	
FLAGELLARIACEAE		
Flagellaria gigantea	- - - - - - - - - -- -- --	- - - - - - - 8 - 10 -- --
HELICONIACEAE		
Heliconia laufao	- - - 4 5 - - 8 9 -- -- --	- - - 4 5 - - 8 9 -- -- 12
PANDANACEAE		
Freycinetia reineckei	- - - - - 6 7 - - -- -- 12	1 - - - - - 7 8 - -- -- 12
Freycinetia storckii	- - - - - - 7 8 - -- -- 12	- - - - - - 7 8 9 10 -- 12
Pandanus reineckei	- - - - - - - - - -- -- --	- - - - 5 - - - - 10 -- --
Pandanus tectorius	1 - - - - - 7 - - -- 11 --	1 2 3 - - - 7 - - -- 11 --
TACCACEAE		
Tacca leontopetaloides	1 2 3 - 5 6 7 - - 10 -- 12	
ZINGIBERACEAE		
Zingiber zerumbet	1 2 3 - - - - - 9 -- 11 12	

APPENDIX D. THE OFU UNIT OF THE NATIONAL PARK OF AMERICAN SAMOA

INTRODUCTION

Part of the island of Ofu in Manu'a is to be included in the National Park of American Samoa, principally because of the superb reefs located there. A botanical survey was carried out on the island on the 14th to the 16th of June 1992. The island, which is about 7.5 km² (3 mi²) in area, is located about 95 km (60 mi) east of the main island of Tutuila. It is part of the caldera rim of an ancient volcano, and is separated from the somewhat similar, adjacent island of Olosega by a narrow strait now crossed by a concrete bridge. The highest elevation of Ofu is Mt. Tumu at nearly 500 m (1621 ft) elevation. A single village is present on the west side of the island, but several houses and a small terminal building are located next to the airstrip, which lies in an east-west direction at the south-central tip of the island. Perhaps only two houses are found adjacent to the park area itself.

The area under consideration is a narrow strip of land along the southeast-facing coast, extending from just east of the airport to Asaga Strait that separates Ofu from Olosega. This includes the pinnacle called Sunitao Peak that extends up to 230 m (750 ft) elevation. The road from Ofu Village to Olosega represents the landward edge of the park boundary. Although not in the original proposed boundaries, the steep slopes leading to Mt. Tumu are important to the integrity of the park, so they, along with the summit of the island, were included in the present study.

Ofu is a very small island, and it is not surprising that it has a flora much smaller than that of Tutuila; its flora is also much smaller than that of the nearby Ta'u documented in the early study for the National Park Service (Whistler 1992b). A checklist of the island is found in the vegetation study of American Samoa (Whistler 1980). Perhaps only three species found on Ofu are not found on Tutuila; *Psychotria garberiana*, which is endemic to Manu'a, *Gyrocarpus americanus*, which in American Samoa is reported only from Ofu (Nu'utele Islet), and *Crateva religiosa*, which in American Samoa is reported only from Ofu.

THE VEGETATION

The plant communities found on Ofu are the same ones described from the park area on Tutuila. Each of the natural communities present will be briefly described. For more general remarks about these communities and the disturbed communities (managed land, secondary scrub, secondary forest), see the comparable sections in the discussion of the vegetation of Tutuila.

1. Herbaceous Strand

The herbaceous strand is found along the whole length of the beach from the airstrip to the bridge separating the two islands. It is very narrow in extent, and is mostly not distinct from the littoral forest, largely because of its extensively damaged condition. The shore from the airport to Mt. Sunitao is a sandy beach, but at Sunitao it becomes rocky and almost vertical in places, before returning to sand just before the bridge.

The dominant plants on the sandy beach is the beach morning-glory vine *Ipomoea pes-caprae* (beach morning-glory, **fue moa**) with lesser amounts of the littoral grasses *Lepturus repens*, *Stenotaphrum micranthum*, and *Thuarea involuta*. Other species present include *Vigna marina* (beach pea, **fue sina**), *Triumfetta procumbens*, *Portulaca samoensis*, *Digitaria setigera*, *Tacca leontopetaloides* (Polynesian arrowroot, **masoa**), and *Chamaesyce atoto*. All of these, except for *Chamaesyce* and *Triumfetta* are found within the Tutuila park. Several other species of weeds are present, but they are secondary in importance to the native species.

The dominant herbaceous plants on Sunitao Peak are *Phymatosorus scolopendria* (**lau magamaga**) on rocky places and *Lepturus repens* on the gravel of talus slopes. Other native plants present include *Portulaca samoensis*, *Portulaca lutea*, *Hedyotis foetida*, and *Mariscus javanicus*. These plants are mixed in with shrubs, which will be noted below under littoral shrubland.

2. Littoral Shrubland

Two types of littoral shrubland are present in the park, one on the sandy beaches where it alternates with littoral forest and herbaceous strand, and the other on the rocks of Sunitao and steep maritime cliff running inland along most of the length of the park. The most common shrub mixed in with the other littoral plants on the sandy beach is the beach sunflower *Wollastonia biflora* (beach sunflower, **ateate**), with lesser amounts of *Scaevola taccada* (**to'ito'i**), *Sophora tomentosa*, *Colubrina asiatica* (**fisoa**), and *Clerodendrum inerme* (**aloalo tai**). *Sophora* should be considered a rare plant in Samoa; it is known in the archipelago from only one beach on 'Upolu, one on Tutuila (Nu'uuli Point), the south part of 'Aunu'u, and this Ofu beach.

The littoral shrubland on the steep sides of Sunitao and the cliffs of the main part of Ofu are much more complex and inaccessible. The slopes of Sunitao are dominated by a mixture of littoral trees and shrubs. Because the trees are often dwarfed, it is perhaps best to consider this vegetation as littoral shrubland, as was done with the vegetation of Pola Islet and the cliffs of Pola'uta Ridge on Tutuila. Littoral forests, however, are present on the gentler slopes of Sunitao and are discussed below.

The dominant plants in the littoral shrubland of Sunitao are *Dendrolobium umbellatum* (**lala**), *Clerodendrum inerme*, *Hibiscus tiliaceus* (beach hibiscus, **fau**), and *Pisonia grandis* (**pu'avai**). To label the vegetation between the littoral forest and lowland forest on the cliffs on the main part of Ofu as littoral shrubland seems a bit incongruous since this community is supposed to be between the shore and the littoral forest. However, since it is composed of shrubby species rather than trees, it is best to consider it littoral shrubland, regardless of its location.

The dominant species on the steep slopes are *Dendrolobium umbellatum*, *Phymatosorus scolopendria*, *Davallia solida* (**laugasese**), *Clerodendrum inerme*, and *Wollastonia biflora*. Other species noted here include *Morinda citrifolia* (Indian mulberry, **nonu**), *Syzygium dealatum* (**asi vai**), *Ipomoea macrantha*, *Pipturus argenteus* (**soga**), *Pisonia grandis*, *Macaranga harveyana* (**lau pata**), *Colubrina asiatica*, and *Garuga floribunda* (**vivao**).

Two other less common species were also noted here. The first, *Gossypium hirsutum* (**vavae**), is the native species of cotton that is very rare on Tutuila (one location recorded) and 'Aunu'u, and this was a surprising record for Ofu. The other, *Plumbago zeylanica*, was reported twice from the adjacent Olosega, but this is a new record for Ofu. Both species should be considered rare in American Samoa.

3. Littoral Forest

The division between this community and littoral shrubland is not very distinct on Ofu, especially when the slopes get steeper and trees get more shrubby. However, three types of littoral forest were recorded. The first is found on the rocky shores of Sunitao. Some of these slopes have been disturbed--the forest has been cut down and the area replanted with coconuts and bananas. This is particularly the case on the east side of the mountain. Probably the natural littoral forest there was dominated by *Barringtonia asiatica*, as it is on the southwest side, and is similar to what is found in the Tutuila park unit.

The gentle slopes leading up to the steeper slopes and cliffs are dominated by the second kind of littoral forest. A sample on the southwest side, inland of the *Barringtonia* littoral forest, showed it to be dominated by a mixture of littoral forest trees. In descending order of dominance, these are *Hernandia nymphaeifolia* (Chinese lantern-tree, **pu'a**), *Erythrina variegata* (coral tree, **gatae**), and *Pisonia grandis* (**pu'avai**). Of lesser importance are *Diospyros samoensis* (**'au'auli**), which was the most common tree present, *Hibiscus tiliaceus* (beach hibiscus, **fau**), *Dysoxylum samoense* (**mamala**), *Ficus scabra* (**mati**), *Guettarda speciosa* (**puapua**), *Syzygium dealatum* (**asi vai**), and *Sterculia fanaiho* (**fana'io**). Strangely, there was no *Barringtonia* in the sample on this slope. The understory was strongly dominated by seedlings and saplings of *Syzygium dealatum* and *Diospyros samoensis*, with lesser amounts of *Psychotria insularum* (**matalafi**), and *Morinda citrifolia*. Other significant plants included the bird's-nest fern *Asplenium nidus* (**laugapapa**) and *Cordyline fruticosa* (**ti**), with a few other species. The ground cover was relatively light, with perhaps only 15% cover. The only vines noted were *Epipremnum pinnatum*, *Dioscorea bulbifera* (bitter yam, **soi**), and *Faradaya amicorum* (**mamalupe**). A

similar forest is probably found on the same kind of slopes below the cliffs on the main part of Ofu, often mixed with lowland forest trees. This area is further discussed below.

Two other significant small trees are found here. *Chionanthus vitiensis* is a new record for American Samoa, and was collected on Tutuila (Vatia) and on Ofu. It is known from only two records in Western Samoa; only a single tree was found in each of these four records. *Ervatamia obtusiuscula* is uncommon on Ofu, and has not been collected on Tutuila since 1894. Both of these species should be considered to be rare in American Samoa.

The littoral forest on the sandy beach was different in species composition. In most places it is highly disturbed and dominated by planted and naturalized coconuts. At the east end this was a mixture of coconuts and *Hernandia nymphaeifolia*, which were shattered by one or more of the recent hurricanes. Also present on the beach is *Terminalia samoensis* (**talie**), which is not present in the Tutuila park unit. The west end of the beach, just to the east of the airstrip, is rocky and narrow (between the beach and the road), and is dominated by a combination of *Hernandia nymphaeifolia*, *Thespesia populnea* (Pacific rosewood, **milo**), *Barringtonia asiatica*, and *Hibiscus tiliaceus*. Much less common there are *Terminalia catappa*, *Morinda citrifolia*, *Guettarda speciosa*, *Macaranga harveyana*, and *Erythrina variegata*.

4. Coastal Marsh

The wetland situation on Ofu is similar to that on Tutuila: on both there is a coastal marsh just outside the boundaries of the park. But since this is an important type of vegetation, and it is so close to the park, it is discussed here. Although the two marshes are similar in their geological structure, they differ greatly in their vegetation. While the Vatia marsh has been abandoned, the one on Ofu is actively being cultivated. It was, that is, until storm waves of a recent hurricane swept across it. Today it is still mostly barren mud, probably unable to support a native marsh or cultivated taro because of the residual salt concentration. It is a habitat for native ducks (toloa).

Originally the vegetation was dominated by *Eleocharis dulcis*, possibly in combination with *Cyclosorus interruptus*, and these species will probably return to dominate the uncultivated portions of the marsh. Also present is the small fragrant herb *Limnophila fragrans*. This plant is currently known in the territory only from the Ta' village marsh, the Ofu marsh, the Olosega marsh, and the Vatia marsh, and should be considered rare in Samoa. It is probably even rarer in Western Samoa. It was found to be present in small quantities in the brackish mud of Ofu marsh, and will probably become more common as the marsh returns to its normal state.

5. Lowland Forest

The lowland forest within the park is disturbed –on the gentler slopes by past and present agriculture, and on the steeper slopes by landslips. A plot was sampled in this vegetation in the 1976 survey (Whistler 1980) on the talus slope east of the airstrip (Appendix B: plot no. 14, modified from the original to correspond to the methods used in the present study). The dominant species in that plot were *Hibiscus tiliaceus* (18% relative dominance), *Dysoxylum samoense* (18%), *Terminalia catappa* (13%), *Myristica fatua* (12%), *Neonauclea forsteri* (11%), *Guettarda speciosa* (11%), and *Diospyros samoensis* (8%). Other species noted to be present on the slopes and cliffs during the June 1992 survey are *Pisonia grandis*, *Sterculia fanaiho*, *Pometia pinnata*, and *Ficus obliqua*.

This vegetation is best classified as a disclimax lowland forest and probably best corresponds to the "*Dysoxylum* lowland forest on talus slopes and cliffs" noted in the Ta'u report (Whistler 1992b) as occurring in similar situations on that island. It is also similar to the vegetation in the Tutuila park between Alava Ridge road and Fagas, and probably on the steep slopes of Alava Ridge above Pago Pago (which are mostly outside the Tutuila park boundaries).

MONTANE FOREST

The vegetation on top of the ridge above the Ofu park area was also briefly examined. The top of the island has been extensively disturbed by past and recent agriculture and by the recent hurricanes. There is also a road leading from Ofu village up to the summit of the island (Mt. Tumu) to a microwave station.

Since the summit is at 500 m elevation, the forest is or was probably best classified as montane forest, similar to that on Tutuila, but with fewer species. In

the relatively undisturbed places, the dominant species are *Syzygium samarangense*, *Calophyllum neo-ebudicum* (**tamanu**), *Syzygium samoense* (**fena vao**), and *Myristica fatua* (**'atone**); the two *Syzygium* species are typical montane forest trees, the other two are lowland forest species. Also present are *Dysoxylum huntii* and *Garcinia myrtifolia*, which are typical montane forest species, and several other tree species characteristic of lowland forest. One tree found here, *Celtis harperi*, was a new record for Ofu-Olosega.

In disturbed places, the dominant tree was *Hibiscus tiliaceus*, which often forms dense thickets. These thickets are similar to those on Alava Ridge east of the TV transmitter on Tutuila. Also common is another secondary forest tree, *Trichospermum richii*. The ground cover is dense here, and is dominated by *Christella harveyi*, *Lomagramma cordipinna*, and *Davallia solida*, all of them ferns.

As the ridge extends east from the microwave station, it decreases in elevation and the vegetation probably goes from ridge lowland forest to coastal lowland forest before it meets the road just west of Sunitao. The ridge at this point is very narrow, and the vegetation is sparse, somewhat like that found on the steep slopes leading from the summit down to the park area. One tree noted on this ridge was *Drypetes vitiensis*, which is a new record for Manu'a.

APPENDIX E. PLANTS AS INDICATORS OF PAST LAND USE

Prior to the arrival of the first Polynesian settlers, most of the surface area of the Samoan archipelago was covered with native rainforest vegetation. The only areas with vegetation not classified as rainforest were littoral communities, summit vegetation (montane scrub and summit scrub communities), recent lava flows and ash deposits, and disturbed vegetation. Nowadays over half of the vegetation of the islands is classified as disturbed or secondary (as opposed to primary), a figure that has been rising in recent years because of the expansion of agriculture to meet the needs of an expanding population and because of a forestry industry that has devastated the lowlands of the archipelago (particularly in Western Samoa). Prior to human settlement, all the disturbed vegetation was natural, caused mostly by hurricanes and landslips, and possibly by occasional forest fires. Nowadays, however, most of the disturbed vegetation is the result of human activities such as agriculture and the development of villages. The disturbed communities recognized in the present report are managed land vegetation, secondary scrub, and secondary forest.

It is sometimes useful to know the past uses of an area of land. In order to set lease prices within the park, there is a need to determine which areas are currently or were historically used for agriculture. This was done mainly by the use of aerial photographs and the maps of Cole *et al.* (1988). More accurate studies involve the structure and floristic composition of the vegetation. Native Samoan plant species require certain environmental conditions for germination and growth, and it is often possible to determine the recent historic uses of the area by analyzing the species composition, community structure, and population dynamics of an area of vegetation. This is most easily done by looking for indicator species, plants that are indicative of a certain type of human activity or climatic event.

The most obvious sign of recent disturbance is the dominance of herbaceous vegetation. The only kind of natural vegetation in Samoa that is herbaceous is in littoral areas (herbaceous strand) and montane scrub (which is characterized by ferns and climbers dominating the ground between scattered trees and shrubs). The most common species in the recently disturbed areas, most of which are abandoned taro or banana plantations, are *Mikania micrantha* (mile-a-minute vine, **fue saina**), *Bidens alba* (beggar's-tick), *Paspalum conjugatum* (T-grass, **vao lima**), and *Nephrolepis hirsutula* (sword fern, **vao tuaniu**), but over 250 species that fit into this category (weeds) have been recorded from Tutuila (see Appendix A).

Several other species planted as ornamentals sometimes remain significant long after cultivation has ended. One such species, the mint *Pogostemon cablin* (patchouli, **patiale**), sometimes forms dense patches by vegetative means; it has not been recorded from the Tutuila park, however. Other weedy species are typical of forest trails. *Axonopus fissifolius* and *Eleusine indica* (**ta'ata'a**) are often found in lowland plantations and along trails in lowland forest. Two other grasses, *Oplismenus compositus* and *Oplismenus hirtellus*, are often found in secondary forest and thus can be indicative of past disturbance. Another two grasses, *Centosteca lappacea* (**sefa**) and *Cyrtococcum oxyphyllum*, occur in primary vegetation, and are thus less valuable as indicator species.

One species of fern, *Dicranopteris linearis* (false staghorn fern, **asaua**), is a natural dominant species in montane scrub (which is usually on trachyte soil), but its presence in other places, such as ridges, is an indication of past disturbance. There are only a few areas (outside of montane scrub) on Tutuila that are reported to be dominated by this fern. These are probably areas of former plantations or villages on ridges, from a period when the bulk of the Samoan population lived inland (for protection from marauders and enemies). The soil has been so over-utilized and the soil minerals so depleted that the native vegetation (mostly ridge lowland forest) has never been able to recover. Similar vegetation is found on 'Upolu, and is attributed to the same cause (Wright 1963).

When managed land is left alone for long enough, the herbaceous vegetation is shaded out by a number of characteristic woody shrubs and trees. The most typical of these are *Pipturus argenteus* (**soga**), *Omalanthus nutans* (**fogamamala**), *Macaranga*

harveyana (**laupata**), *Morinda citrifolia* (Indian mulberry, **nonu**), and *Kleinhovia hospita* (**fu'afu'a**). Less common, but still typical species, include *Trema cannabina* (**magele**) and *Melochia aristata* (**ma'o**). Vegetation dominated by any combination of these species is probably on land that was in cultivation in the last decade or two (with the exception of "disclimax" vegetation on steep slopes, discussed below).

Another indicator species is *Hibiscus tiliaceus* (beach hibiscus, **fau**). This tree is one of the most adaptable species in Samoa, where it is common in disturbed lowland and littoral forest, on the margins of mangrove swamps, on talus slopes, and along streams. The tree is very useful, since its wood is widely used for firewood, artifacts (such as canoe outriggers and the sticks used for making fire by friction), and light construction. The bark is also useful for making cordage of a temporary or permanent nature.

Hibiscus does not seem to have good dispersal ability, since the fruits and seeds are not wind- or bird-dispersed. It probably gets around by being planted (since it is so useful) or may spread slowly from adjacent areas where the trees are present. It is often found in what otherwise appears to be undisturbed ridge lowland forest. It seems to be able to persist for long periods of time, but is probably eventually shaded out when the secondary forest canopy closes. Its presence in these situations may indicate that the area was disturbed long ago for inland villages or plantations. A dense stand of this along Alava Ridge east of the TV transmitter is probably related to the presence of an ancient trail from Vatia village to Pago Pago Bay. The presence of *Hibiscus* on steep talus slopes is probably natural, since this type of "disclimax vegetation" is in a continual state of disturbance due to landslips and rock falls. Another tree with somewhat similar distribution, ecological needs, and stature as *Hibiscus* is *Kleinhovia hospita* (**fu'afu'a**) mentioned above, but this is less common than *Hibiscus*.

Cocos nucifera (coconut, **niu**) is another good indicator tree of past disturbance. Although it is rarely found very far inland in native vegetation, its presence in significant numbers in secondary forest is an almost certain indicator of a former plantation. It is not able to compete with inland species in these habitats. It is also probably unable to naturally compete with littoral forest trees, and its presence along uninhabited coast is usually an indication that it was planted there. Other trees, such as the inland species *Paraserianthes falcataria* (**tamalini**), *Flueggea flexuosa* (**poumuli**), and *Erythrina subumbrans* (dadap, **gatae palagi**), do not readily spread, and are indicators of more recent disturbance, since they are all of modern introduction.

A number of native canopy species are also indicators of past disturbance-from both natural and human causes. The most common of these is *Rhus taitensis* (**tavai**). This tree often forms monodominant forests, particularly on the western half of the island. Apparently the tree, which has readily dispersed seeds (in small succulent fruits), germinates mostly in bright sunlight, because seedlings and saplings are common in areas where native forest has recently been cleared for agriculture, and possibly also when forests are flattened by hurricanes. Seedlings in closed-canopy forest are uncommon. Thus forests dominated by *Rhus* are most likely areas once extensively disturbed decades earlier (the tree probably lives for decades, and perhaps more than a century, since individuals of nearly 2 m dbh have been recorded (Whistler 1980).

A species with similar ecological needs and life history as *Rhus* is *Alphitonia zizyphoides* (**toi**), which is sometimes a co-dominant species with *Rhus*. Other species that likewise indicate past major disturbance are *Pometia pinnata* (**tava**), which, however, is not found within the park, *Neonauclea forsteri* (**afa**), *Cananga odorata* (ilangilang, **moso'oi**), and *Bischofia javanica* (**'o'a**).

Two other secondary forest species, *Elattostachys falcata* (**taputo'i**) and *Macaranga stipulosa* (**lau fatu**), are probably more indicative of "gap replacement" and are not useful as indications or major disturbance to the vegetation. Seedlings of *Elattostachys* are often common in lowland forest, but adult trees are not, indicating that they may only mature if a canopy gap appears while they are a seedling or sapling; if no gap is forthcoming, the seedlings and saplings die. Of the secondary species noted above, all have small seeds, except *Pometia pinnata*. *Pometia*, however, is the dominant tree in one kind of lowland forest-that found on relatively recent lava flows.

Two species that appear to be common in both secondary and primary forest are *Dysoxylum maota* (**maota**) and *Dysoxylum samoense* (**mamala**). On the Tafuna plain, when forest was still present there, the two *Dysoxylum* species appeared to be successional species that replaced *Macaranga harveyi* and in turn was replaced, or shared dominance with, *Pometia pinnata* and *Planchonella samoensis* (**mamalava**). In alluvial valleys, the two *Dysoxylum* species seem to be the dominant species in the climax forest for this habitat, judging by the population dynamics in plots of this on Tutuila and Ta'u (Whistler 1980).

Another category of plants often useful as indicators of past disturbance comprises cultivated Polynesian introductions. The coconut mentioned above would also fit into this category, except that it is probably native; it otherwise fits the general characteristics. Trees and shrubs that belong here are *Atuna racemosa* (**ifiifi**), *Citrus macroptera* (**moli u'u**), *Diospyros major*, *Euodia hortensis* (**usi**), *Inocarpus fagifer* (Tahitian chestnut, **ifi**), *Parinari insularum* (**sea**), and *Syzygium corynocarpum* (**seasea**), *Syzygium malaccensis* (Malay apple, **nonu fi'afi'a**), *Syzygium neurocalyx* (**oli, fena**). *Inocarpus* is now common and naturalized along streams. The others are probably not naturalized, and individuals found in forest are probably relicts of previous cultivation. Further information about these species can be found in Appendix A.

Another species that partly fits here is *Cerbera manghas*, a littoral tree that is sometimes found inland where it presumably was planted (for its showy flowers). It was found on the ridge just west of Vatia in mature forest. Also found in this area was *Syzygium corynocarpum*.

Several non-woody cultigens are also sometimes found in forest appearing to be primary. This includes *Alocasia macrorrhiza* (giant taro, **ta'amu**), *Amorphophallus paeoniifolius* (**teve**), *Etlingera cevuga* (**'avapui vao**), *Schizostachyum glaucifolium* (Polynesian bamboo, **'ofe**), *Solanum viride* (**polo-'iti**), and *Zingiber zerumbet* (**'avapui**). *Alocasia* is not uncommon in forest and in streambeds, *Etlingera*, which may be native, was found once in the park, *Schizostachyum* is reported from the park (R. West, pers. comm.), and *Solanum viride* was collected there once. *Zingiber* is sometimes common along ridges, and may have been present in these places and has subsequently spread, since it does not appear to be easily dispersed.

APPENDIX F. SUMMARY OF THE VASCULAR FLORA OF THE TUTUILA UNIT OF THE NATIONAL PARK OF AMERICAN SAMOA.

Species FAMILY	Status*	E	I	P	M
	FERNS				
ADIANTIACEAE					
Acrostichum aureum		-	X	-	-
Adiantum philippense		-	X	-	-
Bolbitis palustris		-	X	-	-
Pityrogramma brackenridgei		X	-	-	-
Pteris comans		-	X	-	-
Pteris ensiformis		-	X	-	-
Pteris pacifica		-	X	-	-
Pteris tripartita		-	X	-	-
ASPIDIACEAE					
Arachniodes aristata		-	X	-	-
Ctenitis samoensis		-	X	-	-
Pleocnemia leuzeana		-	X	-	-
Tectaria setchellii		X	-	-	-
Tectaria stearnsii		X	-	-	-
ASPLENIACEAE					
Asplenium australasicum		-	X	-	-
Asplenium cuneatum		-	X	-	-
Asplenium horridum		-	X	-	-
Asplenium laserpitiifolium		-	X	-	-
Asplenium nidus		-	X	-	-
Asplenium polyodon		-	X	-	-
Asplenium tenerum		-	X	-	-
ATHYRIACEAE					
Diplazium bulbiferum		-	X	-	-
Diplazium dilatatum		-	X	-	-
Diplazium harpeodes		-	X	-	-
Diplazium proliferum		-	X	-	-
BLECHNACEAE					
Blechnum orientale		-	X	-	-
Blechnum vulcanicum		-	X	-	-
CYATHACEAE					
Cyathea decurrens		-	X	-	-
Cyathea lunulata		-	X	-	-
Cyathea vaupelii		X	-	-	-
DAVALLIACEAE					
Arthropteris repens		-	X	-	-
Davallia epiphylla		-	X	-	-
Davallia solida		-	X	-	-
Humata heterophylla		-	X	-	-
Humata polypodioides		-	X	-	-
Nephrolepis biserrata		-	X	-	-
Nephrolepis hirsutula		-	X	-	-
Oleandra neriiformis		-	X	-	-
DENNSTAEDTIACEAE					
Orthiopteris tenuis		-	X	-	-

Species FAMILY	Status*	E	I	P	M
GLEICHENIACEAE					
Dicranopteris linearis		-	X	-	-
GRAMMITIDACEAE					
Ctenopteris blechnoides		-	X	-	-
Ctenopteris contigua		-	X	-	-
HYMENOPHYLLACEAE					
Hymenophyllum imbricatum		-	X	-	-
Hymenophyllum polyanthos		-	X	-	-
Trichomanes bipunctatum		-	X	-	-
Trichomanes boryanum		-	X	-	-
Trichomanes dentatum		-	X	-	-
Trichomanes humile		-	X	-	-
Trichomanes intermedium		-	X	-	-
Trichomanes saxifragoides		-	X	-	-
Trichomanes tahitense		-	X	-	-
HYPOLEPIDACEAE					
Histiopteris incisa		-	X	-	-
LINDSAEACEAE					
Lindsaea ensifolia		-	X	-	-
Lindsaea harveyi		-	X	-	-
Lindsaea tetragona		-	X	-	-
Microlepia speluncae		-	X	-	-
LOMARIOPSIDACEAE					
Elaphoglossum feejeense		-	X	-	-
Lomagramma cordipinna		-	X	-	-
MARATTIACEAE					
Angiopteris evecta		-	X	-	-
Angiopteris opaca		-	X	-	-
Marattia smithii		-	X	-	-
OPHIOGLOSSACEAE					
Ophioglossum pendulum		-	X	-	-
POLYPODIACEAE					
Microsorium sylvaticum		-	X	-	-
Phymatosorus nigrescens		-	X	-	-
Phymatosorus scolopendria		-	X	-	-
Polypodium subauriculatum		-	X	-	-
Pyrrosia lanceolata		-	X	-	-
SCHIZAEACEAE					
Schizaea dichotoma		-	X	-	-
THELYPTERIDACEAE					
Christella dentata		-	X	-	-
Christella harveyi		-	X	-	-
Macrothelypteris polypodioides		-	X	-	-
Macrothelypteris torresiana		-	X	-	-
Plesioneuron attenuatum		-	X	-	-
Pneumatopteris bryanii		X	-	-	-
Pneumatopteris glandulifera		-	X	-	-
Sphaerostephanos unitus		-	X	-	-

Species FAMILY	Status*	E	I	P	M
VITTARIACEAE					
Antrophyum alatum		-	X	-	-
Antrophyum plantagineum		-	X	-	-
Vaginularria angustissima		-	X	-	-
Vittaria elongata		-	X	-	-
Vittaria scolopendrina		-	X	-	-
FERN ALLIES					
LYCOPODIACEAE					
Lycopodium carinatum		-	X	-	-
Lycopodium cernuum		-	X	-	-
Lycopodium phlegmaria		-	X	-	-
Lycopodium squarrosum		-	X	-	-
SELAGINACEAE					
Selaginella laxa		-	X	-	-
Selaginella whitmeei		X	-	-	-
DICOT ANGIOSPERMS					
ACANTHACEAE					
Blechum brownei		-	-	-	X
Justicia procumbens		-	-	-	X
Ruellia prostrata		-	-	-	X
AMARANTHACEAE					
Alternanthera sessilis		-	-	-	X
ANACARDIACEAE					
Buchanania merrillii		X	-	-	-
Rhus taitensis		-	X	-	-
ANNONACEAE					
Cananga odorata		-	-	X?	-
APIACEAE					
Centella asiatica		-	-	X	-
APOCYNACEAE					
Alstonia pacifica		-	X	-	-
Alyxia bracteolosa		-	X	-	-
Alyxia stellata		-	X	-	-
Cerbera manghas		-	X	-	-
ARALIACEAE					
Meryta macrophylla		-	X	-	-
Polyscias samoensis		-	X	-	-
ARISTOLOCHIACEAE					
Aristolochia cortinata		X	-	-	-
ASCLEPIACACEAE					
Hoya australis		-	X	-	-
Hoya pottsii		-	X	-	-
Hoya vitiensis		-	X	-	-
ASTERACEAE					
Achmella uliginosa		-	-	-	X
Ageratum conyzoides		-	-	-	X
Bidens alba		-	-	-	X
Bidens pilosa		-	-	-	X
Crassocephalum crepidioides		-	-	-	X

Species FAMILY	Status*	E	I	P	M
ASTERACEAE (cont'd)					
Emilia sonchifolia		-	-	-	X
Erechtites valerianifolia		-	-	-	X
Mikania micrantha		-	-	-	X
Synedrella nodiflora		-	-	-	X
Vernonia cinerea		-	-	-	X
Wollastonia biflora		-	X	-	-
Youngia japonica		-	-	-	X
BARRINGTONIACEAE					
Barringtonia asiatica		-	X	-	-
Barringtonia samoensis		-	X	-	-
BORANGINACEAE					
Cordia aspera		-	X	-	-
BURSERACEAE					
Canarium harveyi		-	-	-	X?
Canarium vitiense		-	X	-	-
Garuga floribunda		-	X	-	-
CARICACEAE					
Carica papaya		-	-	-	X
CASSYTHACEAE					
Cassytha filiformis		-	X	-	-
CELASTRACEAE					
Maytenus vitiensis		-	X	-	-
CHRYSOBALANACEAE					
Atuna racemosa		-	-	X	-
CLUSIACEAE					
Calophyllum inophyllum		-	X	-	-
Calophyllum neo-ebudicum		-	X	-	-
Garcinia myrtifolia		-	X	-	-
Mammea glauca		X	-	-	-
COMBRETACEAE					
Terminalia catappa		-	-	-	X?
Terminalia richii		-	X	-	-
CONNARACEAE					
Rourea minor		-	X	-	-
CONVOLVULACEAE					
Ipomoea littoralis		-	X	-	-
Ipomoea macrantha		-	X	-	-
Ipomoea pes-caprae		-	X	-	-
Merremia umbellata		-	-	-	X
Operculina ventricosa		-	-	-	X
Stictocardia tiliifolia		-	-	-	X
CUCURBITACEAE					
Momordica charantia		-	-	-	X
Zehneria mucronata		-	X	-	-
Zehneria samoensis		-	X	-	-
CUNONIACEAE					
Spiraeanthemum samoense		X	-	-	-
Weinmannia affinis		-	X	-	-

Species FAMILY	Status*	E	I	P	M
EBENACEAE					
Diospyros elliptica		-	X	-	-
Diospyros samoensis		-	X	-	-
ELAEOCARPACEAE					
Elaeocarpus tonganus		-	X	-	-
Elaeocarpus ulianus		X	-	-	
EUPHORBIACEAE					
Aleurites moluccana		-	-	X	-
Antidesma sphaerocarpum		-	X	-	-
Baccaurea taitensis		X	-	-	-
Bischofia javanica		-	X?	-	-
Chamaesyce hirta		-	-	-	X
Chamaesyce hypericifolia		-	-	-	X
Chamaesyce hyssopifolia		-	-	-	X
Chamaesyce thymifolia		-	-	-	X
Drypetes vitiensis		-	X	-	-
Glochidion cuspidatum		-	X	-	-
Glochidion ramiflorum		-	X	-	-
Macaranga harveyana		-	X	-	-
Macaranga stipulosa		X	-	-	-
Omalanthus nutans		-	X	-	-
Phyllanthus amarus		-	-	-	X
Phyllanthus debilis		-	-	-	X
Phyllanthus urinaria		-	-	-	X
Phyllanthus virgatus		-	X?	-	-
FABACEAE					
Abrus precatorius		-	X?	-	-
Adenathera pavonina		-	-	-	X
Alysicarpus vaginalis		-	-	-	X
Caesalpinia major		-	X	-	-
Calopogonium muconoides		-	-	-	X
Canavalia cathartica		-	X	-	-
Canavalia rosea		-	X	-	-
Dendrolobium umbellatum		-	X	-	-
Derris trifoliata		-	X	-	-
Desmodium incanum		-	-	-	X
Desmodium tortuosum		-	-	-	X
Desmodium triflorum		-	-	-	X
Erythrina variegata		-	X	-	-
Inocarpus fagifer		-	-	X	-
Intsia bijuga		-	X	-	-
Leucaena leucocephala		-	-	-	X
Macroptilium lathyroides		-	-	-	X
Mimosa invisa		-	-	-	X
Mimosa pudica		-	-	-	X
Mucuna gigantea		-	X	-	-
Paraserianthes falcataria		-	-	-	X
Pueraria lobata		-	-	X	-
Vigna marina		-	X	-	-

Species FAMILY	Status*	E	I	P	M
FLACOURTIACEAE					
Casearia sp. nova		X	-	-	-
Erythrospermum acuminatisimum		-	X	-	-
Flacourtia rukam		-	X	-	-
Homalium whitmeeanum		-	X	-	-
GESNERIACEAE					
Cyrtandra pulchella		X	-	-	-
Cyrtandra samoensis		-	X	-	-
GOODENIACEAE					
Scaevola taccada		-	X	-	-
HERNANDIACEAE					
Hernandia moerenhoutiana		-	X	-	-
Hernandia nymphaeifolia		-	X	-	-
ICACINACEAE					
Citronella samoensis		-	X	-	-
LAURACEAE					
Litsea samoensis		-	X	-	-
LOGANIACEAE					
Fagraea berteroana		-	X	-	-
Geniostoma rupestre		-	X	-	-
LORANATHACEAE					
Decaisnina forsteriana		-	X	-	-
LYTHRACEAE					
Cuphea carthagenensis		-	-	-	X
MALVACEAE					
Hibiscus tiliaceus		-	X	-	-
Sida rhombifolia		-	-	X	-
Thespesia populnea		-	X	-	-
MELASTOMACEAE					
Astronidium pickeringii		X	-	-	-
Clidemia hirta		-	-	-	X
Dissotis rotundifolia		-	-	-	X
Medinilla samoensis		-	X	-	-
Melastoma denticulatum		-	X	-	-
MELIACEAE					
Aglaia samoensis		X	-	-	-
Dysoxylum huntii		X	-	-	-
Dysoxylum maota		-	X	-	-
Dysoxylum samoense		X	-	-	-
MONIMIACEAE					
Hedycarya denticulata		X	-	-	-
MORACEAE					
Ficus godeffroyi		X	-	-	-
Ficus obliqua		-	X	-	-
Ficus prolixa		-	X	-	-
Ficus scabra		-	X	-	-
Ficus tinctoria		-	X	-	-
Ficus uniauriculata		X	-	-	-
MYRISTICACEAE					
Myristica fatua		-	X	-	-
Myristica hypargyraea		-	X	-	-

Species FAMILY	Status*	E	I	P	M
MYRSINACEAE					
Embelia vaupelii		-	X	-	-
Maesa tabacifolia		-	X	-	-
MYRTACEAE					
Descaspermum fruticosum		-	X	-	-
Metrosideros collina		-	X	-	-
Psidium guajava		-	-	-	X
Syzygium brevifolium		X	-	-	-
Syzygium carolinense		-	X	-	-
Syzygium clusiifolium		-	X	-	-
Syzygium dealatum		-	X	-	-
Syzygium inophylloides		-	X	-	-
Syzygium samarangense		-	-	-	X
Syzygium samoense		X	-	-	-
NYCTAGINACEAE					
Boerhavia albiflora		-	X	-	-
Boerhavia repens		-	X?	-	-
Pisonia grandis		-	X	-	-
Pisonia umbellifera		-	X	-	-
OLEACEAE					
Chionanthus vitiensis		-	X	-	-
Jasminum didymum		-	X	-	-
ONAGRACEAE					
Ludwigia hyssopifolia		-	-	-	X
Ludwigia octovalvis		-	-	-	X
OXALIDACEAE					
Oxalis corniculata		-	-	X	-
PASSIFLORACEAE					
Passiflora foetida		-	-	-	X
PIPERACEAE					
Peperomia pellucida		-	-	-	X
Peperomia tutuilana		-	X	-	-
Piper graeffei		-	X	-	-
POLYGALACEAE					
Polygala paniculata		-	-	-	X
PORTULACACEAE					
Portulaca samoensis		-	X	-	-
RHAMNACEAE					
Alphitonia zizyphoides		-	X	-	-
Colubrina asiatica		-	X	-	-
RHIZOPHORACEAE					
Crossostylis bifora		-	X	-	-
RUBIACEAE					
Calycosia sessilis		X	-	-	-
Canthium merrillii		-	X	-	-
Cyclophyllum barbatum		-	X	-	-
Geophila repens		-	X	-	-
Guettarda speciosa		-	X	-	-
Gynochtodes epiphytica		-	X	-	-
Hedyotis biflora		-	X	-	-

Species FAMILY	Status*	E	I	P	M
RUBIACEAE (cont'd)					
Ixora samoensis		X	-	-	-
Morinda citrifolia		-	-	X	-
Morinda myrtifolia		-	X	-	-
Mussaenda raiateensis		-	X	-	-
Neonauclea forsteri		-	X	-	-
Psychotria forsteriana		-	X	-	-
Psychotria insularum		-	X	-	-
Sarcopygme pacifica		X	-	-	-
Spermacoce assurgens		-	-	-	X
Spermacoce mauritiana		-	-	-	X
Tarenna sambucina		-	X	-	-
RUTACEAE					
Acronychia heterophylla		X	-	-	-
Euodia hortensis		-	-	X	-
Euodia samoensis		X	-	-	-
Micromelum minutum		-	X	-	-
SAPINDACEAE					
Allophylus timoriensis		-	X	-	-
Arytera brackenridgei		-	X	-	-
Elattostachys falcata		-	X	-	-
Sapindus vitiensis		-	X	-	-
SAPOTACEAE					
Manilkara dissecta		-	X	-	-
Palaquium stehlinii		X	-	-	-
Planchonella garberi		-	X	-	-
Planchonella grayana		-	X	-	-
Planchonella samoensis		-	X	-	-
SCROPHULARIACEAE					
Lindernia crustacea		-	X	-	-
STERCULIACEAE					
Kleinhovia hospita		-	X	-	-
Sterculia fanaiho		-	X	-	-
THEACEAE					
Eurya pickeringii		-	X	-	-
THYMELAEACEAE					
Phaleria glabra		-	X	-	-
Wikstroemia foetida		-	X	-	-
TILIACEAE					
Grewia crenata		-	X	-	-
Trichospermum richii		-	X	-	-
ULMACEAE					
Trema cannabina		-	X	-	-
URTICACEAE					
Cypholophus macrocephalus		-	X	-	-
Dendrocnide harveyi		-	X	-	-
Leucosyke corymbulosa		-	X	-	-
Pilea microphylla		-	-	-	X
Pipturus argenteus		-	X	-	-
Procris pedunculata		-	X	-	-

Species FAMILY	Status*	E	I	P	M
VERBENACEAE					
Clerodendrum chinense		-	-	-	X
Clerodendrum inerme		-	X	-	-
Faradaya amicorum		-	X	-	-
Premna serratifolia		-	X	-	-
Stachytarpheta urticaefolia		-	-	-	X
MONOCOT ANGIOSPERMS					
AGAVACEAE					
Cordyline fruticosa		-	-	X	-
ARACEAE					
Amorphophallus paeoniifolius		-	-	X	-
Epipremnum pinnatum		-	X	-	-
Rhapidophora graeffei		X	-	-	-
ARECACEAE					
Cocos nucifera		-	X	-	-
COMMELINACEAE					
Commelina diffusa		-	-	X	-
CYPERACEAE					
Cyperus compressus		-	-	-	X
Fimbristylis autumnalis		-	-	-	X
Fimbristylis cymosa		-	X	-	-
Fimbristylis dichotoma		-	-	X	-
Kyllinga brevifolia		-	-	-	X
Kyllinga nemoralis		-	-	X	-
Mapania macrocephala		-	X	-	-
Mariscus cyperinus		-	X?	-	-
Mariscus javanicus		-	X	-	-
Mariscus seemannianus		-	X	-	-
Pycreus polystachyos		-	-	-	X
Scleria lithosperma		-	X	-	-
Scleria polycarpa		-	X	-	-
DIOSCOREACEAE					
Dioscorea bulbifera		-	-	X	-
HELICONIACEAE					
Heliconia laufao		X	-	-	-
ORCHIDACEAE					
Appendicula bracteosa		-	X	-	-
Bulbophyllum longiscapum		-	X	-	-
Bulbophyllum polypodioides		-	X	-	-
Bulbophyllum rosticeps		-	X	-	-
Bulbophyllum sp. nova		X	-	-	-
Calanthe triplicata		-	X	-	-
Coelogyne lycastoides		-	X	-	-
Dendrobium biflorum		-	X	-	-
Dendrobium calcaratum		-	X	-	-
Dendrobium dactylodes		-	X	-	-
Dendrobium goldfinchii		-	X	-	-
Dendrobium samoense		-	X	-	-
Dendrobium sladei		-	X	-	-

Species FAMILY	Status*	E	I	P	M
ORCHIDACEAE (cont'd)					
Didymoplexis micradenia		-	X	-	-
Diplocaulobium fililobum		X	-	-	-
Eria robusta		-	X	-	-
Flickingeria comata		-	X	-	-
Glomera montana		X	-	-	-
Liparis condylobulbon		-	X	-	-
Malaxis resupinata		-	X	-	-
Malaxis samoensis		X	-	-	-
Moerenhoutiana heteromorpha		X	-	-	-
Oberonia equitans		-	X	-	-
Oberonia heliophila		-	X	-	-
Phreatia matthewsii		-	X	-	-
Phreatia micrantha		-	X	-	-
Phreatia obtusa		-	X	-	-
Spathoglottis plicata		-	X	-	-
Taeniophyllum fasciola		-	X	-	-
Taeniophyllum gracile		-	X	-	-
Thrixspermum graeffei		-	X	-	-
PANDANACEAE					
Freycinetia reineckei		X	-	-	-
Freycinetia storckii		-	X	-	-
Pandanus tectorius		-	X	-	-
POACEAE					
Axonopus compressus		-	-	-	X
Bothriochloa bladhii		-	-	-	X
Brachiaria mutica		-	-	-	X
Brachiaria paspaloides		-	-	X	-
Brachiaria subquadripara		-	-	-	X
Centosteca lappacea		-	X?	-	-
Chloris barbata		-	-	-	X
Coix lacryma-jobi		-	-	X	-
Cyrtococcum oxyphyllum		-	X?	-	-
Dacytloctenium aegyptium		-	-	-	X
Digitaria ciliaris		-	-	-	X
Digitaria horizontalis		-	-	-	X
Digitaria setigera		-	X?	-	-
Digitaria violascens		-	-	-	X
Echinochloa colona		-	-	-	X
Eleusine indica		-	-	X	-
Eriochloa procera		-	-	-	X
Ischaemum murinum		-	X	-	-
Lepturus repens		-	X	-	-
Miscanthus floridulus		-	X	-	-
Oplismenus compositus		-	-	X?	-
Oplismenus hirtellus		-	-	X?	-
Paspalum conjugatum		-	-	-	X
Paspalum orbiculare		-	X	-	-
Paspalum paniculatum		-	-	-	X
Paspalum vaginatum		-	-	-	X

Species FAMILY	Status*	E	I	P	M
POACEAE (cont'd)					
Sporobolus diander		-	-	-	X
Stenotaphrum micranthum		-	X	-	-
Thuarea involuta		-	X	-	-
TACCACEAE					
Tacca leontopetaloides		-	-	X	-
ZINGIBERACEAE					
Costus speciosa		-	-	-	-
Etlingera cevuga		-	X?	-	-
Zingiber zerumbet		-	-	X	-

E = Endemic; I = Indigenous; P = Polynesian introduction; M = Modern Introduction.