

**Botanical Survey  
of the  
Huvalu Forest Conservation Area  
Niue**

by

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## INTRODUCTION

Niue lies in the South Pacific Ocean at latitude 19°S and longitude 169°W, between Samoa to the west and the Cook Islands to the east. The oval-shaped island, with an area of 260 km<sup>2</sup> and a maximum elevation of 69 m, was formed in recent geological times by the emergence and elevation of a coral atoll that sits atop a long-dormant undersea volcano. The outer portion or coastal zone of the island comprises several terraces formed during periods when the island paused during its emergence from the sea. This series of terraces is quite weathered in some areas and is marked in many places by deep crevices and rugged pinnacles. The central basin, which makes up the bulk of the island, represents the former lagoon of the atoll. The surface of the basin is not homogeneous since it varies in soil and rockiness. Areas with pockets of soil are favoured by trees for the growth of dense lowland forests, but also by human inhabitants for the cultivation of food.

The climate in Niue is wet and tropical. The mean annual temperature is 25° C, the mean diurnal range is 8° C, and the mean maximum temperature ranges between 21 and 27°C. Rainfall is relatively heavy with a mean annual total of 204 cm. The months from June to September are the driest, but even these months average at least 10 cm per month. Humidity is nearly always high, averaging 89% at 9.a.m. (Wright and van Westerndorp 1965). Droughts occasionally occur, and cyclones periodically hit the island during the summer months (mostly November to April). The high rainfall and warm temperatures partly make up for the relatively poor soil conditions and allow the island (the central basin at least) to support a tropical rainforest.

### The Vegetation

Brief accounts of the vegetation was given by Frost and Berryman (1966), a timber survey by the Niue Forestry Section (1990), and Sykes (1970). Frost and Berryman divided the forest into three categories, "coastal forest," "light and scattered forest," and "merchantable forest", but did not discuss non-forest vegetation. The Forestry Section report also did not deal with overall vegetation, but reiterated the three forest types of Frost and Berryman and added a fourth vegetation category, "open areas". Sykes gave a brief but more detailed account of the vegetation and noted that the island was originally covered with a rainforest of tall trees that formed a relatively dense canopy, below which was a relatively poorly developed shrub and herbaceous layer. However, because of the long period of human habitation and the modifications made during shifting agriculture, and, in more recent times, by a timber industry, most of the mature forest has now been removed and replaced by secondary forest. The best remaining forest, according to Sykes, is in the central, east, and southeastern portions of the island. Sykes also noted a low-stature "coastal forest" around the outer portions of the island that merges into inland forest

Much of the remaining tall stature inland forests is actually secondary forest in various stages of development. This secondary forest, according to Sykes, is generally richer in species number than is mature forest. In addition to the forest types, Sykes also recognised "scrub" areas that are the extreme result of man's activity. This vegetation, referred to by Yuncker (1943) as "thickets" and by Wright and van Westerndorp as "desert", are typically dominated by the fern *Nephrolepis*



*hirsutula (mohuku)*. He also noted the absence of a sharp distinction between mature and secondary forest, and between secondary forest and scrub. Another brief account of the vegetation are given by Yuncker (1943).

### The Flora

The collection of the flora of Niue began in 1774 with the visit of Captain James Cook. However, only four specimens were obtained (Sykes 1970). Another collection was made in 1876 by amateur botanist F. Jensen, but these collections, which are stored at the British Museum, were only noted in recent times (St. John 1976) and it is likely that many of the specimens attributed to Niue were actually collected elsewhere (Whistler 1984). The next significant collection was made in about 1899 by H. F. Moore, but these specimens, which are stored at the U.S. National Herbarium (Smithsonian) have apparently not been studied. A year or two later (1901), another collection was made by S. P. Smith, and is stored at the Auckland Museum herbarium.

It was not until 1940 that a large and comprehensive collection of the flora of Niue was made. This was by T. G. Yuncker, who, on the basis of these collections, published *The Flora of Niue Island* in 1943. Another larger collection was made by W. R. Sykes in 1965, and is the basis for his *Contributions to the Flora of Niue* (1970). Several years later Sykes did further collecting on Niue, but these specimens have not been documented in the literature. The author (Whistler) made a small collection on Niue during two trips in the mid-1980s, but these too have not been documented in the literature.

Sykes estimated the size of the native vascular plant flora (flowering plants, ferns, and fern allies) at 175 species. Also present and listed by Sykes were a number of adventive or weedy species. Ornamentals were also listed by both Sykes and Yuncker, but these were not of concern for the present study. In addition to the 175 native species estimated by Sykes, there are also several others that were first recorded during the present survey (see Appendix 1).

## METHODOLOGY

The methodology used had four major components—literature review, site selection, botanical field work, and vegetation mapping—and each will be described in turn.

### Literature Review

Prior to the field work, a review of the literature was undertaken, particularly of *The Huvalu Forest Conservation Area, Niue, Project Preparation Document* (SPREP 1995), in order to determine the characteristics of the study site and the distribution of the vegetation within it. A preliminary checklist of the flora of Niue was compiled from the literature, particularly from Yuncker (1943) and Sykes (1970). Vegetation maps from the report by Frost and Berryman (1966) and the Forestry Section (1990) were also reviewed.

### Site Selection

Site selection was based on a review of existing information, and, in particular, the vegetation map and descriptions published in the Huvalu Forest Conservation Area Project Preparation Document or PPD (SPREP 1995). The vegetation map in the PPD is itself based on the Niue Forestry Division 1990 Forest map (Forestry Section 1990). The vegetation map in the PPD shows four vegetation types in the Conservation Area (CA)—coastal forest, primary forest, secondary forest, and scrub/agricultural areas—and gives the areas of each. The number of plots selected in each forest type was proportional to the area of each forest type. No plots were selected in scrub areas since the plot methodology used is applicable only to forest areas where there is a continuous tree canopy, and not to open areas where no such tree canopy exists. For open areas, qualitative assessments involving preparation of plant checklists were made instead. When selecting plots, the team took into account that the CA boundary has changed since the publication of the PPD. The western boundary of the CA has been moved about 1 km farther to the west, and as a result the size of the CA has increased from 5400 ha to 6029 ha.

A target of 2 plots per day was selected as a realistic target. This gave an overall goal of 20 plots over ten field days. A total of 21 plots were eventually sampled. These were selected at random within each forest vegetation type to give a broad coverage throughout the conservation area for each type of vegetation. To simplify mapping plot location, plots were selected at known distances from landmarks such as road junctions. The distance from the known point was measured by means of a “hip chain”—a forester's device consisting of a string and a counter to measure how much string has been played out (i.e., how far the person has gone since the end of the string was attached to a reference point). In a few cases plots had to be slightly relocated from the originally selected position because of recent disturbance such as agricultural clearing or logging. Selected plots were marked clearly on a field copy of the Niue topographical map (1:10,000) with notes on plot location, such as distance from known landmarks.

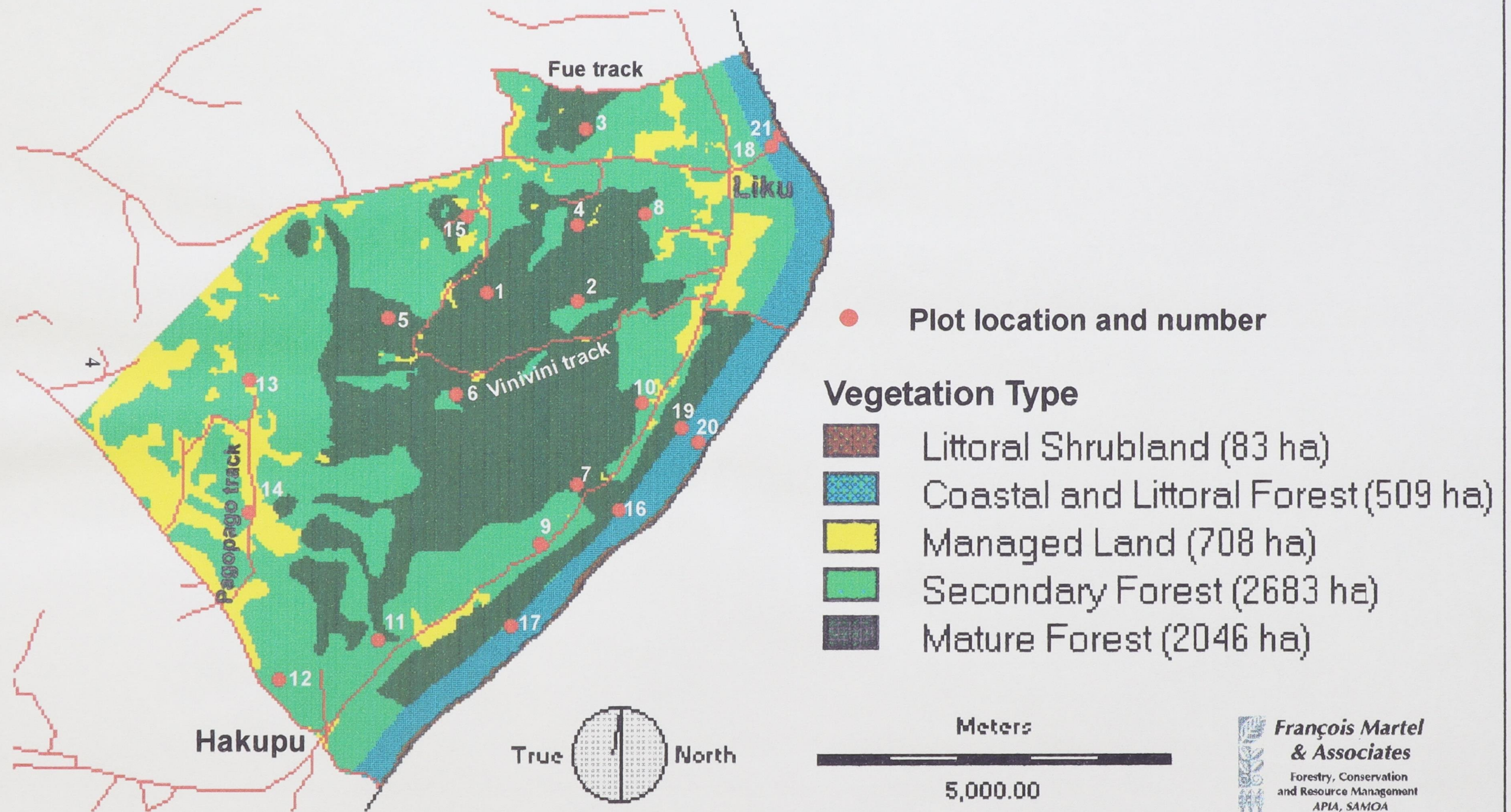
The 21 plots included 8 in secondary forest, 7 in mature forest, 4 in coastal forest, and 2 in littoral forest (see table 1). However, the separation of forest into types is somewhat arbitrary, because it was found that there are few distinct boundaries between them. Inland plots (i.e., ones away from the coast) dominated by trees characteristic of “climax forest” were termed “mature forest” plots, and those dominated by species that tend to colonise abandoned croplands and whose saplings are virtually absent in high forest were termed “secondary forest” plots. Forests on the seaside of the road, especially those near the terraces, were termed “coastal forest.” Those on the seaward side of the terrace and down to the shore were termed “littoral forest” since the species that tend to dominate in this area are dependent upon the sea for dispersal. Figure 1 shows the location of all selected plots.

Table 1. Number of plots selected in each forest type

Forest Type	Area of forest in original CA (ha)	Percent of original CA forest cover	No of plots selected
Coastal/littoral forest	550	12%	6
Primary or mature forest	1900	42%	7
Secondary forest	2100	46%	8



**Figure 1. Huvalu CA Vegetation Map showing Botanical Survey Plot Locations**





## Botanical Field Work

A one-day field reconnaissance trip to the conservation area was conducted on 29 October 1997 and notes taken on vegetation types. Field work began on 30 October and ended on 11 November. The survey team consisted of the consultants A. Whistler and J. Atherton, along with three staff members from the Department of Community Affairs—Logopati Seumanu (the CASO), Masani Togiamana, and Ioane Mamaia. The local field staff was trained in determining location, establishment and marking of botanical plots, the use of the dbh tape, and the recording of plot data.

Lines were cut with a machete to the starting point of the plot, and the nearest tree was then marked with spray paint to facilitate plot location in the future. Then a 100-m tape was laid out, typically perpendicular to the trail used to reach the site, and red plastic flagging tape was used to mark the boundary lines of the plot, 5 m on either side of the 100-m tape. This resulted in a plot 100 x 10 m, or 1000 m<sup>2</sup> (two littoral forest plots were only 500 m<sup>2</sup>, however). Two of the staff then measured all of the trees having a minimum dbh (diameter at breast height) of 5 cm (Fig. 2), using dbh tapes, while other members of the team recorded the data. Identifications were made by consensus. This was not a problem, since the consultants were familiar with nearly all of the tree species from earlier work in Tonga and Samoa, and the local staff knew most of them from their living in and with the forest. Voucher species of most of the species were made, and these are deposited in the personal collection of the author (Whistler) at the University of Hawaii, with duplicates to be sent to other scientific institutions.

While the plot was being laid out, a checklist of all vascular species found in the immediate area was made. This list was expanded as new species were encountered during the measuring of trees. The qualitative results—presence or absence within the plot—is considered to be fairly accurate, except for epiphytes which are very difficult to see since they are mostly restricted to large branches in the forest canopy.

The data collected were then analysed and the numbers of individuals of each species were tabulated, along with the number of individuals above 15 cm dbh (as a measure of the typical size of the population). From the dbh measurements, the basal area of each individual was calculated using the formula for the area of a circle ( $\pi r^2$ ), and the total stem cross-sectional area of each species was added up. This figure, total stem cross-sectional area, is standardly used as a basis of “dominance.” Dominance is determined by adding the total stem area of each species to get a plot total, and then dividing each of the species figures by the total cross-sectional area of all species in the plot area to give a percentage. The results of these 21 plot surveys can be found in Appendix 2. In the appendix the forest plots have been classified into four different vegetation classes: littoral forest, coastal forest, secondary forest, and mature forest.

Each of the tables includes totals for the number of trees, the number of trees 15cm dbh and above, the total stem cross-sectional area (in cm<sup>2</sup>), and the relative dominance of all the species. Non-tree data are also noted, including other species fitting into the categories “other trees” (found in the area but not the plot, or typically, present only as seedlings), terrestrial ferns, epiphytic ferns, vines, and others (species that do not fit well or at all in the other categories).



**Figure 2** Measuring the Diameter at Breast Height (DBH) of a tree. In the botanical plots, all trees above 5cm dbh were measured.



**Figure 3** A taro plantation on the Alofi-Hakupu road. Taro is now an important export crop in Niue with many small taro plantations scattered near tracks throughout the CA. Most of these plantations were originally cleared by bulldozer.



## Vegetation Mapping

The mapping of Huvalu CA vegetation consisted of 3 steps: the reinterpretation of 1981 aerial photographs, adjustment of a provisional vegetation map with data from the botanical survey, and digitisation of the vegetation map.

Some anomalies were identified in the 1990 vegetation map published in the PPD. This map was based on interpretation of 1981 aerial photographs. In many cases the mapping of open areas appeared suspect, especially in the vicinity of Hakupu. Consequently, it was decided to reinterpret the 1981 aerial photographs and remap the vegetation classes, especially the open areas. Adjustment to the area of secondary forest was made as a result of the reinterpretation of open areas but no adjustment was made to the mature rainforest area since it could not be mapped more accurately. The 1994 maps of the Liku forest cover prepared by François Martel & Associates in their Deforestation Survey of Samoa and Niue (SPREP 1997) were used as a guide in this process. Mapping was done on tracing paper overlaid onto a 1:10,000 black and white aerial photograph mosaic of the conservation area.

A major problem when mapping the vegetation was the difficulty in distinguishing between vegetation classes that merge into one another, without distinct boundaries. The Niue rainforest is a complex mosaic of forest at different ages, from recently cleared and regenerating forest, to mature forest perhaps never cleared before. Consequently, typing of the Niue forest is a very subjective process and any vegetation map should be considered an approximation of a complex system.

A new vegetation class could be distinguished on the aerial photographs. This is littoral shrubland, which is the open vegetation found on the coral rocks of the lower coastal terrace within 20–60 m of the sea. On its inland margin this vegetation is replaced by coastal and littoral forest having a continuous tree canopy. Coastal and littoral forest have not been distinguished on the vegetation map since pockets of littoral forest are found throughout the coastal forest and the two forest types merge imperceptibly into one another.

A SPOT satellite image of Niue taken in 1994 which has been classified by Terralink (New Zealand) into vegetation classes, was obtained from the Niue Department of Lands and Survey. However, it was decided not to use this map because of some anomalies in vegetation classification, especially with regard to open areas and merchantable forest. Ground truthing of this map by the Niue Forestry Division showed that  $\frac{1}{4}$  of all ground truthing check points were incorrectly classified. In any case no documentation on how the vegetation was classified is available. Until the map has been corrected and a full description on the vegetation classification that was used is available, it is of limited use for vegetation mapping.

The aerial photo interpretation provided a provisional vegetation map which could then be adjusted as a result of new plot information and visual observations made during the botanical survey. The 21 plots completed in the conservation area and the visual observations made during reconnaissance trips throughout the CA provided a strong dataset on which to adjust the vegetation map.

In the second step, some vegetation classes were slightly adjusted as a result of ground truthing. No adjustments were made to the littoral shrubland zone which appeared to be accurate. Slight adjustment of the coastal forest zone between Liku and Hakupu was made because it was found that along most of this coast coastal forest merges into mature forest rather than being

separated from it by secondary forest. In other cases mature forest and secondary forest were adjusted slightly as a result of new plot information.

In the third step, the 1:10,000 scale vegetation map was digitised using TOSCA, the vector software package for IDRISI. The map was then converted to raster based IDRISI format and printed out on A4 sheets. Figure 1 shows the final vegetation map.

## VEGETATION OF THE CONSERVATION AREA

The vegetation of the CA is divided here into two categories, Managed Land Vegetation and Natural Vegetation. Managed Land Vegetation is in a continual state of disturbance from the activities of man, i.e., it is being used continuously, such as land in villages (which are not further discussed here), or periodically, such as croplands used in shifting cultivation. The Natural Vegetation category includes all vegetation that is not currently (in the long term) being used by man, such as forests and littoral shrubland. Table 2 shows the areas of each vegetation class shown on the vegetation map (figure 1).

Table 2. Vegetation types in the Huvalu CA

Vegetation Type	Area in CA (ha)	Percent of CA
Managed land	708	12%
Littoral shrubland	83	1%
Coastal and littoral forest	509	8%
Mature forest	2046	34%
Secondary forest	2683	45%
<b>TOTAL (CA)</b>	<b>6029</b>	<b>100%</b>

### Managed Land Vegetation

Managed land covers approximately 708 ha (12%) of the conservation area and includes all vegetation that is undergoing active disturbance by man. It is divided here into two subcategories: (1) Cropland; and (2) Fernland, although these have not been distinguished on the vegetation map. It must be kept in mind that the two are interrelated, and the abandonment of an area of cropland leads, within a few years, to fernland. Thus the two are parts of a continuum, where cropland is actively managed and older fernland is cropland that has been undisturbed for several years.



### (1) Cropland

Much of the managed land in the CA comprises cropland. Cropland may be permanent, such as in coconut plantations, or it may be only in temporarily in use, as is done in the practice of "shifting cultivation." In shifting cultivation the land is used only periodically. Land covered with secondary or mature vegetation is cleared, usually bulldozed and burned, and then crops, mostly taro, which has recently become important as an export crop, is planted (Fig. 3). After one or two years of crops, the soil fertility drops, and the land is abandoned (allowed to go fallow) and the process repeated somewhere else. The addition of fertilisers is prohibitively expensive, and without them the land cannot be economically farmed. Thus it is most beneficial to the farmers to move on to a new piece of land after one or two years, but the practice is not so beneficial to the environment.

### (2) Fernland

This is the land that has been cleared in the recent past (perhaps past 5 years) and has not had time to regenerate into a closed canopy secondary forest of trees. It is typically located along or near roads and tracks in the CA (Fig. 4). Once cropland is abandoned after one or two years of crops, weedy species rapidly take over. They do this in a typical pattern, and the species composition, i.e., which species dominate, can be an accurate indicator of the length of time since the land has been abandoned. Soon after abandonment, the weedy plants dominating the former cropland are mostly herbaceous species, particularly *Paspalum conjugatum* (**vailima**), *Mikania micrantha* (**fue Saina**), *Stachytarpheta urticifolia* (**motofu Samoa**), *Chamaesyce hirta* (**toto tane**), *Polygala paniculata*, and *Plantago lanceolata*.

After a couple of years, ferns become the dominant ground cover species, particularly *Nephrolepis hirsutula* (**mohuku**), *Spaherocarpus invisus*, and *Phymatosorus grossus* (**mamanu**), and the area becomes an actual fernland. Shrubs and small trees also become a major component of these fernlands, particularly *Hibiscus tiliaceus* (**fou**), *Morinda citrifolia* (**nonu**), *Glochidion ramiflorum* (**kahame**), *Scaevola taccada* (**pa**), and *Macaranga harveyana* (**le hau**), and to a lesser extent, *Premna serratifolia* (**aloalo**), *Cyrtandra samoensis* (**gahu**), *Psidium guajava* (**lala**), *Tarenna sambucina* (**manono**), *Omalanthus nutans* (**fumamala**), *Timonius polygamous* (**kaveutu**), *Stachytarpheta urticifolia*, and *Geniostoma rupestre* (**tete**). At later stages in the fernlands, the trees gain dominance and produce a shade that eventually displaces all but the most shade tolerant of the fernland species.

### Natural Vegetation

This is the vegetation that is undisturbed by man, or at least has not been disturbed for many years. On the shore the native vegetation is herbaceous and shrubby, which is the first plant community described below, (3) Littoral Shrubland, but inland all natural vegetation is forest. The forests are divided here into four plant communities: (4) Littoral Forest; (5) Coastal Forest; (6) Mature Forest; and (7) Secondary Forest. For mapping purposes only, littoral forest has been combined with coastal forest due to difficulties in distinguishing between them on aerial photographs.



**Figure 4** An area of fern scrubland near the Vinivini track near Liku. This former agricultural area was abandoned perhaps five years ago and is now dominated by secondary scrub, ferns and other weedy species. Eventually these fernlands are replaced by a closed canopy secondary forest.



**Figure 5** Littoral shrubland at Tuhia. In this case the windswept vegetation is dominated by the shrubs *Scaevola taccada* and *Tournefortia argentea* growing on jagged coral rock.



### (3) Littoral Shrubland

This narrow zone of windswept vegetation (Fig. 5) is found in the CA on the southeast facing side of the island, and is much more affected by exposure than it is on the western (leeward) side of the island. In the CA, littoral shrubland only covers about 83 ha or 1% of the CA. The width of this zone varies according to the degree of exposure to wind and waves and to the rockiness of the substrate. On the rockiest coasts, such as at Togo and Vaikona, the littoral scrub zone may be up to 60 m wide with patches of vegetation growing on jagged coral rock. On less rocky coasts such as at Liku and Hakupu the littoral scrub zone may be only 20m wide. In some places, the exposure is so extreme that the immediate coastal area is virtually devoid of vegetation, and consists of barren, jagged limestone rock. The plants comprising this zone are known as littoral species, and are characterised by seawater-dispersed seeds, resistance to salty sea air and mist, and ability to live on otherwise barren limestone rock. These plants are almost all heliophytes that require bright sunshine for growth, and are rarely found in the shade of littoral forest.

The most common and abundant littoral plants in the CA are shrubs and small trees, particularly, *Pemphis acidula* (**gigie**), *Scaevola taccada* (**pa**), and *Tournefortia argentea* (**toihuni**), which often form dense patches. *Pemphis* is particularly dominant closest to the sea, particularly on the steepest and rockiest areas. Less abundant but still common shrubs are *Clerodendrum inerme*, *Timonius polygamus* (**kaveutu**), and *Ficus scabra* (**ata**). Also common are herbaceous or subshrubby species, such as *Chamaesyce atoto*, *Capparis cordifolia* (**pamoko**), *Heliotropium anomalum*, *Achyranthes aspera* (**talamoa fiti**), *Portulaca lutea* (**tamole**), *Sesuvium portulacastrum*, and *Triumfetta procumbens*; vines, such as *Canavalia sericea* (**feteka tea**) and *Ipomoea macrantha* (**fue tea**); grasses and sedges, such as *Fimbristylis cymosa* and *Lepturus repens*; and the fern *Phymatosorus grossus* (**mamanu**). In some places there are dense stands of *Pandanus tectorius* (**fa vao**), which often grade into littoral forest. Most of these species are restricted to the coast, since they are adapted to the conditions there and are not able to grow in the shade of forests inland from the coast.

### (4) Littoral Forest

Littoral forest occurs inland of the littoral shrubland vegetation, sometimes fairly near the coast in protected areas. It is restricted mostly to the slopes of the terraces, inland of which lowland forest species predominate. Like species of the littoral strand, littoral forest species, especially trees, are often seawater dispersed, and are able to survive in the very harsh conditions near the coast because of their resistance to salt spray and brackish or saline ground water.

By far the most dominant of littoral forest trees is *Barringtonia asiatica* (**futu**), the fish poison tree. Like typical littoral forest tree species, it is restricted mostly to the coast. However, individual trees and small patches of the trees are sometimes found considerably inland in areas otherwise dominated by other forest types. In these cases, the seeds were probably carried there by man. Two plots of littoral forest were sampled (plot nos. 20 and 21 in Appendix 2). One was a typical *Barringtonia* forest, where this tree had a relative dominance of 73%. The only other common tree in that forest was *Neisosperma oppositifolium* (**pao**), which is a subcanopy littoral tree. In that plot *Neisosperma* had 17% relative dominance, but nearly half of the individual trees

in the plot belonged to this species. Also common in the plot were *Polyscias multijuga* (**tanetane**) and *Macaranga harveyana* (**le hau**), which are typical in open canopy forests inland.

The other littoral forest plot was atypical, in that it did not contain any *Barringtonia*, and was instead dominated by *Syzygium dealatum* (**tuali**) with 30% relative dominance and *Pisonia grandis* (**puka tea**) with 25%. **Tuali** is a coastal and inland forest species, and **pukatea** is a littoral forest tree, so this plot is somewhat intermediate between the two forest types. Other typical littoral forest species included *Calophyllum inophyllum* (**fetau**), *Planchonella grayana* (**kalaka**), *Guettarda speciosa* (**panopano**), *Cordia subcordata* (**motou**), *Neisosperma oppositifolium* (**pao**), and *Cocos nucifera* (**niu**), the coconut.

The most common ground cover species in littoral forest is the birdnest fern *Asplenium nidus* (**luku**). Less common are *Asplenium robustus*, *Davallia solida*, *Nephrolepis hirsutula* (**kapihi**), and *Tectaria latifolia*. The dicot herb *Procris pedunculata* (**kapa**) is often locally abundant on rocks. The most common vines are *Clerodendrum inerme* (which is more of a shrub with long drooping branches that lean on other plants and ascend into the canopy) and *Ipomoea macrantha* (**fue tea**). Epiphytes are relatively uncommon in this forest, the most common epiphyte probably being *Asplenium nidus* (**luku**), which, when it falls to the ground, continues to grow (and dominate) as a terrestrial species.

### (5) Coastal Forest

In the CA coastal (and littoral) forest covers approximately 509 ha or 8% of the CA. Coastal forest is intermediate between mature forest and littoral forest, and occurs from near the top of the second terrace and extends inland a few hundred meters before it imperceptibly grades into mature or secondary forest (Fig. 6). Where soil rockiness decreases at about 500–600 m from the shore, the tree canopy tends to be higher and the coastal forest merges into mature or secondary primary forest. Thus coastal forest occupies a strip of vegetation approximately 300 m wide between about 300 and 600 m from the shore. Like mature forest, it is often dominated by one or more *Syzygium* species, but the forest is of shorter stature, the trees are fewer in number and have smaller average diameters, and it contains a number of tree species that are mostly restricted to coastal areas (because of the proximity of the area to the sea and the rockiness of the soil).

In the four coastal forest plots (nos. 16–19 in Appendix 2), the dominant tree by far was *Syzygium samarangense* (**kolivao**) with 37% relative dominance. The other dominant species in the plots were *Syzygium inophylloides* (**kafika**), *Syzygium dealatum* (**tuali**) with 5%, *Dysoxylum forsteri* (**moota**) with 4%, and *Macaranga seemannii* (**le**) with 3% (see Table 3). The first three dominants are the same as those recorded in mature forest (see Table 4), which indicates that these two forest types are not readily separable on the basis of dominant species. One floristic difference is in the subcanopy or understory species—*Polyscias multijuga* (**tanetane**), *Diospyros samoensis* (**kieto**), *Chionanthus vitiensis* (**hooto**), and *Morinda citrifolia* (**nonu**) are only poorly represented in mature forest, but are typical components of coastal forest. Several other species—*Dysoxylum forsteri* (**moota**), *Macaranga harveyana* (**le hau**), and *Glochidion ramiflorum* (**kahame**)—are typical secondary forest species that are probably present in coastal forest because the canopy is not as dense as in mature forest. This relatively open canopy and rocky nature of the soil (because of its proximity to the coast and terraces) is probably the reason



Table 3. Relative dominance of trees in Coastal Forest Plot nos. 16--19.

Species	Niue Name	PLOT No.				TOTAL
		1	2	3	4	
<b>canopy trees</b>						
<i>Syzygium samarangense</i>	kolivao	51	36	2	60	37%
<i>Syzygium inophylloides</i>	kafika	3	4	15	7	7%
<i>Syzygium dealatum</i>	tuali	+	1	16	2	5%
<i>Dysoxylum forsteri</i>	moota	-	8	3	3	4%
<i>Macaranga seemannii</i>	le	9	1	3	-	3%
<i>Barringtonia asiatica</i>	futu	8	-	-	-	2%
<b>subcanopy and understory trees</b>						
<i>Polyscias multijuga</i>	tanetane	8	9	4	9	8%
<i>Elaeocarpus tonganus</i>	malava	1	3	8	1	3%
<i>Diospyros samoensis</i>	kieto	+	3	1	6	3%
<i>Macaranga harveyana</i>	le hau	7	-	-	2	2%
<i>Streblus anthropophagorum</i>	atatu	8	-	-	-	2%
<i>Heritiera ornithocephala</i>	tafaki	+	-	6	-	2%
<i>Chionanthus vitiensis</i>	hotoo	-	1	6	-	2%
<i>Glochidion ramiflorum</i>	kahame	-	2	4	+	2%
<i>Morinda citrifolia</i>	nonu	1	2	2	1	2%

for the relative low basal area of the trees in these forest. In the four sampled plots, this averaged about 0.38 cm<sup>2</sup>/m<sup>2</sup>, which is only a little over half of that found in the mature forest plots.

The ground cover in coastal forest is moderate, with ferns and saplings and seedlings of tree species (typically *Syzygium samarangense* and *Syzygium inophylloides*) dominating the area. The most common ferns are *Asplenium nidus* (**luku**), *Nephrolepis hirsutula*, (**mohuku**), and *Davallia solida* (**kapihi**). Also often common on the ground are seedlings of vines, particularly *Alyxia stellata* (**maile**) and *Rourea minor* (**kanai uli**).

Lianas are common in the forest, partly because of the relatively light conditions on the forest floor, which promotes the growth of the lianas from the ground up into the canopy. The most common liana species are *Merremia peltata* (**fue vao**), *Ipomoea macrantha* (**fue tea**), and *Rourea minor* (**kanai uli**). However, other species are frequently encountered, especially *Alyxia stellata* (**maile**), *Flagellaria gigantea* (**va**), *Jasminum didymum* (**kanai tea**), *Jasminum betchei* (**kanai tea**), *Morinda myrtifolia*, *Abrus precatorius* (**mataila**), *Dioscorea bulbifera* (**hoi**), and *Dioscorea pentaphylla* (**pilita**). Epiphytes are particularly sparse, with only a few species having been recorded, probably because of the smaller size of the trees which limits the number of sites upon which epiphytes can grow. In fact, only a few fern species were recorded as epiphytes in the four coastal forest plots.



**Figure 6** Coastal forest near Vaikona. Typically coastal forest has similar species composition as inland forest but the trees are of shorter stature and fewer in number due to the rockiness of the soil and the proximity to the sea.



**Figure 7** Mature forest in the centre of the CA. A buttressed **kafika** tree (*Syzygium inophylloides*) is on the right. The forest floor of mature forest is typically open since few understory trees are able to survive in the dense shade of the canopy.



(6) Mature Forest

This tropical rainforest originally covered nearly the whole central basin of the island. However, because of the effects of nearly 2000 years of human occupation—shifting cultivation and utilisation of the trees by the native population—it is difficult to determine what is really primary forest, i.e., forest that has not been affected by the activities of man—and what is secondary forest. In a sense none of the present forests may fit into a strict interpretation of primary forest, because the dominant species in most of what appears to be primary forest is an apparently introduced species, **kolivao** (*Syzygium samarangense*). Consequently, the term mature forest will be used here instead of primary forest. It is used synonymously with climax forest, in which the species are in relative equilibrium and overall species composition can be expected to change relatively little over time, barring serious disturbance (manmade or natural).

The mature forest is a dense tropical rain forest with a closed canopy, the top of which is up to 20–30 m in height (Fig. 7). It covers an area of 2046 ha or 34% of the CA. Mature forest is generally closed, which allows relatively little light to reach the forest floor. Consequently light requiring species (heliophytes) are virtually absent and the flora is comprised of species that are adapted to germinating, maturing, and reproducing in shady conditions. One estimation of the density of the forest is the total basal area of the trees present, which is a measure of the cross-sectional area of all trees in a sample plot of fixed size. The average total basal area of the seven plots in this forest (plot nos. 1--7 in Appendix 2) was 0.60 cm<sup>2</sup>/m<sup>2</sup>. This compares favourably with rainforests in American Samoa (Whistler 1980), where good quality mature forest was found to have similar total basal areas and is nearly twice as much as that obtained in the coastal forest on Niue (plot nos. 16--19).

The Niuean mature forest is entirely dominated by three species in the genus *Syzygium*: *Syzygium samarangense* (**kolivao**), *Syzygium inophylloides* (**kafika**), and *Syzygium dealatum* (**tuali**). In the seven plots sampled during the survey that were classified as mature forest these three species had a relative dominance of 39, 31, and 8%, respectively (Table 4). In numbers of individual trees, **kolivao** far exceeded the others. In fact nearly half all trees measured belonged to this species, which is indicative of its dominance in all size classes and in nearly all areas of forest (except littoral forest) on Niue.

The next most dominant species is *Macaranga seemannii* (**le**), which in mature forest is represented almost entirely by large individuals. It is known as a “gap replacement” species because it typically forms under gaps in the canopy created by the fall of a large tree. The difference between this and secondary forest species is a matter of degree, and *Macaranga* itself is can also be found in large amounts in secondary forest. In mature forest plot nos. 1--7 it has an average relative dominance of 8%.

Other less dominant but still common canopy tree species include *Planchonella samoensis* (**kanumea**) with 2%, *Pometia pinnata* (**tava**) with 1%, and *Ficus prolixa* (**ovava**) with 1%. The low figure for the latter species is probably due to chance, since many huge individuals (made from the massed trunks and hanging roots of this banyan species) of this and the other similar banyan, *Ficus obliqua* (**pualiki**) are found in all the inland forest types. Noticeably absent from mature forest are *Rhus taitensis* (**tavahi**), *Alphitonia zizyphoides* (**toi**), and *Dysoxylum forsteri* (**moota**), which usually develop in an area after extensive disturbance, and are characteristic of secondary forest.

Table 4. Relative dominance of Mature Forest trees in plot nos. 1--7.

Species	Niue Name	PLOT No.							TOTAL
		1	2	3	4	5	6	7	
<b>canopy trees</b>									
<i>Syzygium samarangense</i>	kolivao	33	46	59	30	23	53	28	39%
<i>Syzygium inophylloides</i>	kafika	30	39	20	36	50	12	31	31%
<i>Syzygium dealatum</i>	tuali	25	3	+	9	5	11	6	8%
<i>Macaranga seemannii</i>	le	3	1	-	16	3	9	28	8%
<i>Planchonella samoensis</i>	kanumea	6	1	3	1	+	3	1	2%
<i>Pometia pinnata</i>	tava	-	+	2	2	1	3	-	1%
<i>Ficus prolixa</i>	ovava	-	-	2	-	-	-	-	+
<b>subcanopy and understory trees</b>									
<i>Streblus anthropophagorum</i>	atatu	2	1	-	1	4	2	3	2%
<i>Diospyros samoensis</i>	kieto	-	4	1	+	-	3	2	1%
<i>Polyscias multijuga</i>	tanetane	-	1	3	-	1	1	1	1%
<i>Baccaurea seemannii</i>	koka	1	+	1	1	-	2	-	1%
<i>Celtis harperi</i>	piliva	1	-	-	3	-	1	-	1%
<i>Elaeocarpus tonganus</i>	malava	+	2	1	1	+	1	1	1%
<i>Ficus scabra</i>	ata	-	-	3	+	+	-	-	+

The forest floor of mature forest is typically open, since few understory species are able to survive in the dense shade of the canopy (see Fig. 7). The most common species in this area are the ferns *Asplenium nidus* (**luku**), and less commonly, *Tectaria dissecta*, *Nephrolepis hirsutula* (**mohuku**), and *Asplenium robustus*. Seedlings of the dominant trees, particularly *Syzygium samarangense* and *Syzygium inophylloides*, also make up a significant part of the forest floor ground cover. Orchids are relatively scarce, the most common one being *Hetaeria oblongifolia*, but his species would best be described as uncommon. Other herbaceous species such as *Geophila repens* (**tono**) and *Tacca leontopetaloides* (**pia**) are sometimes found here.

Lianas are moderate in amounts. The most common species are *Merremia peltata* (**fue vao**) and *Rourea minor* (**kanai uli**). Also frequently found are *Jasminum betchei* (**kanai tea**), *Jasminum didymum* (**kanai tea**), *Flagellaria gigantea* (**va**), and *Alyxia stellata* (**maile**). *Flagellaria*, however, is mostly found as a seedling and not climbing up to the canopy, probably because of the low light conditions on the forest floor.

Epiphytes are common in the mature forest, but nearly all of these are found on the large canopy branches of the dominant species. The most common of these are the ferns *Davallia solida* (**kapihi**), with lesser amounts of *Humata heterophylla* and *Asplenium nidus* (**luku**), and the orchids *Phreatia micrantha*, *Dendrobium biflorum*, with lesser amounts of *Oberonia equitans*, *Phreatia myosorus*, and *Bulbophyllum distichobulbum*.



(7) Secondary Forest

Secondary forest covers 2683 ha (45 %) of the CA - the largest area of any vegetation type. It has a great deal of variation, from the forest that takes over and shades out fernlands to forest that appears nearly identical to mature forest except for a few floristic differences. It is difficult to distinguish this from mature forest when it is mature, but the key difference is the presence of several species that become established only in sunny conditions. These trees, particularly the canopy trees *Rhus taitensis* (**tavahi**), *Alphitonia zizyphoides* (**toi**), and *Dysoxylum forsteri* (**moota**) are nearly entirely absent from forest described here as mature. In mature forest nearly all the canopy trees are represented by individuals of all size classes, showing that the same species will continue to dominate well into the future. However, the three typical species noted above typically lack small individuals--seedlings, or at least saplings--in their population in secondary forest.

Eight plots of secondary forest were measured during the survey, plot nos. 8--15 (Appendix 2). In all of the mature and secondary forest plots there is a figure at the end of each entry called "index of disturbance". This is just an indicator of what percent of the total basal area in the plot is attributable to secondary forest species (i.e., those species present in Table 5 but not in Table 3).

The dominant species in the secondary forest plots, *Syzygium samarangense* (**kolivao**) and *Syzygium inophylloides* (**kafika**), are the same two that dominate coastal forest and mature forest, which accentuates the general floristic similarity of all the inland forest of the CA. These two species had a relative dominance of 29 and 12%, respectively (Table 5), somewhat lower than their totals in mature and coastal forest. Other prominent species in secondary forest canopy species are *Macaranga seemannii* (**le**) with 12%, *Rhus taitensis* (**tavahi**) with 8%, *Dysoxylum forsteri* (**moota**) with 6%, *Syzygium dealatum* (**tuali**) with 5%, *Pometia pinnata* (**tava**) with 4%, *Alphitonia zizyphoides* (**toi**) with 3%, and *Cocos nucifera* (**niu**), coconut, with 1%. Coconuts are a very good sign of disturbance because they do not grow in inland forest without being planted (purposefully or accidentally).

The total basal stem area of the plots varied widely in the eight plots, from a low of 0.27 cm<sup>2</sup>/100m<sup>2</sup> to a high of 0.62 cm<sup>2</sup>/100 m<sup>2</sup>. There is undoubtedly a lot of variation of disturbance history of these plots, with at least one plot appearing to have been logged in the past. The average basal stem area of the eight plots was 0.44 cm<sup>2</sup>/100 m<sup>2</sup>. In seven plots (excluding plot no. 9, which appears to be in a very young secondary forest), the number of trees of *Dysoxylum forsteri* (**moota**), *Rhus taitensis*, (**tavahi**), and *Alphitonia zizyphoides* (**toi**) totaled 61 individual trees, 56 of which were over 15 cm dbh. This dearth of individuals in the lower size classes indicates that these secondary forest species are disappearing from these forests, and barring further disturbance, the large trees will die without replacement.

The other tree species--subcanopy and understory trees--that are most indicative of secondary forest, are *Hibiscus tiliaceus* (**fou**) and *Adenantha pavonina* (**pomea**), which had a relative dominance of 1% each. Also notable is the high amount of *Polyscias multijuga* (**tanetane**), which had an average relative dominance of 7% (compared to 1% in the 7 mature forest plots of Table 1).

The conditions of the secondary forest plots are quite variable, with many of the plots having a comparatively broken or open canopy that allows more light to reach the forest floor.

Table 5. Relative dominance of trees in Secondary Forest plot nos. 8--15

Species	Niue Name	PLOT No.								TOTAL
		8	9	10	11	12	13	14	15	
<b>canopy trees</b>										
<i>Syzygium samarangense</i>	kolivao	25	65	16	32	25	26	21	20	29%
<i>Syzygium inophylloides</i>	kafika	17	+	17	13	2	16	17	2	12%
<i>Macaranga seemannii</i>	le	12	15	15	-	-	11	13	26	12%
<i>Rhus taitensis</i>	tavahi	-	2	3	-	16	-	11	35	8%
<i>Dysoxylum forsteri</i>	moota	+	-	4	21	9	11	1	1	6%
<i>Syzygium dealatum</i>	tuali	3	1	21	-	10	6	+	1	5%
<i>Pometia pinnata</i>	tava	10	-	-	3	7	6	3	1	4%
<i>Alphitonia zizyphoides</i>	toi	8	4	3	-	2	1	+	3	3%
<i>Cocos nucifera</i>	niu	-	-	-	5	1	-	2	1	1%
<b>subcanopy and understory trees</b>										
<i>Polyscias multijuga</i>	tanetane	9	2	6	14	6	2	10	3	7%
<i>Elaeocarpus tonganus</i>	malava	4	+	3	3	5	3	10	1	4%
<i>Diospyros samoensis</i>	kieto	-	-	8	1	6	-	2	1	2%
<i>Hibiscus tiliaceus</i>	fou	-	-	-	-	7	-	3	-	1%
<i>Adenantha pavonina</i>	pomea	-	1	+	3	2	+	1	1	1%
<i>Morinda citrifolia</i>	nonu	-	3	+	+	1	1	+	2	1%
<i>Celtis harperi</i>	piliva	1	+	+	-	+	4	2	1	1%

Thus the ground cover in secondary forest is often much denser than in mature forest. The most abundant terrestrial species is the fern *Asplenium nidus* (**luku**), with *Davallia solida* (**kapihi**) and *Nephrolepis hirsutula* (**mohuku**) also being common. Also common are the seedlings and saplings of the major tree species, particularly *Syzygium samarangense* (**kolivao**) and *Syzygium inophylloides* (**kafika**) and seedlings of *Alyxia stellata* (**maile**) and *Rourea minor* (**kanai uli**). Also sometimes common are the large herb *Tacca leontopetaloides* (**pia**) and the large lilylike *Cordyline fruticosa* (**ti**).

Lianas are very common in secondary forest, particularly in young secondary forest. The most common species are *Alyxia stellata* (**maile**), *Rourea minor* (**kanai uli**), and *Flagellaria gigantea* (**va**). Less common species are *Jasminum betchei* (**kanai tea**), *Jasminum didymum*, *Merremia peltata* (**fue vao**), *Morinda myrtifolia*.

Epiphytes are not as common in secondary forest as in mature forest, especially in younger secondary forests that lack the large trees needed for epiphytes. The most common species, which occur on the large branches in the canopy, are the ferns *Davallia solida* (**kapihi**), with lesser amounts of *Humata heterophylla*, *Nephrolepis biserrata*, and *Phymatosorus grossus* (**mamanu**), and the orchids *Dendrobium biflorum* and *Phreatia micrantha*.



## FLORA OF THE CONSERVATION AREA

The vascular flora (flora of flowering plants, ferns, and fern allies) of the CA is included as a checklist in Appendix 1. It consists of 228 species. Some of these are native species, some are Polynesian introductions, and some are modern introductions. Most of the modern introductions on the list are weeds. The Polynesian introductions may be either weeds or naturalised plants, i.e., plants that spread and/or reproduce in an area with the need for human help. The most important plants for the CA are native species. Sykes (1970) estimated the number of native plants in Niue to be 175 species. Of this total, 139 were recorded in the CA during the study or prior to it (a few were collected in the area that would become the CA by Sykes in 1966, but were not found during the present survey). This represents 79% of the native flora, and this would probably increase somewhat upon further study of the CA. These figures cannot be exact because some of the plants considered by Sykes in 1970 to be native are now considered to be introduced, and visa versa.

Since there are no endemic plant species on Niue, the CA likewise contained none. One species, *Psychotria insularum*, needs further study to see if it sufficiently different from the *Psychotria insularum* found elsewhere in western Polynesia. Several other species have been described as, or implied as, endemic, but most of these have been relegated to synonymy under a wider ranging species. This includes *Acronychia niueana* (= *Melicope retusa*) and *Phreatia yunckeri* (*Phreatia myosorus*). An unidentified species first reported by Sykes, *Bulbophyllum* sp., has been determined to be the same as the newly named *Bulbophyllum distichobulbum* of Samoa. Another described species *Myoporum niueanum*, named by St. John, is undoubtedly based on a mistaken locality and almost certainly does not occur on Niue.

## DISCUSSION

The CA area is probably situated in the best remaining sizeable area of native forest on Niue, and contains good examples of all the vegetation types recognised on the island. Based on the botanical survey and earlier botanical records, nearly 80% of the native vascular plants recorded from the island are or were found within the area. The species missing from the area are mostly those requiring the slightly moister inland forests to the north of the area and a number of rare species with very limited distributions.

Over the past few decades, there has been a decrease in pressure on the land because of the dwindling population of Niue. With fewer people, there is less agriculture and less cutting of the forest for timber. However, this decreasing pressure has apparently been reversed lately with the collapse of taro cultivation in Samoa. This has led to an increase in the price of export taro and an increase in the amount of taro exported from Niue. Not only that, but in recent times a different kind of agriculture has been instituted involving the use of bulldozers and pesticides (Fig. 8) to establish taro plantations. This has apparently led to the virtual disappearance of several plant species that rely on the normal shifting agriculture cycles to grow and reproduce. Plants such as *Solanum repandum* (**loku**) and *Cucumis melo* (**\*atiu**) are difficult to find nowadays (and neither were recorded during the survey in the CA).

By far the most dominant tree in Niuean forests is *Syzygium samarangense* (**kolivao**), which apparently is a modern introduction that has become completely naturalised and indistinguishable



**Figure 8** The main method of clearing land for agriculture in Niue is the use of bulldozers. These can clear land faster than traditional methods of land clearing. However, there are serious concerns about the environmental impact of bulldozers on the soil and on island flora and fauna.



**Figure 9** A recently cut **kafika** tree (*Syzygium inophylloides*) near the Vinivini track. At the present time only kafika trees are being cut in Niue leading to concerns about the ecological impact of logging on forest species composition.



from native tree species. It completely dominates in relative dominance as well as in the number of individuals in nearly all size classes in almost all plots that were sampled. Unlike some invasive species, **kolivao** seems not to do major harm to the forest, since it is a useful timber tree and the fruits are probably a major source of food for native birds. However, at the present time this tree is not being cut for timber because it needs chemical treatment to be resistant to insects. The only tree currently being cut is *Syzygium inophylloides* (**kafika**) (Fig. 9). The cutting of only one species is probably not a good idea, since this may tend to promote further dominance of **kolivao** in the forest.

## RECOMMENDATIONS

The following recommendations are made based upon the botanical survey and vegetation mapping done on Niue.

1. Cut down only secondary forest and fernlands for croplands. It is important that mature forest remains in good condition in the CA. There is sufficient unused secondary forest and fernland on Niue to ensure that mature forest in the CA is not needed for agricultural activities.
2. Sounder cultivation practices should be initiated in the CA (as well as on the whole island). It would be advisable to initiate a study on what effects the bulldozing and use of pesticides have on the vegetation and species of plants on Niue.
3. An effort should be made to harvest **kolivao** for timber. Currently this is not being done because the proper treatment system for insect resistance is not available on the island.
4. Make the area relevant to the environmental educational needs of Niue. The schools should utilise the CA for the teaching of conservation and natural history of Niue. This should be coordinated with the Department of Community Affairs in order to make more use of the CA and involve school children in what is a very intact native forest. Niue has some of the best remaining mature native forests in the South Pacific and the establishment of this park should help to keep it that way.
5. Develop a code of sound logging practise. There is a need for development and adherence to strict guidelines related to sustainable logging practise on the whole island, and especially within the CA. Such guidelines would, for example, give limits to timber volumes to be cut per year and on the technology used to remove the timber. A monitoring programme should also be established to monitor adherence to the code.

It should be noted that most of the above recommendations are not new but are have already been made in a number of reports, such as the Niue National Environmental Management Strategy (SPREP 1993), the Huvalu CA Project Preparation Document (SPREP 1995), and the deforestation survey of Samoa and Niue (SPREP 1997). There is now a need to put such recommendations into action.

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## APPENDIX 1. ANNOTATED CHECKLIST OF THE FLORA OF THE HUVALU CONSERVATION AREA

The species of the following checklist are arranged into four categories--Dicotyledonae (vascular plants--dicots), Monocotyledonae (vascular plants--monocots), Pteridophytes (ferns), and Fern Allies. Within each of these categories the plants are put into taxonomic families in alphabetical order, and in alphabetical order by species name within each family.

### DICOTYLEDONAE ACANTHACEAE

#### *Asystasia gangetica* (L.) T. Anders.

Weak-stemmed herb with opposite leaves, white, bell-shaped flowers in one-sided, terminal racemes, and a club-shaped capsule. Uncommon as a weed of lawns. A modern introduction.

#### *Ruellia prostrata* Poiret

Herb with opposite leaves, solitary, axillary, lavender, bell-shaped flowers, and a club-shaped capsule. Locally common as a weed of disturbed places such as forest tracks. A modern introduction.

### AIZOACEAE

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

Prostrate herb with succulent, succulent linear or cylindrical leaves, solitary, axillary, 5-parted flowers, many stamens, and a small capsule. Locally common on rocks near the sea. Indigenous. Voucher no. 10777.

### AMARANTHACEAE

#### *Achyranthes aspera* L.

talamoa fiti

Subshrub with opposite, silvery-pubescent leaves and a terminal spike of grass-like spikelets that readily adhere to clothing. Uncommon to occasional in sunny littoral and disturbed coastal areas. Indigenous or a Polynesian introduction. The leaves are sometimes used in native medicines. Voucher no. 10764.

### ANACARDIACEAE

#### *Rhus taitensis* Guillemin

tavahi

Large forest tree with alternate, pinnately compound leaves, a somewhat milky sap, panicles of tiny white flowers, and a small purple fruit. Common in secondary forest, roadsides, and mature fernlands. Indigenous. The bark was formerly used to make rough baskets for food preparation, and the timber was used for making canoes.



APIACEAE

**Centella asiatica** (L.) Urban tono

Low herb with creeping stems rooting at the nodes, alternate, kidney-shaped leaves, tiny green, axillary flowers, and a small 2-lobed fruit. Occasional as a weed of disturbed places. A modern or Polynesian introduction. The leaves are commonly used in native medicines.

APOCYNACEAE

**Alyxia stellata** (Forst. f.) Roemer & Schultes maile

Shrub or scrambling vine with milky sap, opposite or whorled, shiny green leaves, a small white corolla of fused petals, and a purple to black fruit that is ovoid or sometimes constricted into two or more ovoid parts. Common in native primary and secondary forest. Indigenous. The leaves and bark stripped from the stems are commonly fashioned into garlands and leis. Voucher no. 10814.

**Catharanthus roseus** (L.) G. Don

Subshrub with milky sap, opposite, glossy leaves, solitary or paired, axillary flowers, a magenta or white, salverform corolla of 5 fused petals, and a narrow capsule. Occasional as a weed of disturbed places, escaping from cultivation. A modern introduction. The plant is commonly planted as an ornamental because of its attractive flowers.

**Neisosperma oppositifolium** (Lam.) Fosb. & Sacht pao

Medium-sized tree with opposite, glossy green, obovate, revolute leaves, small white corollas with 5 curved lobes, and large, green, fibrous, ovoid fruits in pairs. Common as an understory tree in littoral forest. Indigenous. The wood was formerly used in construction, and the seed has been used as a famine food. Voucher no. 10869.

ARALIACEAE

**Polyscias multijuga** (A. Gray) Harms tanetane

Small tree with alternate, pinnately compound leaves with a sheathing petiole base, panicles of small white flowers, and a small purple fruit. Common in somewhat open native forests. Indigenous. The leaves are sometimes used to cover earth ovens and as fodder.

ASTERACEAE

**Ageratum conyzoides** L.

Erect herb with coarse, opposite, fragrant leaves and lavender disc florets in heads arranged in terminal panicles. Occasional as a weed of disturbed places. A modern introduction.

**Bidens pilosa** L. kofetoga

Herb with pinnately lobed or compound, opposite leaves, yellow disc florets in heads arranged in panicles of heads, and small, cylindrical achenes with 3 barbs at the top. Occasional as a weed of disturbed places. A modern introduction.

**Conyza bonariensis** (L.) Cronq.

Erect, scarcely branching herb with hairy foliage, alternate, gray-green leaves, white ray florets small heads on branching panicles, and tiny "parachute-like" achenes. Uncommon in disturbed places. A modern introduction.

**Crassocephalum crepidioides** (Benth.) S. Moore

Erect herb with toothed or lobed, alternate leaves, drooping heads of disc florets red-brown at the tips, and "parachute-like" achenes. Occasional as a weed of disturbed places. A modern introduction.

**Mikania micrantha** H.B.K. fue Saina

Herbaceous, glabrous vine with opposite, deltoid leaves, clusters of heads with small, white ray florets, and "parachute-like" achenes. Common to abundant as a weed of disturbed places. A modern introduction. The leaves are commonly used to treat cuts.

**Sonchus oleraceus** L. pupu lele

Erect herb with alternate, clasping, pinnately lobed or divided leaves, spine-tipped leaf margins, yellow disc florets in heads arranged in loose terminal clusters, and "parachute-like" achenes. Common as a weed of disturbed places. A modern introduction.

**Synedrella nodiflora** (L.) Gaernt.

Erect herb with coarse, opposite leaves, yellow disc florets arranged in sessile, axillary heads, and small achenes. Occasional as a weed of disturbed places. A modern introduction.



**Tithonia diversifolia** (Hemsley) A. Gray

matala

Shrub with alternate, densely woolly, 3--5-lobed leaves, flowers in large heads, showy yellow ray florets yellow, and dark colored disc florets. Occasional as a roadside weed. A modern introduction.

**Vernonia cinerea** (L.) Lessing

Small herb with alternate leaves, purple disc florets in terminal cymes of heads, and tiny "parachutel-like" achenes. Common as a weed of disturbed places. A modern introduction.

#### BARRINGTONIACEAE

**Barringtonia asiatica** (L.) Kurz

futu

Large, spreading tree with alternate, obovate leaves, large showy flowers bearing numerous pink and white stamens, and a large top-shaped fruit. Often dominant in littoral forest, less common inland. Indigenous. The grated seed was formerly used as a fish poison and the fruits as fishnet floats. Voucher no. 10778.

#### BORAGINACEAE

**Cordia subcordata** Lam.

motou

Medium-sized tree with alternate, ovate leaves, showy orange, trumpet-shaped flowers, and a brown, subglobose fruit. Uncommon to occasional in littoral forest. Indigenous. The fine wood is of occasional use.

**Heliotropium anomalum** Hook. & Arn.

taihuni fifine?

Subshrub with alternate, oblanceolate, silvery leaves, small white flowers in scorpeoid cymes, and a fruit of four tiny nutlets. Occasional to common in sunny littoral areas. Indigenous. Voucher no. 10864.

**Tournefortia argentea** L. f.

taihuni

Small to medium-sized tree with large, alternate, silvery leaves, scorpeoid cymes of small white, 5-lobed flowers, and a small green globose fruit. Occasional in littoral habitats. Indigenous.

#### BRASSICACEAE

**Lepidium viriginicum** L.

Much-branched herb with alternate, toothed leaves, small white 4- parted flowers, and flattened, round fruit notched at the tip. Occasional to common as a weed of disturbed places. A modern introduction.

#### BURSERACEAE

**Canarium harveyi** Seem.

'ai

Medium-sized tree with alternate, odd-pinnately compound leaves, small white flowers, and a black ellipsoid drupe. Uncommon in native forest. Indigenous or perhaps introduced. The seed is edible and the sap was used to caulk canoes. Voucher no. 10773.

#### CAPPARACEAE

**Capparis cordifolia** Lam.

pamako?

Prostrate shrub with alternate, somewhat fleshy, elliptic to ovate leaves, large, solitary, showy white flowers bearing numerous long stamens, and a long-stalked pod. Common in sunny littoral areas. Indigenous. Voucher no. 10844.

#### CARICACEAE

**Carica papaya** L.

loku

Small unbranched tree with alternate, palmately lobed leaves, milky sap, white, tubular male flowers in hanging racemes, solitary, axillary, white female flowers, and a large orange fruit. Common in cultivation, occasional in disturbed places. A modern introduction. The fruit is commonly eaten and fed to animals.

#### CASSYTHACEAE

**Cassytha filiformis** L.

feteinoa

Leafless parasitic vine with greenish, striated, stringlike stems, short spikes of tiny white flowers, and a white globose fruit. Common in sunny littoral and coastal areas growing on other plants, and sometimes in disturbed habitats. Indigenous. Voucher no. 10799.



CLUSIACEAE

**Calophyllum inophyllum** L. fetau

Large tree with yellow sap, opposite, leathery, finely veined, elliptic leaves, axillary racemes, flowers with four white sepals and four white petals, numerous yellow stamens, and a green, globose drupe. Occasional in littoral forest. Indigenous. The tree produces a durable timber and the seeds have been used by children as marbles.

**Calophyllum neo-ebudicum** Guillaumin tamanu

Large tree with opposite, coriaceous, finely veined, oblong to elliptic leaves, racemose axillary clusters of flowers with four white sepals and four white petals, numerous yellow stamens, and a purple, globose drupe. Rare in inland forest. Indigenous. The tree is used for its good quality timber. Voucher no. 10874.

COMBRETACEAE

**Terminalia catappa** L. telie

Large, spreading tree with alternate, subsessile, obovate leaves, tiny white flowers in racemes, and a corky ovoid fruit. Occasional in littoral forest. Probably indigenous. The good timber is used for canoes and slit-gongs, and the bark and leaves have been used for preparing a black dye. Voucher no. 10870.

**Terminalia richii** A. Gray malili

Large tree with alternate, narrowly elliptic leaves, racemes of tiny 5-parted flowers, and a purple, compressed ovoid fruit. Rare in inland forest. Not recorded during the present survey, but collected by Sykes along the Vinivini track in 1965. A modern introduction (introduced in modern times for its timber potential?) or possibly indigenous. The name was not mentioned by Smith (1902), Loeb (1926), or the Tregear and Smith dictionary (1907).

CONNARACEAE

**Rourea minor** (Gaertn.) Alston kanai uli

Liana with tough black stems, alternate, pinnately compound leaves bearing ovate leaflets, small white flowers, and a capsule containing a red seed. Common to abundant in inland forests. Indigenous. The wiry stems are used to make fish baskets and as makeshift cordage.

CONVOLVULACEAE

**Ipomoea littoralis** Bl. tefifi

Vine with milky sap, alternate, glabrous, cordate leaves, a magenta, wheel-shaped corolla, and a small 4-seeded capsule. Occasional as a weed of disturbed places. Indigenous. Voucher no. 10803.

**Ipomoea macrantha** Roemer & Schultes fue tea

Vine or liana with milky sap, alternate, heart-shaped leaves, a large, showy white, long-tubed, salverform corolla, and a 4-seeded capsule. Common in littoral and coastal forest and sometimes inland. Indigenous. Voucher no. 10802.

**Merremia peltata** (L.) Merr. fue, fue kula, fue vao

Vine with milky sap, large, alternate, heart-shaped, peltate leaves, a white wheel-shaped corolla, and a 4-seeded capsule. Common as a forest liana and scrambling over shrubs in disturbed areas. Indigenous. Voucher no. 10855.

**Operculina ventricosa** (Peter) Bertero

Prostrate vine with alternate, heart-shaped, non-peltate leaves, flowers solitary or in clusters, a white, bell-shaped corolla, and a 4-seeded capsule. Uncommon in sunny littoral areas. Apparently native, but a modern arrival. Not recorded during the present survey, but collected by Sykes in 1965 on the coast near Tautu.

CRASSULACEAE

**Kalanchoe pinnatum** (Lam.) Pers. tupu noa?

Erect succulent herb with simple or compound, opposite leaves, terminal panicles, showy, drooping, red, cylindrical flowers, and four separate fruits. Uncommon in disturbed places, escaping from cultivation. A modern introduction.

CUCURBITACEAE

**Zehneria samoensis** (A. Gray) Fosb. & Sachet ume

Herbaceous vine with thin stems, cordate leaves, small white, unisexual flowers, and a red ellipsoid fruit. Uncommon in sunny coastal areas. Indigenous. The fruit is sometimes eaten. Voucher no. 10830.



EBENACEAE

**Diospyros elliptica** (Forst.) P.S. Green keakea, kanume, ume

Medium-sized tree with alternate, elliptic, coriaceous leaves, tiny white, urn-shaped, 3-lobed flowers, and a red to yellow, ellipsoid fruit. Uncommon in coastal forest. Indigenous. Voucher no. 10756.

**Diospyros samoensis** A. Gray kieto

Medium-sized tree with alternate, coriaceous, elliptic to ovate leaves, white, urceolate, 4-parted flowers, and a globose, yellowish fruit with 4 persistent, reflexed calyx lobes. Common in native forest. Indigenous. The timber has been used for timber and making furniture and warclubs. The seeds were formerly used as a fish poison. Voucher no. 10808.

ELAEOCARPACEAE

**Elaeocarpus tonganus** Burk. malava, mamalava

Medium-sized tree with alternate, ovate to elliptic leaves that turn red before falling, a bent petiole, white 5-parted flowers with numerous stamens, and a bluish, ovoid fruit. Common in inland forests. Indigenous. The timber has been used in house construction.

EUPHORBIACEAE

**Aleurites moluccana** (L.) Willd. tuitui

Large tree with alternate, ovate or lobed, gray-green leaves, small white flowers in dense panicles, and a greenish, globose fruit containing a single, hard-shelled seed. Occasional in secondary forest, plantations and villages. A Polynesian introduction. The seeds were formerly used to make torches, ornaments for personal adornment, and the dye used in tattooing. Voucher no. 10876.

**Baccaurea seemannii** Muell. koka

Medium-sized tree with alternate, obovate leaves, tiny white, unisexual flowers in racemes, and a brown, spherical fruit. Common in inland forests. Indigenous. The wood was formerly used in house construction and the bark was utilized for making a brown dye used to color tapa.

**Chamaesyce atoto** (Forst. f.) Croizat toto tea?, toto

Low herb with milky sap, oblong, opposite leaves, and tiny white flowers in axillary inflorescences called cyathia, and a 3-lobed capsule. Common in sunny littoral areas. Indigenous. Voucher no. 10760.

**Chamaesyce hirta** (L.) Millsp. toto tane?

Small succulent herb with opposite, pubescent leaves, milky sap, tiny green flowers in dense axillary cyathia, and a 3-lobed capsule. Common as a weed of disturbed places. A modern introduction.

**Chamaesyce hypericifolia** (L.) Millsp.

Erect herb with glabrous, opposite leaves, milky sap, tiny white flowers in axillary cyathia, and a 3-lobed capsule. Occasional as a weed of disturbed places. A modern introduction.

**Chamaesyce prostrata** (Ait.) Small

Small prostrate herb with milky sap, tiny opposite leaves, purple, nearly glabrous stems, inconspicuous axillary flowers in cyathia, and a 3-lobed capsule. Occasional as a weed of disturbed places. A modern introduction.

**Euphorbia cyathophora** Murray toto uli?

Medium-sized erect herb with milky sap, alternate leaves, and tiny green flowers in terminal cyathia borne above leaflike bracts notched on the margins and red at the base. Occasional to locally common as a weed of disturbed places. A modern introduction.

**Euphorbia heterophylla** L.

Erect herb with milky sap, alternate leaves, upper leaves sometimes notched but always green, apetalous flowers arranged in cyathia, and a 3-lobed schizocarp. Occasional as a weed of disturbed places. A modern introduction.

**Excoecaria agallocha** L. fetaanu

Medium-sized dioecious tree with poisonous sap, alternate, glabrous, elliptic to obovate leaves, tiny greenish, unisexual flowers in spikes, and a 3-lobed capsule. Uncommon in sunny littoral areas. Indigenous. The white sap is poisonous to the eyes. Voucher no. 10867.

**Glochidion ramiflorum** Forst. f. kahame

Small tree with alternate, ovate to elliptic leaves, tiny yellow, 3-lobed flowers in axillary clusters, and a wheel-shaped capsule containing red seeds. Common in secondary forest and fernlands. Indigenous. The wood was formerly used for house timbers and the leaves and bark are used in native medicines. Voucher no. 10805.



**Macaranga harveyana** (Muell. Arg.) Muell. Arg. le hau

Small to medium-sized, dioecious tree with glaucous foliage, alternate, ovate, peltate leaves, panicles of tiny yellow male flowers, female flowers in racemes, and green soft-spiny capsules. Common in open secondary forest and fernlands. Indigenous. Voucher nos. 10806, 10861.

**Macaranga seemannii** (Muell. Arg.) Muell. Arg. le

Large dioecious tree with mostly pubescent foliage, large, alternate, ovate, peltate leaves, panicles of tiny yellow, male flowers, racemes of female flowers, and smooth green capsules. Common in primary and secondary forest. Indigenous. The timber is used for making canoe parts and the leaves to cover earth ovens.

**Omalanthus nutans** (Forst. f.) Pax fumamala, fougamala

Small tree with alternate, deltoid to ovate leaves, racemes of tiny yellow male flowers, and a compressed-globose fruit with two persistent stigmas. Occasional to locally common in disturbed places. Indigenous. Voucher no. 10854.

**Phyllanthus amarus** Sch. & Thon.

Erect herb with spirally arranged branches bearing small, alternate, elliptic, round-tipped leaves arranged in one plane, tiny green, axillary flowers, and a tiny globose schizocarp. Occasional as a weed of disturbed places. A modern introduction.

#### FABACEAE

**Abrus precatorius** L. mata'ila

Liana with alternate, pinnately compound leaves, small oblong leaflets, pink papilionaceous flowers, and pods containing red and black seeds. Occasional in coastal areas and scrub. Indigenous. The seeds have been used in decoration, but are poisonous.

**Adenantha pavonina** L. pomea

Medium-sized tree with alternate, bipinnately compound leaves, racemes of white flowers having many stamens, and pod that twists open at maturity to expose the shiny red seeds. Occasional in disturbed forest. A modern introduction. The edible seeds are used in making necklaces. Voucher nos. 10809, 10849.

**Canavalia cathartica** Thou.

Prostrate vine with alternate, trifoliolate leaves, large, acute-tipped leaflets, magenta papilionaceous flowers, and a flattened pod containing several brown, ovoid seeds. Uncommon in sunny places. Indigenous. Voucher no. 10800.

**Canavalia sericea** A. Gray feteka tea

Trailing vine with alternate, trifoliolate leaves, silvery leaflets, magenta papilionaceous flowers, and a flattened pod containing several brown, ovoid seeds. Common in sunny littoral areas. Indigenous. Voucher no. 10763.

**Chamaecrista nictitans** (L.) Moench

Scarcely branching subshrub with alternate, pinnately compound leaves, yellow, axillary 5-parted flowers, and a small, flattened-linear pod. Uncommon a weed of disturbed places. A modern introduction. Voucher no. 10748.

**Crotalaria anagyroides** H.B.K.

Large shrub with alternate, trifoliolate leaves, racemes of yellow papilionaceous flowers, and an inflated, cylindrical pod. Locally common along roadsides. A modern introduction.

**Crotalaria pallida** Ait.

Shrub with alternate, trifoliolate leaves, dense terminal racemes of yellow papilionaceous flowers marked with red lines, and a glabrous inflated pod. Occasional as a weed of disturbed places. A modern introduction.

**Derris malaccensis** Prain niukini

Liana with alternate, pinnately compound or trifoliolate leaves, axillary racemes of pink papilionaceous flowers (but rarely flowering), and a flattened pod. Uncommon in forest and elsewhere, a relic of former cultivation. A modern introduction. Voucher no. 10774.

**Desmodium incanum** DC.

Somewhat woody herb with alternate, trifoliolate leaves, variegated, oblong leaflets, racemes of mauve, papilionaceous flowers, and a fuzzy, jointed pod. Locally common as a weed of disturbed places. A modern introduction.

**Desmodium triflorum** (L.) DC.

Prostrate herb with small, alternate, trifoliolate leaves, 1--3 axillary, purple, papilionaceous flowers, and a curved, flattened, papery, 3--6-jointed pod. Common as a weed of disturbed places and fernlands. A modern introduction.



**Erythrina variegata** L.

gate

Large, thorny tree with alternate, trifoliolate leaves, dense racemes of large, showy red, papilionaceous flowers, and a black cylindrical pod. Uncommon in coastal areas. Indigenous. Not recorded during the present survey, but reported by knowledgeable sources to occur in the area.

**Leucaena leucocephala** (Lam.) de Wit.

pepe

Shrub or small tree with alternate, bipinnately compound leaves, small white flowers in axillary heads, and a strap-shaped pod. Locally common in disturbed places. A modern introduction. The seeds are used to make necklaces.

**Macroptilium atropurpureum** (DC.) Urb.

Vine with alternate, trifoliolate leaves, shallowly lobed, pubescent leaflets, racemes of dark purple, papilionaceous flowers, and a narrowly cylindrical pod. Locally common as a weed of disturbed places. A modern introduction.

**Mimosa pudica** L.

Woody herb with thorny stems, alternate, bipinnately compound leaves with palmately arranged pinnae, pink flowers in dense globose heads, and a bristly pod. Uncommon as a weed of disturbed places. A modern introduction.

**Mucuna gigantea** (Willd.) DC.

feteka uli?

Liana with alternate, glabrous, trifoliolate leaves, hanging racemes of showy, cream-colored, papilionaceous flowers, and a black, flattened pod containing 2--several disc-shaped seeds. Occasional in native forest. Indigenous.

**Pueraria lobata** (Willd.) Ohwi

aka

Coarse, hairy vine with alternate, trifoliolate leaves, lobed leaflets, violet papilionaceous flowers with a yellow blotch, and a long hairy pod. Occasional as a weed of disturbed places. A Polynesian introduction. Voucher no. 10871.

**Rhynchosia minima** (L.) DC.

pine liku?

Herbaceous vine with alternate trifoliolate leaves, racemes of tiny yellow, papilionaceous flowers, and a small flattened, pubescent pod. Locally common as a weed of disturbed places. A modern introduction.

**Senna occidentalis** (L.) Link

Subshrub with alternate, pinnately compound leaves, ovate leaflets, yellow, 5-parted flowers, and a long, curved, flattened-linear pod. Uncommon as a weed of disturbed areas. A modern introduction.

**Senna tora** (L.) Roxb.

Subshrub with alternate, pinnately compound leaves, glaucous leaf surfaces, a terminal raceme of yellow, 5-parted flowers, and a narrow cylindrical pod. Uncommon as a weed of disturbed places. A modern introduction. A new record for Niue.

**Tephrosia purpurea** (L.) Pers.

kohuhu

Small shrub with alternately, pinnately compound leaves having 7--15 oblanceolate leaflets notched at the tip, small, white, papilionaceous flowers, and a small, flattened-linear pod. Occasional as a weed of disturbed or sunny places. Indigenous or a Polynesian introduction. The crushed plant has long been used as a fish poison. Not recorded during the present survey, but noted by informants to occur within the CA.

## GESNERIACEAE

**Cyrtandra samoensis** A. Gray

gahu

Somewhat fleshy subshrub with large, opposite, often unequally-sided leaves, toothed leaf margins, white bell-shaped flowers in axillary clusters, and a succulent, flesh-colored berry. Occasional in open sunny areas. Indigenous. Voucher no. 10781.

## GOODENIACEAE

**Scaevola taccada** (Gaertn.) Roxb.

gahu pa, pa

Subshrub with alternate, somewhat fleshy, spoon-shaped obovate leaves, a white corolla with all the lobes arranged on one side, and a white, ovoid drupe. Common to abundant in sunny littoral areas and fernlands. Indigenous. The stems have been used by children to make pop-guns. Voucher no. 10762.

## HERNANDIACEAE

**Hernandia nymphaeifolia** (Presl) Kubitski

puka kula; puka uli

Large monoecious tree with alternate, ovate, peltate leaves, white flowers in long-stalked axillary cymes, and a fruit surrounded by a greenish, globose vesicle open at the top. Occasional in littoral and coastal areas. Indigenous.



## LAMIACEAE

**Salvia coccinea** Juss. ex Murr. momili?

Herb with square stems, opposite, ovate leaves, terminal racemes of whorls of red 2-lipped flowers, and a deeply lobed fruit splitting into 4 nutlets. Locally common as a weed of disturbed places. A modern introduction.

**Salvia occidentalis** Sw. tealu

Herb with square stems, opposite, foul smelling leaves, tiny blue and white, bilabiate flowers in slender racemes, and a deeply lobed fruit splitting into 4 nutlets. Locally common as a weed of disturbed places. A modern introduction.

## LOGANIACEAE

**Fagraea berteriana** A. Gray pua

Spreading, medium-sized tree with opposite leaves, a bump at the base of the petiole, a showy white to pale orange, tubular corolla, and a large red-orange, many-seeded berry. Occasional in disturbed forests and fernlands. Indigenous. The good quality wood was used for various purposes, and the flowers were used to make garlands and to scent coconut oil. Voucher no. 10825.

**Geniostoma rupestre** Forst. f. tete

Small tree with opposite leaves, fascicles of tiny white flowers, and an ovoid, 2-valved capsule that splits open to expose the red seeds. Common in fernlands and secondary forest. Indigenous. The bark is sometimes used in native medicines. Voucher no. 10804.

## LYTHRACEAE

**Pemphis acidula** Forst. gigie

Shrub with alternate, oblanceolate leaves, solitary, axillary flowers with six white petals, and a bell-shaped capsule. Abundant on rocks directly on the shore. Indigenous. The hard wood is used to make the spearhead of the tika spear. Voucher no. 10865.

## MALVACEAE

**Hibiscus diversifolius** Jacq. fou igo

Shrub with prickly stems, alternate, hairy, palmately lobed leaves, showy pale yellow, monadelphous flowers dark colored at the base, and a bristly, subglobose capsule. Uncommon as a weed of disturbed places. A modern introduction. Voucher no. 10758.

**Hibiscus tiliaceus** L. fou

Medium-sized, often spreading tree with alternate, pubescent, cordate to round leaves, axillary, solitary (or in few-flowered cymes) flowers with showy yellow, monadelphous flowers purple at the base, and a 5-valved capsule. Common in disturbed places and secondary forest. Indigenous. Its wood is used for various purposes, and the bark is used to make rough cordage, and formerly, "grass skirts." Voucher no. 10858.

**Malvastrum coromandelianum** (L.) Garcke

Low woody herb with alternate, ovate leaves, hairy stems, pale orange, monadelphous flowers, and a wheel-shaped capsule with 3 bracts at the base. Common as a weed of disturbed places. A modern introduction.

**Sida rhombifolia** L. motofu

Subshrub with alternate, ovate leaves spirally arranged, pale orange, axillary, monadelphous flowers on long stalks, and a wheel-shaped capsule lacking bracts beneath it. Common as a weed of disturbed places. A Polynesian introduction.

## MELIACEAE

**Dysoxylum forsteri** (Jussieu) C. DC. mootu

Large tree with garlic-smelling bark, alternate, pinnately compound leaves, axillary racemes or panicles of white tubular flowers, and a tan subglobose capsule containing 4 red seeds. Common in secondary forest. Indigenous. The wood has commonly been used to make canoes. Voucher no. 10846.

## MENISPERMACEAE

**Pachygone cf. vitiense** Diels

Woody vine with alternate, coriaceous, ovate leaves, subcordate leaf bases, green, 6-parted flowers, with several obovoid drupelets. Rare in coastal forest. Indigenous. Voucher 10757.

## MORACEAE

**Ficus obliqua** Forst. f. pualiki

Large banyan with milky sap, alternate, elliptic, finely veined leaves, netted venation visible on both leaf surfaces, and an orange to red, globose syconium with caducous bracts. Occasional in native forest. Indigenous. The fruits are commonly eaten by birds.



**Ficus prolixa** Forst. f. ovava

Large banyan more spreading than the former species, with milky sap, alternate to lanceolate leaves, netted venation visible only on lower leaf surface, and a globose, yellow to purple fruit having persistent basal bracts. Occasional in native forest. Indigenous. The fruits are commonly eaten by birds. Voucher no. 10818.

**Ficus scabra** Forst. f. mati

Small to medium-sized tree with milky sap, alternate, ovate to elliptic leaves having a scabrous surface (or glabrous and leathery, particularly on coasts), and a yellow to purple, globose syconium. Common in forests and in sunny littoral areas. Indigenous. The seeds of the coastal type are chewed by women. Voucher 10751.

**Ficus tinctoria** Forst. f. ata

Small tree with milky sap, elliptic to oblong leaves, smooth leaf surfaces, and a red to purple, globose fruit. Occasional in forests and fernlands, often growing as an epiphyte or strangler. Indigenous. The bark is sometimes used for rough cordage and formerly for tapa cloth. Voucher 10877.

**Streblus anthropophagorum** (Seem.) Corner atatu

Small dioecious tree with milky sap, elliptic, alternate leaves, spikes of apetalous, unisexual, white flowers, and a bright red ovoid drupe (on the female trees). Common in primary forest. Indigenous. The leaves are used for fodder.

#### MYRTACEAE

**Eugenia reinwardtiana** (Bl.) DC. liki tahi, liki

Shrub or small tree with opposite, elliptic to obovate, leathery leaves, solitary white flowers having numerous stamens, and a red globose berry. Common in sunny littoral habitats. Indigenous. Voucher no. 10828.f

**Psidium guajava** L. lala, kautoga

Small tree with opposite leaves, flowers with numerous, showy white stamens, and a yellow berry filled with many seeds embedded in a red, fleshy pulp. Common as a weed of disturbed places and fernlands. A modern introduction. The fruits are eaten and an extract of the young leaves is used to treat diarrhea.

**Syzygium dealatum** (Burk.) A.C. Sm. tuali

Medium-sized tree with opposite, obovate, coriaceous leaves, terminal panicles with somewhat flattened branch segments, white flowers with numerous white stamens, and a large, purple to black, ovoid fruit. Common in primary and coastal forest. The wood is used for timber and the fruits are eaten by bats. Voucher no. 10788.

**Syzygium inophylloides** (A. Gray) C. Muell. kafika

Large tree with finely veined, opposite leaves with a twisted attenuate tip, panicles of white flowers bearing numerous stamens, and a yellow, obovoid to ellipsoid fruit. Common in native forest. Indigenous. Probably the best of the common timber trees on the island, and the only one currently being harvested. The fruits are eaten by bats. Voucher no. 10763.

**Syzygium samarangense** (Bl.) Merr. & Perry kolivao

Large tree with opposite, elliptic, subsessile leaves, short, terminal panicles of large white flowers having numerous stamens, and a large pear-shaped to ellipsoid berry red at maturity. Abundant in all mature forests except those on or near the coast. A modern introduction, but so naturalized in forests that Niueans believe it to be native. However, the tree is not mentioned in Smith (1902), Loeb (1926), or the dictionary of Tregear and Smith (1907). The wood is used for timber, and the fruits are eaten by bats. Voucher no. 10790.

#### NYCTAGINACEAE

**Pisonia grandis** R. Br. puka tea

Huge tree with opposite, elliptic leaves clustered at the ends of the branches, small unisexual, apetalous flowers in subumbellate clusters, and a sticky cylindrical fruit covered with rows of short spines. Common in littoral forest and forming thickets on littoral rocks. Indigenous. The wood has been used for making canoe parts.

#### OLACACEAE

**Ximenia americana** L. toa

Shrub with alternate, elliptic leaves, somewhat spiny stems, clusters of cream-colored flowers with hairy petals, and an subglobose fruit containing a single hard seed. Occasional in coastal areas at Liku. A new record for Niue. Voucher no. 10862.



## OLEACEAE

**Chionanthus vitiense** (Seem.) A.C. Smith ooto, hooto

Medium-sized tree with opposite, elliptic to oblong leaves, small, white, 4-parted flowers having two stamens, and a large, subglobose, pale orange drupe. Occasional in forests, especially near the coast. Indigenous. The tree is used for firewood. Voucher no. 10815.

**Jasminum betchei** F. Muell. kanai tea

Thin liana with simple, opposite, ovate leaves, showy white, several-lobed, salverform flowers bearing two stamens, and a black, subglobose drupe. Common in inland and coastal forests. Indigenous. The stems are used for making crayfish traps. Voucher nos. 10746, 10795.

**Jasminum didymum** Forst. f. kanai tea

Thin liana with opposite, trifoliate leaves, ovate leaflets, panicles of white, 4-lobed flowers bearing two stamens, and black, subglobose fruit. Common in inland and coastal forests. Indigenous. The stems are used for making crayfish traps. Voucher no. 10826.

## OXALIDACEAE

**Oxalis corniculata** L. kihikihi

Small herb with basal, long-stalked, trifoliate leaves, obcordate leaflets, yellow, 5-parted flowers, and an explosive, cylindrical capsule. Occasional as a weed of disturbed places. A Polynesian introduction. The plant is used in native medicines.

## PASSIFLORACEAE

**Passiflora aurantia** Forst. f.

Herbaceous vine with alternate, ovate, 3-lobed leaves, axillary tendrils, solitary or paired showy flowers with a purplish-red corona, and a subglobose to ellipsoid berry. Uncommon in sunny forest areas. Voucher no. 10850.

**Passiflora foetida** L. vine vao

Hairy herbaceous vine with alternate, palmately 3-lobed leaves, axillary tendrils, showy white and purple flowers, and a red to orange globose berry enclosed by the branching calyx lobes. Occasional as a weed of disturbed places. A modern introduction. The fruits are sometimes eaten. Voucher no. 10851.

## PIPERACEAE

**Macropiper puberulum** Benth. kava vao

Shrub with alternate, ovate to heart-shaped, palmately 5--9-veined leaves, apetalous male and female flowers in separate, axillary spikes, and tiny red drupes on the female spikes. Locally common in native forest. Indigenous.

**Peperomia pallida** (Forst. f.) Dietr. kapa?

Small herb with opposite leaves, 2--6 spikes with tiny green, apetalous, axillary flowers, and tiny black, subglobose fruits. Occasional in native forest and locally common on sunny littoral rocks. Indigenous. Voucher nos. 10742, 10785, 10863.

## PITTOSPORACEAE

**Pittosporum brackenridgei** A. Gray kuiti

Medium-sized tree with alternate leaves often clustered in short spirals, axillary panicles of white, 5-parted flowers, and a capsule splitting along two seams to expose the orange seeds. Occasional in secondary forest. Indigenous. The bark is used in native medicines. Voucher no. 10801.

## PLANTAGINACEAE

**Plantago lanceolata** L.

Stemless herb with basal, lanceolate leaves with parallel veins, inconspicuous flowers in a dense ovoid spike atop a long stalk, and exerted stamens. Common as a weed of disturbed places. A modern introduction.

**Plantago major** L.

Stemless herb with broad basal leaves with parallel veins, inconspicuous flowers in a long-stalked, narrow spike, and exerted stamens. Uncommon as a weed of disturbed places. A modern introduction.

## POLYGALACEAE

**Polygala paniculata** L.

Small herb with fragrant roots, alternate, narrow leaves, and tiny white flowers in terminal and axillary racemes. Common as a weed of disturbed places. A modern introduction.



PORTULACACEAE

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

Low, succulent herb with alternate, ovate to nearly round leaves, solitary, showy 5-parted flowers with numerous stamens, and a subglobose capsule that opens when the top splits off. Occasional in sunny littoral areas. Indigenous. Voucher no. 10832.

**Portulaca oleracea** L. kamole

Low succulent herb with reddish stems, obovate leaves, terminal clusters of several sessile, yellow, 5-parted flowers with many stamens, and a capsule that opens when the top splits off. Occasional in sunny littoral or disturbed places. A modern introduction.

RHAMNACEAE

**Alphitonia zizyphoides** (Spreng.) A. Gray toi

Large tree with alternate, oblong to ovate leaves gray on the lower surface, small white flowers in cymes, and a globose black fruit. Common in secondary forests and mature fernlands. Indigenous. The good wood is used for various purposes. Voucher no. 10853.

**Colubrina asiatica** (L.) Brongn. vihoa

Somewhat vinelike shrub with alternate, ovate leaves, small yellow flowers in short axillary cymes, and pea-sized green capsule. Common in sunny littoral and coastal areas, and in abandoned plantations inland. Indigenous. The leaves, which contain saponins, were formerly used for soap. Voucher 10811.

RUBIACEAE

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

Small, creeping herb with opposite, reniform leaves, small, white, axillary, salverform flowers, and a small, globose berry. Uncommon to occasional in native forest. Indigenous. The leaves are or were used in native medicines.

**Gardenia taitensis** DC. tiale tafa

Shrub with dark, shiny green, opposite leaves, solitary, axillary, showy white flowers with 6--9 lobes, and a ribbed capsule. Uncommon in sunny littoral areas. A Polynesian introduction. The attractive, fragrant flowers are used in personal adornment, and formerly, to make scented coconut oil.

**Guettarda speciosa** L. panopano

Medium-sized tree with opposite, obovate leaves, interpetiolar stipules, white salverform flowers, and a white to brown, ovoid drupe. Occasional in littoral forest. Indigenous. The wood is used for various purposes. Voucher 10843.

**Hedyotis foetida** (Forst. f.) J.E. Sm. pupu feutu?

Woody herb with 4-angled stems, opposite, elliptic leaves, interpetiolar stipules, axillary panicles of 4-parted flowers, a white, funnellform corolla 4--8 mm long, and an ovoid capsule. Occasional on littoral rocks. Indigenous. Voucher no. 10833.

**Ixora triflora** (Forst. f.) Seem. moea

Shrub with opposite, elliptic leaves, interpetiolar stipules, terminal few-flowered (typically 3) clusters of flowers subtended by leaflike bracts, a 4-lobed, salverform corolla, and a subglobose drupe. Occasional in inland forests. Indigenous. The stems are used for making outrigger parts. Voucher no. 10798.

**Morinda citrifolia** L. nonu

Shrub or small tree with opposite, elliptic to ovate leaves, interpetiolar stipules, white flowers in a globose head, and a large, fleshy, translucent, lumpy fruit made of the fused ovaries. Common in open forest and disturbed places. Indigenous. Various parts of the plant are used in native medicines and the fruit has been a famine food. Voucher no. 10848.

**Morinda myrtifolia** A. Gray kanai kula

Liana with opposite, elliptic leaves, interpetiolar stipules, flowers in an axillary, stalked, globose head, corolla cream-colored, and a purple fruit formed from the fused ovaries. Common in native forest. Indigenous. Voucher no. 10872.

**Psychotria insularum** A. Gray moea kula

Shrub with opposite, elliptic leaves, interpetiolar stipules, branching, terminal inflorescences of small, white, 5-parted flowers, and a red, globose fruit. Locally common in inland forests. Indigenous. Voucher nos. 10791, 10797.

**Spermacoce assurgens** Ruiz & Pavon

Small herb with opposite, elliptic leaves, interpetiolar stipules, and dense axillary clusters of tiny sessile, white flowers, and a tiny capsule. Common as a weed of disturbed places. A modern introduction.



**Tarennia sambucina** (Forst. f.) Durand ex Drake manono

Small tree or shrub with opposite, elliptic leaves, interpetiolar stipules, widely branching clusters of flowers having white to yellowish tubular corollas, and a black globose berry. Common in sunny places. Indigenous. The stems were used for digging sticks and spear shafts. Voucher no. 10852.

**Timonius polygamus** (Forst. f.) Robinson kaveutu

Low dioecious shrub with opposite, obovate to suborbicular leaves, interpetiolar stipules, white, funnel-shaped corollas, and a subglobose, purple to black berry. Common in sunny littoral areas and fernlands. Indigenous. Voucher no. 10761.

#### RUTACEAE

**Melicope retusa** (A. Gray) T. Hartley kalakalai

Shrub or small tree with opposite, obovate to elliptic leaves, short, many-flowered, axillary, clusters of tiny white flowers, and a subglobose fruit of 1--4 follicles, each containing a shiny black seed. Uncommon in native forest. Indigenous. Voucher nos. 10752, 10845.

**Micromelum minutum** (Forst. f.) Seem. takapalu

Small tree with alternate, pinnately compound leaves having 7-- 12 ovate leaflets, small white flowers in panicles, and an ellipsoid, red, gland-dotted drupe. Occasional in native forest. Indigenous. The hard wood was reportedly used as a crowbar. Voucher no. 10747.

#### SAPINDACEAE

**Dodonaea viscosa** Jacq. kapa 'akau?

Dioecious shrub with alternate, oblanceolate leaflets, small white, unisexual flowers in panicles, and a reddish, papery 2--4- winged capsule forming on the female plants. Occasional in open places. Indigenous. Voucher no. 10859.

**Elattostachys falcata** (Seem.) Radlkofer lautaha

Large tree with alternate, even-pinnately compound leaves having 4--6 pairs of leaflets, axillary racemes or panicles of racemes, tiny flowers with conspicuous red stamens, and an obovoid, shallowly 3-lobed capsule. Uncommon in inland forests. Indigenous. The wood was formerly used for weapons. Voucher no. 10807.

**Pometia pinnata** Forst. tava

Large tree with a buttressed trunk, large, pinnately compound leaves, toothed leaf margins, dense panicles of tiny apetalous flowers, and a large subglobose fruit. Common in native forest. Indigenous or a recent or Polynesian introduction. The tree is sometimes used for its timber and the fruit is edible

#### SAPOTACEAE

**Planchonella garberi** Christoph. oluolu

Large tree with alternate, obovate to elliptic leaves, fascicles of small white flowers, and a purple ellipsoid fruit containing 2 or more shiny black, ellipsoid seeds. Occasional in native forest. Indigenous. The wood was used for making clubs and tools.

**Planchonella grayana** St. John kalaka

Large tree with alternate, elliptic to obovate leaves, milky sap, fascicled, white flowers, and a large, green to yellowish, subglobose to ellipsoid fruit containing 2 or more large, shiny ellipsoid seeds. Common in forests. Indigenous.

**Planchonella samoensis** Lam ex Christoph. kanumea, kanomea

Large tree with large, alternate, elliptic leaves, milky sap, fascicles of flowers, and an ellipsoid fruit containing 2 or more shiny black, ellipsoid seeds. Common in native forest. Indigenous. The wood is used for timber and the seeds for making necklaces.

#### SOLANACEAE

**Physalis angulata** L. manini

Erect, glabrous herb with alternate, ovate leaves, pale yellow, wheel-shaped flowers, and a globose berry enclosed within a bladder-like calyx. Common as a weed of disturbed places. Probably a Polynesian introduction.

**Solanum americanum** Mill. polo kai, polo fua

Erect herb with alternate, ovate leaves, umbels of tiny white, 5-lobed flowers, conspicuous yellow stamens, and a black, globose berry. Common as a weed of disturbed places. A Polynesian introduction or native. The leaves and fruits are sometimes eaten. Voucher no. 10810.



**Solanum repandum** Forst. f.

loku moka

Small shrub with large, alternate, pubescent leaves, white, rotate flowers in small clusters, and a large subglobose yellow to red fruit covered with stellate hairs. Uncommon in plantations, and sometimes casually cultivated for its fruit. Probably a Polynesian introduction. Not recorded during the present survey, but collected by Sykes in 1965 near Utuhina. The fruits are used in soups.

**Solanum viride** Sol. ex Forst. f.

polo iti

Subshrub with alternate, ovate leaves, axillary cymose inflorescences, white, 5-lobed corollas having yellow stamens, and a glossy red, subglobose fruit. Uncommon in disturbed places. Probably a Polynesian introduction. Not recorded during the present survey, but probably collected by Sykes in 1965 in the Conservation Area "near Hakupu." The fruits have been used to make garlands.

#### STERCULIACEAE

**Heritiera ornithocephala** Kostermans

tafaki

Large tree with alternate, oblong to ovate-elliptic leaves having a silvery-scaled lower surface, apetalous, unisexual flowers purplish inside, and a fruit of 2--5 ovoid nuts. Occasional in forests. Indigenous. The wood was reported to have been used to make weapons. Voucher 10827.

**Sterculia fanaiho** Setchell

kanukata

Medium-sized tree with alternate, broadly elliptic to ovate leaves having long petioles, subterminal panicles of white, apetalous flowers, and several large, spreading, red follicles containing one or more globose, shiny, black seeds. Occasional in native forest. Indigenous. The bark was formerly used in weaving of baskets and hats.

#### TILIACEAE

**Grewia crenata** (Forst.) Schinz & Guillaumin

lala uli?, lala vao?, tea vao?

Small tree with alternate, ovate to lanceolate leaves having toothed margins, axillary umbellate clusters of greenish-white, 5-parted flowers, many yellow stamens, and a 4-lobed drupe black at maturity. Occasional in secondary areas. Indigenous. The wood was reportedly once used for making bonito fish hooks. Voucher no. 10816.

**Triumfetta procumbens** Forst. f.

titi tai?

Prostrate subshrub with alternate, broadly ovate to lobed leaves, yellow, 5-parted flowers having numerous stamens, and a subglobose burr covered with hooked spines. Common in sunny littoral areas. Indigenous. The leaves are reportedly used in native medicines. Voucher no. 10759.

**Triumfetta rhomboidea** Jacq

Shrub with alternate, hairy, palmately lobed leaves, surfaces covered with star-shaped hairs, small yellow, 5-parted flowers in axillary fascicles, and a small burr fruit. Occasional as a weed of disturbed places. A modern introduction.

#### ULMACAEAE

**Celtis harperi** Horne ex Baker

piliva

Medium-sized tree with alternate, ovate to elliptic leaves 3-veined from the base, short axillary panicles of tiny, greenish, unisexual flowers, and a black ovoid drupe. Occasional in inland forests. Indigenous. The slow-burning wood was formerly used to keep fires alight overnight. Voucher no. 10794.

#### URTICACEAE

**Dendrocnide harveyi** (Seem.) Chew

magiho

Large, dioecious tree with stinging hairs, large, alternate, ovate to elliptic leaves, branching panicles of tiny, greenish, apetalous, unisexual flowers, and small green achenes. Uncommon in disturbed forests. Indigenous. Voucher no. 10813.

**Pilea microphylla** (L.) Liebm.

pikimaka?

Small prostrate, somewhat succulent herb with tiny opposite leaves and greenish inconspicuous flowers and fruits. Occasional in disturbed places, especially on rock surfaces. A modern introduction.

**Pipturus argenteus** (Forst. f.) Wedd.

melege

Small, dioecious tree with alternate, ovate leaves 3-veined from the base, gray lower leaf, apetalous, unisexual, greenish flowers in globose clusters on branching axillary panicles, and a succulent, white receptacle with the achenes embedded in it. Common in disturbed places and secondary forest. Indigenous. The leaves are used as fodder. Voucher no. 10834.

**Procris pedunculata** (Forst.) Wedd.

kapa

Fleshy epiphytic or terrestrial herb with alternate, oblong to oblanceolate leaves, short clusters of tiny, white, apetalous male flowers, female flowers in sessile globose clusters, and a red, strawberry-like fruit. Occasional in forests as an epiphyte or terrestrial plant. Indigenous. The fruit is sometimes eaten. Voucher no. 10782.



VERBENACEAE

**Clerodendrum buchanani** (Roxb.) Walpers talufe?

Subshrub with opposite, nearly round, finely pubescent leaves, dense panicles of showy red, sympetalous flowers, exerted stamens, and a shiny black, 4-lobed fruit. Occasional in disturbed places, also cultivated for its showy flowers. A modern introduction.

**Clerodendrum chinense** (Osbeck) Mabblerly

Large shrub with opposite, heart-shaped leaves, dense clusters of showy white, double-flowered corollas, and no fruit. Locally common in plantations and disturbed places. A modern introduction.

**Clerodendrum inerme** (L.) Gaertn. koli?, kakoli?

Vinelike shrub with ovate to elliptic leaves, showy white salverform flowers having red, long-exserted stamens, and an obovoid, 4-lobed fruit splitting into nutlets. Common in sunny littoral habitats. Indigenous. Voucher no. 10875.

**Lantana camara** L.

Shrub with thorny stems, coarse, toothed, opposite leaves, multicolored sympetalous flowers in heads, and a small, black, globose berry. Uncommon as weed of disturbed places. A modern introduction.

**Premna serratifolia** L. aloalo

Shrub or small tree with opposite, ovate to elliptic leaves, tiny 4-parted, white flowers in dense, flat-topped panicles, and a small, black, ovoid drupe. Common in sunny littoral areas and fernlands. Indigenous. The leaves are used in native medicines. Voucher no. 10812.

**Stachytarpheta urticaefolia** (Salisb.) Sims motofu Samoa?

Subshrub with coarse, opposite leaves, dentate leaf margins, narrow spikes of purple, sympetalous flowers, and a small 2-celled capsule. Common to abundant as a weed of disturbed places. A modern introduction.

VISCACEAE

**Korthalsella platycaula** (V. Tieg.) Engl. holofa akau

Parasitic shrub with leafless, jointed stems and tiny white, axillary flowers and fruits. Occasional in native forest. Indigenous. Voucher no. 10776.

MONOCOTYLEDONAE  
AGAVACEAE

**Cordyline fruticosa** (L.) Chev. ti

Shrub with parallel-veined, lanceolate leaves, white to pink flowers in dense panicles, and a small red, globose berry. Occasional to common in disturbed places and forests. Probably a Polynesian introduction. The root was formerly cooked and eaten and the leaves are used in native medicines.

**Furcraea foetida** (L.) Haw. toua

Large shrublike plant with a basal rosette of large, sharp-pointed leaves and many white cupshaped flowers arranged in tall, terminal panicles. Occasional as a weed of disturbed places. A modern introduction. The leaf fibers were formerly used to make rope.

ARECACEAE

**Cocos nucifera** L. niu

Tall palm tree with large, pinnately compound fronds, unisexual male and female flowers in large panicles, and a large, thick-husked nut. Common in plantations and secondary forest. Indigenous or perhaps a Polynesian introduction. Various parts of the palm were used, including the nut for drinking, eating, and cooking, and the husk fibers which were braided into cordage.

**Pritchardia pacifica** Seem. & Wendl. piu

Medium-sized palm tree with large, fan-shaped leaves, large axillary panicles of white flowers, and an ovoid drupe. Uncommon in disturbed places, escaping from cultivation. A modern introduction. The plant is used as an ornamental and children eat the fruits.

COMMELINACEAE

**Rhoeo spathacea** (Sw.) Stearn talotalo?

Herb with alternate, ovate to lanceolate leaves purple on the lower surface, and tiny white, 3-parted flowers enclosed within a boatlike bract. Escaping from cultivation and becoming locally common as a weed of disturbed places, but not spreading.



CYPERACEAE

**Cyperus rotundus** L.

Small sedge with rhizomes and tubers, basal linear leaves shorter than the triangular stem, and compressed, red-brown, linear-lanceolate spikelets in umbellate clusters subtended by short involucral bracts. Occasional as a weed of open disturbed places. A modern introduction.

**Fimbristylis cymosa** R. Br.

Small, clump-forming sedge with linear leaves and brown spikelets in a head or panicle of heads. Occasional in sunny littoral and disturbed inland places. Indigenous. Voucher nos. 10831, 10878.

DIOSCOREACEAE

**Dioscorea bulbifera** L. hoi

Climbing weedy vine with alternate, cordate leaves, axillary, tuberlike bulbils, panicles of tiny greenish flowers, and a winged fruit. Common as a weed of disturbed places. A Polynesian introduction. The tubers are a famine food.

**Dioscorea pentaphylla** L. pilita

Climbing weedy vine with alternate, palmately 3--5 lobed leaves, panicles of tiny greenish flowers, and a winged fruit. Uncommon in disturbed places. A Polynesian introduction. The tubers are a famine food. Voucher no. 10745.

FLAGELLARILACEAE

**Flagellaria gigantea** Hook. f. va

High-climbing cane with large grass-like leaves modified at the tips into tendrils, tiny white flowers in a branching inflorescence, and a small red, ovoid fruit. Common in forests. Indigenous. The stems were used for thatch sticks and wall reinforcement.

ORCHIDACEAE

**Bulbophyllum longiscapum** Rolfe

Creeping, medium-sized epiphytic orchid with pseudobulbs producing several erect leaves, and showy, long-petalled, greenish flowers on a long scape. Uncommon in inland forest. Indigenous. Voucher no. 10769.

**Bulbophyllum distichobulbum** Cribb

Prostrate epiphytic orchid with pseudobulbs, small ovate leaves, and solitary yellow flowers atop a long scape. Occasional as an epiphyte in inland forests. Indigenous. Voucher no. 10765.

**Dendrobium biflorum** (Forst. f.) Sw.

Epiphytic orchid with stiff stems bearing grass-like leaves and paired white, axillary flowers with long-attenuate tepals. Occasional as an epiphyte in inland forests. Indigenous. Voucher no. 10750.

**Didymoplexis micradenia** (Reichenb. f.) Hemsl.

Small, leafless terrestrial orchid with mostly unbranched stems, a short raceme of several white flowers, and a purplish cylindrical pod. Uncommon in open forests. Indigenous. Voucher nos. 10787, 10880.

**Eulophia pulchra** (Thou.) Lindl.

Medium-sized terrestrial orchid with broad, plicate leaves and yellow and red flowers in a terminal raceme on a leafless stalk. Uncommon in inland forest. Indigenous. Voucher no. 10856.

**Geodorum densiflorum** (Lam.) Schlechter

Large-leafed terrestrial orchid with plicate leaves, showy pink flowers in a short, scapose spike drooping at the tip, and a large, ribbed capsule. Rare in sunny places. Indigenous. Not recorded during the present survey, but collected by Sykes in 1965 "near Hakupu."

**Hetaeria oblongifolia** Bl.

Small terrestrial orchid with ovate leaves, several (4--6 or more) bracts on the pubescent peduncle, and a terminal raceme of many small white flowers. Common in forests. Indigenous. Voucher no. 10740.

**Malaxis resupinata** (Forst.) Kuntze

Medium-sized terrestrial orchid with relatively large, plicate, ovate leaves and a terminal raceme of maroon flowers. Occasional in forests. Indigenous. Voucher no. 10741.

**Nervilia aragoana** Gaud.

Stemless terrestrial orchid with heart-shaped leaves and a leafless raceme of white flowers often produced when the leaves have died. Rare in inland forests. Indigenous. Not recorded during the present survey, but collected by Sykes in 1965 at Tualagi.



**Oberonia equitans** (Forst. f.) Mutel

Small, erect, laterally compressed, epiphytic orchid with distichous leaves and a terminal raceme of tiny white flowers. Occasional in forests. Indigenous. Voucher no. 10739.

**Phaius tankervilleae** (Banks ex L'Her.) Bl. pupukale

Large terrestrial orchid with large basal, plicate leaves, and a terminal raceme of large, showy lavender, white, and brownish flowers. Rare in forests and open places. Probably indigenous, but a recent arrival. Not recorded during the present survey, but collected by Sykes in the Huvalu forest.

**Phreatia micrantha** (A. Rich.) Schltr.

Medium-sized, laterally compressed epiphytic orchid with overlapping leaf bases and several basal racemes of tiny white flowers. Common in inland forest. Indigenous. Voucher no. 10767.

**Phreatia myosurus** (Forst. f.) Ames

Small, laterally compressed, epiphytic orchid with overlapping leaf bases and long-stalked racemes of tiny white flowers. Uncommon in forests. Indigenous. Voucher no. 10766.

**Spathoglottis plicata** Bl. pupukale

Large terrestrial orchid with large, basal, plicate leaves and a tall raceme of large, showy, pink flowers with yellow in the center. Occasional to common in fernlands and other disturbed places. Indigenous. Voucher no. 10753.

**Taeniophyllum fasciola** (Forst. f.) Reichenb. f.

Leafless, epiphytic orchid with flattened, photosynthetic roots, and tiny white flowers in a thin, few-flowered raceme. Occasional in inland forests. Indigenous. Voucher no. 10768.

PANDANACEAE

**Pandanus tectorius** Parkinson fa vao

Medium-sized tree with prickly trunks and branches, long, thorny leaves, prop-roots, white bracted male inflorescences, and a large, woody, globose, syncarp fruit. Common in open forests and fernlands. Indigenous. The leaves are used for weaving mats.

POACEAE

**Axonopus compressus** (Sw.) Beauv.

Mostly prostrate, mat-forming grass with small leaves, 2--4 subdigitately arranged, spikelike racemes, and oblong, sessile, awnless spikelets in 2 rows on one side of the angled rachis. Locally common as a weed of disturbed places. A modern introduction.

**Bothriochloa bladhii** (Retz.) S.T. Blake

Erect, medium-sized grass with appressed-hairy nodes, a branched panicle, and awned, purple spikelets. Uncommon as a weed of disturbed places. A modern introduction.

**Brachiaria paspaloides** (Presl) C.E. Hubb.

Medium-sized ascending grass with linear, subglabrous blades, a panicle of slender, spreading spikelike racemes, and ovate, awnless spikelets. Occasional as a weed of disturbed places. A modern introduction. Voucher no. 10879.

**Cenchrus calyculatus** Cav.

Large erect grass with long narrowly lanceolate leaves and a terminal raceme of soft, burr-like spikelets. Rare in coastal and littoral areas. Indigenous. Not recorded during the present survey, but collected by Sykes in 1965 along the track from Tuhia to Hakupu.

**Cenchrus echinatus** L.

Medium-sized grass with a narrow spike bearing sharp-spiny burs. Locally common in disturbed places, especially in coastal areas. A modern introduction.

**Chrysopogon aciculatus** (Retz.) Trin. motie fiti

Small low-growing grass with stems rooting at lower nodes, short, erect panicles with filiform branches, and purple, awned spikelets. Locally common in sunny disturbed places and lawns. A Polynesian or modern introduction.

**Cynodon dactylon** L. motie molulu

Creeping grass with stolons rooting at the nodes, small leaves, several narrow, spreading panicle branches atop the rachis, awnless spikelets, and seeds falling free from them. Common as a weed of coastal areas and often dominant in lawns. An early modern introduction.



**Digitaria henryi** Rendle

Small prostrate grass with palmately arranged branches spreading little at maturity, paired, unequally stalked ovate spikes, a small outer glume, and inner glume about half as long as the spikelet. Uncommon in sunny places. A modern introduction. Voucher no. 10829. Some authors consider this to belong to *Digitaria ciliaris* (Retz.) Koeler, which is much larger.

**Digitaria setigera** Roth ex Roemer & Schultes

Medium-sized grass with palmately arranged spike branches spreading little at maturity and paired, unequally stalked, ovate spikelets, no outer glume, and a short inner glume. Occasional in sunny coastal areas. A modern introduction. Voucher no. 10868.

**Eleusine indica** (L.) Gaertn. motie fuhitalo, motie fuhitalotalo

Tufted, medium-sized grass with several panicle branches atop the rachis and one lower, and closely packed, awnless spikelets with the seed dropping free from them. Common as a weed of disturbed places, especially plantation roads. A Polynesian introduction.

**Eragrostis tenella** (L.) Beauv.

Small delicate grass with linear-lanceolate leaves, spreading panicles with filiform branches, and tiny, 4--6-flowered spikelets with the seeds falling free from them. Occasional as a weed of disturbed places. A modern introduction.

**Lepturus repens** (Forst. f.) R. Br.

Creeping grass rooting at the nodes, with spikelets embedded in a narrow spike rachis which splits into one-seeded sections at maturity. Uncommon in sunny littoral areas. Indigenous.

**Oplismenus hirtellus** (L.) Beauv.

Small, low-growing grass with stems rooting at the lower nodes and a panicle with clusters of sessile, awned spikes arranged along the rachis. Occasional as a weed of disturbed places. A modern introduction. Voucher no. 10873.

**Paspalum conjugatum** Berg. motie vailima

Medium-sized grass with long stolons rooting at the nodes, a pair of narrow spikes atop the scape, and sessile, pubescent, ovate spikelets arranged in two rows along the rachis. Common as a weed of disturbed places. A modern introduction.

**Paspalum scrobiculatum** L.

Erect, medium-sized grass with a panicle of several flattened spreading branches with densely packed, flattened oval spikelets. Occasional as a weed of disturbed places and fernlands. Indigenous.

**Brachiaria subquadripara** (Trin.) Hitchc.

Low creeping grass with linear leaves, several spreading racemes, and solitary spikelets in two rows on one side of the angular rachis. Occasional as a weed of disturbed places. A modern introduction.

**Paspalum vaginatum** Sw. motie kalalahi

Erect, clump-forming grass creeping by rhizomes, with a 2- branched inflorescence and awnless ovate spikelets on two rows on the rachis. Common in sunny littoral areas. Probably an early European introduction.

**Sorghum sudanense** (Piper) Stapf

Large, coarse tufted grass with large leaves often spotted with brown, a terminal panicles of narrow branches, and unequal, awned, ovate spikelets arranged in 3s on the rachis. Common as a weed of disturbed places. A modern introduction.

**Sporobolus diander** (Retz.) P. Beauv.

Small, clump-forming grass with small leaves, narrow panicles with short ascending branches, and small awnless spikelets containing a single seed that falls free from them. Common as a weed of disturbed places. A modern introduction.

**Stenotaphrum micranthum** (Desv.) C.E. Hubb.

Creeping grass rooting at the nodes, with lanceolate leaves and spikelets embedded in the non-splitting spike rachis. Occasional in sunny littoral areas. Indigenous. Voucher no. 10835.

TACCACEAE

**Tacca leontopetaloides**(L.)Kuntze pia

Tall, stemless herb with irregularly palmately lobed leaves, and a leafless flowering stalk with a cluster of green flowers at the top. Occasional in littoral and coastal forest. A Polynesian introduction or native. The roots were formerly used for starch, and the plant is sometimes used in native medicines. Voucher no. 10860.



## ZINGIBERACEAE

**Zingiber zerumbet** (L.) J.E. Sm.

poloi

Tall, erect herb arising from a rhizome, with alternate leaves and a leafless stalk bearing a terminal spike with overlapping bracts and white flowers. Occasional in forests and disturbed areas. A Polynesian introduction. The juice collecting in the bracts was formerly used for shampoo. The plant has also been used as a spice and in native medicines.

**FERNS**  
ASPIDIACEAE

**Tectaria dissecta** (Forst. f.) Lell.

Large terrestrial fern with a bipinnate to tripinnatifid lamina, pinnules lobed nearly to costa, and sori with a kidney-shaped indusium. Occasional in disturbed places. Indigenous. Voucher no. 10737.

**Tectaria latifolia** (Forst. f.) Copel.

Medium-sized terrestrial fern with a deltoid lamina that is pinnatifid above and pinnate below, acuminate pinnae, and small sori irregularly scattered on the lower surface. Occasional in coastal and littoral forest. Indigenous. Voucher no. 10783.

## ASPLENIACEAE

**Asplenium nidus** L.

luku

Large epiphytic or terrestrial fern with simple laminae arranged in a basal rosette, and sori in parallel rows on the lower side of the lamina from the near the midrib to half way to the margin. Common in forests. Indigenous. The young leaf tips, especially those of the type known as luku fua, are cooked and eaten. Voucher no. 10780.

**Asplenium polyodon** Forst. f.

Medium-sized epiphytic or sometimes terrestrial fern with a pinnate lamina, up to 15 pairs of unequally sided, toothed, and long sori covering most of the length of the veins. Uncommon in inland forests. Indigenous. Voucher no. 10817.

**Asplenium robustus** Bl.

Medium-sized terrestrial fern with a dark rachis, a tripinnate or more divided lamina, and sori in rows on veins of the lower surface. Common in shady inland forests. Indigenous. Voucher no. 10738.

## DAVALLIACEAE

**Davallia solida** (Forst. f.) Sw.

kapihi

Medium-sized epiphytic or terrestrial fern with a creeping rhizome, densely scaly, stipes grooved on upper surface, a deltoid, tripinnate to tripinnatifid lamina, and sori several to each lobe, with a tubular, truncate indusium. Common in forests. Indigenous. Voucher no. 10770.

**Humata heterophylla** (J.E. Sm.) Desv.

Small epiphytic fern with long creeping rhizomes, dimorphic fronds, simple, sterile lamina lanceolate with entire margins, fertile ones pinnatifid and lobed over half way to margins, and sori indusiate borne on the teeth of the lobes. Locally common in forests. Indigenous. Voucher no. 10771.

## HYMENOPHYLLACEAE

**Trichomanes tahitense** Nadeau

Tiny epiphytic, algaelike fern with a membranous, peltate, nearly round frond appressed to the tree trunk with sori on the margin. Uncommon in shady forest. Indigenous. A new record for Niue. Voucher no. 10749.

## NEPHROLEPIDACEAE

**Nephrolepis biserrata** (Sw.) Schott

mohuku

Large epiphytic or sometimes terrestrial fern with a pinnate lamina up to 2 m long, many narrowly lanceolate pinnae, and sori well within the margin. Occasional in forests. Indigenous. Voucher nos. 10742, 10755.

**Nephrolepis hirsutula** (Forst. f.) Presl

mohuku

Medium-sized to large terrestrial fern with red-brown scaly stipes and rachis, a pinnate lamina up to 1 m in length, pinnae narrowly lanceolate with an auricle on upper margin, and sori close to the margin. Common to abundant in sunny areas and forest clearings. Indigenous. This may be a form of the species above.

## OPHIOGLOSSACEAE

**Ophioglossum pendulum** L.

Small to medium-sized, epiphytic fern with simple, linear, pendulous fronds and sori on a hanging spike attached near the middle of the lamina. Uncommon in inland forests. Indigenous. Voucher no. 10857.



**Ophioglossum petiolatum** Hooker

Tiny terrestrial fern with an erect rhizome, a frond consisting of an ovate lamina and a fertile spike, and sori arranged on the unbranched spike. Rare in sunny forest. Indigenous. Voucher no. 10789.

POLYPODIACEAE

**Phymatosorus grossus** (Langsd. & Fisch.) Brownlie mamanu

Medium-sized terrestrial or epiphytic fern with a scaly, creeping rhizome, a pinnatifid lamina, 1--10 pairs of lobes, and sori in 1 or 2 rows on either side of the midrib of the lobes. Common in forests. Indigenous. Voucher no. 10784.

PTERIDACEAE

**Acrostichum aureum** L. palatava?

Tall, clump forming terrestrial fern with a leathery, pinnately divided lamina with the lower surface of the fertile fronds covered with a velvety layer of sori. Uncommon to occasional on littoral rocks. Indigenous. Voucher no. 10779.

**Pteris tripartita** Sw.

Large terrestrial fern with a purple rachis, tripartite lamina, the central branch deeply bipinnatifid, lateral branches further divided, and sori nearly continuous on lower half of sinuses. Uncommon in forest clearings. Indigenous. Voucher no. 10744.

SCHIZAEACEAE

**Schizaea dichotoma** (L.) J.E. Sm.

Small terrestrial fern with a lamina dichotomously branched 2--8 times, the ultimate segments winged, and sori terminal on the palmate fertile lobes. Uncommon in forests. Indigenous. Voucher no. 10783.

THELYPTERIDACEAE

**Amphineuron opulentum** (Kaulf.) Holttum

Medium-sized terrestrial fern with clustered stipes, a bipinnatifid lamina, all veins free, no reduced pinnae, and indusiate sori. Rare in sunny forest areas. Probably indigenous, but a new record for Niue. Voucher no. 10796.

**Christella parasitica** (L.) Lev.

Medium-sized terrestrial fern with clustered stipes, a bipinnatifid\* lamina, basal veins united, yellow glands on the lower surface, and indusiate sori\*. Probably indigenous, but a new record for Niue. Voucher no. 10755.

**Sphaerostephanos invisus** (Forst. f.) Holttum

Large terrestrial fern with a bipinnatifid lamina, pinnae lobed less than half way to the midrib, lower 2 or so pinnae reduced, yellow glands absent from lower surface, and sori with a hairy indusium. Common in fernlands and other sunny places. Indigenous.

VITTARIACEAE

**Antrophyum plantagineum** (Cav.) Kaulf.

Epiphytic fern with curved, strap-shaped fronds and the sori arranged in a network of veins on the lower lamina surface. Uncommon in coastal forest. Not recorded during the present survey, but collected by Sykes in 1965 in Hakupu.

**Vittaria elongata** Sw.

Small epiphytic fern with clustered fronds, a simple, strap-shaped lamina, and linear sori along the margins of the lamina. Uncommon in coastal forest. Indigenous. A new record for Niue. Voucher no. 10736.

FERN ALLIES  
PSILOTAECAE

**Psilotum nudum** (L.) Beauv.

Small terrestrial fern-ally with scalelike leaves, erect stems triangular in cross-section, and globose, yellow sori on short terminal and lateral branches. Common in fernland and scrubland. Indigenous. Voucher no. 10792.



APPENDIX 2. HUVALU CONSERVATION AREA PLOT DATA

Plot 1. Tualagi Mature Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	31	15	28,127	33%
2. Syzygium inophylloides	kafika	14	5	25,745	30%
3. Syzygium dealatum	tuali	2	2	21,680	25%
4. Planchonella samoensis	kanumea	33	7	4,759	6%
5. Macaranga seemannii	le	7	3	2,843	3%
6. Streblus anthropophagorum	atatu	12	1	1,453	2%
7. Celtis harperi	piliva	4	2	1,047	1%
8. Baccaurea seemannii	koka	2	1	362	+
9. Heritiera ornithocephala	tafaki	1	0	79	+
10. Elaeocarpus tonganus	malava	1	0	50	+
<b>Totals</b>		<b>107</b>	<b>36</b>	<b>86,145 cm2</b>	

**Other trees:** Adenantha pavonina (s), Ficus obliqua, Micromelum minutum (s), Sterculia fanaiho (s). **Ferns (Terrestrial):** Asplenium nidus (\*), Asplenium robustus (\*), Tectaria dissecta. **Ferns (Epiphytic):** Asplenium nidus (\*\*), Davallia solida, Humata heterophylla, Trichomanes taitense. **Vines:** Flagellaria gigantea, Jasminum betchei, Merremia peltata (\*\*), Rourea minor (\*). **Orchids (Terrestrial):** Hetaeria oblongifolia. **Orchids (Epiphytic):** Phreatia micrantha (\*). **Others:** Ficus tinctoria (epiphyte), Geophila repens, Peperomia pallida. **Index of Disturbance:** 3%

Plot 2. Pitakaua Mature Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	66	34	24,047	46%
2. Syzygium inophylloides	kafika	16	11	20,363	39%
3. Diospyros samoensis	kieto	3	1	2,122	4%
4. Syzygium dealatum	tuali	1	1	1,661	3%
5. Elaeocarpus tonganus	malava	4	2	970	2%
6. Macaranga seemannii	le	1	0	707	1%
7. Polyscias multijuga	tanetane	11	2	670	1%
8. Streblus anthropophagorum	atatu	7	0	608	1%
9. Planchonella samoensis	kanumea	4	1	339	1%
10. Baccaurea seemannii	koka	3	0	227	+
11. Pometia pinnata	tava	1	0	50	+
<b>Totals</b>		<b>117</b>	<b>52</b>	<b>51,864 cm2</b>	

**Other Trees:** Adenantha pavonina (s), Dysoxylum forsteri (s), Ficus prolixa (s), Glochidion ramiflorum (s), Micromelum minutum (s), Morinda citrifolia (s), Pometia pinnata. **Ferns (Terrestrial):** Asplenium nidus (\*), Asplenium robustus, Davallia solida, Nephrolepis hirsutula, Humata heterophylla. **Ferns (Epiphytic):** Davallia solida. **Vines:** Alyxia stellata (s), Flagellaria gigantea (s), Jasminum betchei, Jasminum didymum, Merremia peltata (\*), Morinda myrtifolia (r), Rourea minor (\*). **Orchids (Terrestrial):** Hetaeria oblongifolia. **Orchids (Epiphytic):** Phreatia micrantha, Taeniophyllum fasciola. **Others:** Cordyline fruticosa. **Index of Disturbance:** 2%

Plot 3. Palatao Mature Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	68	42	25,903	59%
2. Syzygium inophylloides	kafika	11	4	8,647	20%
3. Rhus taitensis	tavahi	1	1	2,042	5%
4. Ficus scabra	mati	6	4	1,489	3%
5. Planchonella samoensis	kanumea	5	1	1,411	3%
6. Polyscias multijuga	tanetane	6	3	1,269	3%
7. Ficus prolixa	ovava	1	1	764	2%
8. Pometia pinnata	tava	5	2	644	2%
9. Baccaurea seemannii	koka	5	1	599	1%
10. Elaeocarpus tonganus	malava	6	0	352	1%
11. Diospyros samoensis	kieto	4	0	340	1%
12. Morinda citrifolia	nonu	1	0	95	+
13. Syzygium dealatum	tuali	1	0	64	+
14. Micromelum minutum	takapalu	2	0	58	+
15. Dysoxylum forsteri	moota	1	0	38	+
16. Adenantha pavonina	pomea	1	0	28	+
<b>Totals:</b>		<b>124</b>	<b>59</b>	<b>43,663 cm2</b>	

**Other Trees:** Glochidion ramiflorum (s), Streblus anthropophagorum. **Ferns (Terrestrial):** Asplenium nidus (\*), Asplenium robustus, Davallia solida (r), Nephrolepis biserrata, Nephrolepis hirsutula, Schizaea dichotoma (r), Tectaria dissecta. **Ferns (Epiphytic):** Davallia solida. **Vines:** Alyxia stellata, Flagellaria gigantea (s), Jasminum betchei (s), Merremia peltata, Morinda myrtifolia (r), Rourea minor. **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** Dendrobium biflorum, Oberonia equitans. **Others:** Cordyline fruticosa (r), Geophila repens, Procris pedunculata, Tacca leontopetaloides. **Index of Disturbance:** 8%

Plot 4. Folitifa Mature Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium inophylloides	kafika	15	9	21,726	36%
2. Syzygium samarangense	kolivao	41	23	17,755	30%
3. Macaranga seemannii	le	8	8	9,715	16%
4. Syzygium dealatum	tuali	3	3	5,442	9%
5. Celtis harperi	piliva	3	3	2,094	3%
6. Pometia pinnata	tava	6	2	945	2%
7. Streblus anthropophagorum	atatu	6	1	620	1%
8. Elaeocarpus tonganus	malava	2	1	592	1%
9. Planchonella samoensis	kanumea	4	1	445	1%
10. Ficus scabra	mati	1	1	346	1%
11. Dysoxylum forsteri	moota	1	1	227	+
12. Diospyros samoensis	kieto	1	0	64	+
13. Baccaurea seemannii	koka	1	0	50	+
<b>Totals</b>		<b>91</b>	<b>53</b>	<b>60,001 cm2</b>	

**Other Trees:** Adenantha pavonina, Ficus prolixa, Heritiera ornithocephala, Micromelum minutum, Polyscias multijuga. **Ferns (Terrestrial):** Asplenium nidus (\*), Asplenium robustus, Davallia solida, Humata heterophylla (r), Nephrolepis hirsutula. **Ferns (Epiphytic):** Asplenium nidus, Asplenium robustus, Davallia solida (\*). **Vines:**



Flagellaria gigantea (s), Jasminum betchei (s), Jasminum didymum (s), Merremia peltata (\*), Rourea minor (\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** Oberonia equitans. **Others:** Ficus tinctoria (epiphyte). **Index of Disturbance:** 16%

**Plot 5. Fuihi Mature Forest**

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium inophylloides	kafika	42	16	20,766	50%
2. Syzygium samarangense	kolivao	48	10	9,512	23%
3. Dysoxylum forsteri	moota	2	2	4,884	12%
4. Syzygium dealatum	tuali	3	2	2,073	5%
5. Streblus anthropophagorum	atatu	10	5	1,549	4%
6. Macaranga seemannii	le	1	1	1,385	3%
7. Pometia pinnata	tava	4	1	509	1%
8. Polyscias multijuga	tanetane	6	0	378	1%
9. Elaeocarpus tonganus	malava	3	0	191	+
10. Planchonella samoensis	kanumea	3	0	157	+
11. Ficus scabra	mati	1	0	50	+
<b>Totals:</b>		<b>123</b>	<b>37</b>	<b>41,454 cm<sup>2</sup></b>	

**Other trees:** Adenanthera pavonina (s), Baccaurea seemannii (s), Chionanthus vitiensis (s), Diospyros samoensis (s), Glochidion ramiflorum (s), Planchonella garberi (r,s). **Ferns (Terrestrial):** Asplenium nidus, Asplenium robustus, Nephrolepis hirsutula, Tectaria dissecta. **Ferns (Epiphytic):** Asplenium nidus, Davallia solida. **Vines:** Alyxia stellata (s), Jasminum didymum (s), Merremia peltata (\*), Rourea minor. **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** Bulbophyllum distichobulbum, Dendrobium biflorum, Phreatia micrantha (\*). **Others:** Cordyline fruticosa, Geophila repens. **Index of Disturbance:** 16%

**Plot 6. Fukafikahega Mature Forest**

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	51	25	34,233	53%
2. Syzygium inophylloides	kafika	33	4	7,923	12%
3. Syzygium dealatum	tuali	1	1	7,386	11%
4. Macaranga seemannii	le	4	4	5,855	9%
5. Pometia pinnata	tava	2	1	1,908	3%
6. Diospyros samoensis	kieto	5	1	1,752	3%
7. Planchonella samoensis	kanumea	10	2	1,694	3%
8. Baccaurea seemannii	koka	3	1	1,141	2%
9. Streblus anthropophagorum	atatu	11	1	1,045	2%
10. Elaeocarpus tonganus	malava	4	1	819	1%
11. Celtis harperi	piliva	5	1	555	1%
12. Polyscias multijuga	tanetane	4	1	429	1%
<b>Totals</b>		<b>133</b>	<b>43</b>	<b>64,750 cm<sup>2</sup></b>	

**Other trees:** Dysoxylum forsteri (s), Planchonella garberi (r,s), Sterculia fanaiho (r,s). **Ferns (Terrestrial):** Asplenium nidus, Asplenium robustus, Nephrolepis hirsutula, Tectaria dissecta. **Ferns (Epiphytic):** Asplenium nidus, Davallia solida (\*). **Vines:** Flagellaria gigantea, Jasminum betchei, Jasminum didymum (s), Merremia peltata (\*), Rourea minor (\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** Bulbophyllum longiscapum,

Dendrobium biflorum, Phreatia micrantha. **Others:** Geophila repens, Tacca leontopetaloides (r). **Index of Disturbance:** 10%

**Plot 7. Anato Mature Forest**

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium inophylloides	kafika	10	9	21,695	31%
2. Syzygium samarangense	kolivao	82	14	19,687	28%
3. Macaranga seemannii	le	21	20	19,612	28%
4. Syzygium dealatum	tuali	1	1	4,534	6%
5. Streblus anthropophagorum	atatu	27	3	2,224	3%
6. Diospyros samoensis	kieto	2	2	1,508	2%
7. Polyscias multijuga	tanetane	12	1	592	1%
8. Elaeocarpus tonganus	malava	7	0	406	1%
9. Planchonella samoensis	kanumea	4	1	398	1%
10. Heritiera ornithocephala	tafaki	1	0	95	+
11. Dysoxylum forsteri	moota	1	0	64	+
12. Chionanthus vitiensis	hooto	1	0	64	+
13. Adenanthera pavonina	pomea	1	0	38	+
<b>Totals:</b>		<b>170</b>	<b>51</b>	<b>70,917 cm<sup>2</sup></b>	

**Other trees:** Celtis harperi (s), Glochidion ramiflorum (s), Morinda citrifolia (s), Psychotria insularum. **Ferns (Terrestrial):** Asplenium nidus, Asplenium robustus, Davallia solida, Nephrolepis hirsutula. **Ferns (Epiphytic):** Davallia solida. **Vines:** Flagellaria gigantea, Jasminum betchei, Jasminum didymum, Merremia peltata, Rourea minor. **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** None recorded. **Others:** Tacca leontopetaloides. **Index of Disturbance:** 29%

**Plot 8. Veovava Secondary Forest**

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	35	16	14,676	25%
2. Syzygium inophylloides	kafika	17	5	10,174	17%
3. Macaranga seemannii	le	3	3	7,066	12%
4. Adenanthera pavonina	pomea	22	7	6,548	11%
5. Pometia pinnata	tava	5	2	5,855	10%
6. Polyscias multijuga	tanetane	39	14	5,610	9%
7. Alphitonia zizyphoides	toi	1	1	4,899	8%
8. Elaeocarpus tonganus	malava	5	2	2,442	4%
9. Syzygium dealatum	tuali	5	2	3,178	3%
10. Celtis harperi	piliva	1	1	804	1%
11. Ficus scabra	mati	1	1	254	+
12. Dysoxylum forsteri	moota	1	0	113	+
13. Chionanthus vitiensis	hooto	2	0	84	+
<b>Totals:</b>		<b>137</b>	<b>54</b>	<b>59,903 cm<sup>2</sup></b>	

**Other trees:** Baccaurea seemannii (s), Calophyllum inophyllum (s,r), Diospyros samoensis (s), Glochidion ramiflorum (s), Ixora triflora, Micromelum minutum (s), Planchonella samoensis (s). **Ferns (Terrestrial):** Asplenium nidus, Asplenium robustus. **Ferns (Epiphytic):** Davallia solida (\*), Humata heterophylla. **Vines:** Flagellaria gigantea, Jasminum betchei, Jasminum didymum, Merremia peltata, Morinda myrtifolia, Rourea minor



(\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** Bulbophyllum distichobulbum, Dendrobium biflorum, Phreatia micrantha. **Others:** None. **Index of Disturbance:** 40%

**Plot 9. Togo Secondary Forest**

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	52	25	25,296	65%
2. Macaranga seemannii	le	10	5	5,730	15%
3. Macaranga harveyana	le hau	7	4	1,818	5%
4. Alphitonia zizyphoides	toi	8	1	1,584	4%
5. Morinda citrifolia	nonu	28	1	1,326	3%
6. Rhus taitensis	tavahi	5	2	902	2%
7. Polyscias multijuga	tanetane	12	5	751	2%
8. Syzygium dealatum	tuali	1	1	452	1%
9. Adenanthera pavonina	pomea	9	0	320	1%
10. Tarenna sambucina	manono	8	0	224	+
11. Chionanthus vitiensis	hoto	3	0	122	+
12. Glochidion ramiflorum	kahame	2	0	78	+
13. Elaeocarpus tonganus	malava	2	0	58	+
14. Streblus anthropophagorum	atatu	1	0	50	+
15. Syzygium inophylloides	kafika	1	0	20	+
<b>Totals</b>		<b>149</b>	<b>44</b>	<b>38,731 cm2</b>	

**Other trees:** Diospyros samoensis (s), Dysoxylum forsteri (s). **Ferns (Terrestrial):** Asplenium nidus, Davallia solida, Nephrolepis hirsutula, Psilotum nudum. **Ferns (Epiphytic):** Asplenium nidus, Davallia solida, Phymatosorus grossus (r). **Vines:** Alyxia stellata (\*), Flagellaria gigantea (\*), Jasminum betchei, Jasminum didymum, Merremia peltata, Rourea minor. **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** Dendrobium biflorum. **Others:** Cordyline fruticosa, Tacca leontopetaloides. **Index of Disturbance:** 32%

**Plot 10. Matala Secondary Forest**

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium dealatum	tuali	12	10	12,769	21%
2. Syzygium inophylloides	kafika	12	8	10,415	17%
3. Syzygium samarangense	kolivao	16	8	9,644	16%
4. Macaranga seemannii	le	16	14	9,053	15%
5. Diospyros samoensis	kieto	7	7	4,809	8%
6. Polyscias multijuga	tanetane	26	13	3,906	6%
7. Dysoxylum forsteri	moota	1	1	2,641	4%
8. Elaeocarpus tonganus	malava	15	2	1,961	3%
9. Rhus taitensis	tavahi	2	2	1,794	3%
10. Alphitonia zizyphoides	toi	1	1	1,711	3%
11. Canarium harveyi	ai	2	2	805	1%
12. Chionanthus vitiensis	hoto	8	1	657	1%
13. Heritiera ornithocephala	tafaki	13	0	621	1%
14. Pandanus tectorius	fa	2	2	438	1%
15. Morinda citrifolia	nonu	3	1	305	+
16. Adenanthera pavonina	pomea	1	1	254	+
17. Ixora triflora	moea	8	0	168	+
18. Planchonella grayana	kalaka	2	0	76	+
19. Ficus tinctoria	ata	1	0	50	+
<b>Totals:</b>		<b>146</b>	<b>74</b>	<b>62,077 cm2</b>	

**Other trees:** Diospyros elliptica (s), Glochidion ramiflorum (s), Melicope retusa (s), Micromelum minutum, Psychotria insularum. **Ferns (Terrestrial):** Asplenium nidus (\*), Davallia solida, Nephrolepis hirsutula, Schizaea dichotoma. **Ferns (Epiphytic):** Davallia solida, Nephrolepis cf. biserrata. **Vines:** Alyxia stellata, Flagellaria gigantea, Jasminum betchei, Jasminum didymum, Morinda myrtifolia, Rourea minor (\*\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** None recorded. **Others:** Cordyline fruticosa, Tacca leontopetaloides. **Index of disturbance:** 32%



Plot 11. Pupiu Secondary Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	55	24	8,787	32%
2. Dysoxylum forsteri	moota	11	11	5,735	21%
3. Polyscias multijuga	tanetane	29	7	3,963	14%
4. Syzygium inophylloides	kafika	7	5	3,520	13%
5. Cocos nucifera	niu	2	2	1,367	5%
6. Pometia pinnata	tava	2	2	918	3%
7. Adenantha pavonina	pomea	5	2	829	3%
8. Elaeocarpus tonganus	malava	9	5	708	3%
9. Artocarpus altilis	mei	2	0	308	1%
10. Diospyros samoensis	kieto	4	0	296	1%
11. Ficus tinctoria	ata	2	0	233	1%
12. Dendrocnide harveyi	magiho	1	1	201	1%
13. Streblus anthropophagorum	atatu	1	0	154	1%
14. Ficus scabra	mati	2	0	143	1%
15. Tarenna sambucina	manono	2	0	92	+
16. Grewia crenata	lala sea?	1	0	79	+
17. Morinda citrifolia	nonu	1	0	64	+
<b>Totals:</b>		<b>136</b>	<b>59</b>	<b>27,396 cm<sup>2</sup></b>	

**Other trees:** Ficus prolixa, Macaranga seemanii, Planchonella garberi (s). **Ferns (Terrestrial):** Asplenium nidus (\*), Asplenium robustus, Davallia solida, Nephrolepis hirsutula, Psilotum nudum, Tectaria dissecta. **Ferns (Epiphytic):** Nephrolepis biserrata (r). **Vines:** Alyxia stellata, Dioscorea pentaphylla (r), Flagellaria gigantea (\*), Jasminum betchei, Jasminum didymum (\*), Rourea minor. **Orchids (Terrestrial):** Hetaeria oblongifolia. **Orchids (Epiphytic):** None recorded. **Others:** Cordyline fruticosa, Tacca leontopetaloides. **Index of Disturbance:** 45%

Pot 12. Tuaki Secondary Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	30	17	8,772	25%
2. Rhus taitensis	tavahi	3	3	5,477	16%
3. Syzygium dealatum	tuali	15	6	3,344	10%
4. Dysoxylum forsteri	moota	4	4	3,048	9%
5. Pometia pinnata	tava	10	4	2,422	7%
6. Hibiscus tiliaceus	fou	17	5	2,384	7%
7. Polyscias multijuga	tanetane	23	4	2,237	6%
8. Diospyros samoensis	kieto	10	3	1,964	6%
9. Elaeocarpus tonganus	malava	15	3	1,891	5%
10. Syzygium inophylloides	kafika	11	1	763	2%
11. Alphitonia zizyphoides	toi	1	1	707	2%
12. Adenantha pavonina	pomea	2	1	592	2%
13. Cocos nucifera	niu	1	1	492	1%
14. Morinda citrifolia	nonu	6	0	236	1%
15. Celtis harperi	piliva	2	0	161	+
16. Ficus prolixa	ovava	1	0	95	+
17. Ficus tinctoria	ata	1	0	95	+
18. Tarenna sambucina	manono	2	0	88	+
19. Streblus anthropophagorum	atatu	1	0	28	+
20. Pittosporum brackenridgei	kuiti	1	0	28	+
<b>Totals:</b>		<b>156</b>	<b>53</b>	<b>34,824 cm<sup>2</sup></b>	

**Other trees:** Chionanthus vitiensis (s), Diospyros elliptica (s), Glochidion ramiflorum (s), Micromelum minutum (s), Pandanus tectorius. **Ferns (Terrestrial):** Asplenium nidus, Davallia solida, Nephrolepis hirsutula. **Ferns (Epiphytic):** Davallia solida. **Vines:** Alyxia stellata (\*), Flagellaria gigantea, Ipomoea macrantha, Jasminum betchei, Jasminum didymum, Morinda myrtifolia, Rourea minor (\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** Taeniophyllum fasciola. **Others:** Cordyline fruticosa, Tacca leontopetaloides. **Index of Disturbance:** 44%



Plot 13. Pagopago Secondary Forest

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	19	10	12,549	26%
2. Syzygium inophylloides	kafika	24	10	7,997	16%
3. Macaranga seemannii	le	6	5	5,292	11%
4. Dysoxylum forsteri	moota	8	6	5,219	11%
5. Rhus taitensis	tavahi	4	4	5,011	10%
6. Pometia pinnata	tava	22	5	3,190	6%
7. Syzygium dealatum	tuali	3	2	3,094	6%
8. Celtis harperi	piliva	6	4	2,100	4%
9. Elaeocarpus tonganus	malava	14	1	1,459	3%
10. Polyscias multijuga	tanetane	17	0	977	2%
11. Alphitonia zizyphoides	toi	1	1	491	1%
12. Morinda citrifolia	nonu	5	0	423	1%
13. Streblus anthropophagorum	atalu	7	0	390	1%
14. Ficus scabra	mati	6	1	277	1%
15. Ficus tinctoria	ata	2	0	271	1%
16. Adenantha pavonina	pomea	1	0	133	+
17. Baccaurea seemannii	koka	1	0	95	+
18. Melicope retusa	kalakalai	2	0	78	+
19. Chionanthus vitiensis	hooto	1	0	38	+
<b>Totals:</b>		<b>149</b>	<b>49</b>	<b>49,035 cm<sup>2</sup></b>	

**Other trees:** Diospyros elliptica (s), Diospyros samoensis (s), Fagraea berteriana (s), Ficus prolixa, Glochidion ramiflorum (s,r), Hibiscus tiliaceus, Ixora triantha, Pandanus tectorius, Planchonella garberi (s), Planchonella samoensis (s). **Ferns (Terrestrial):** Asplenium nidus (\*), Asplenium polyodon, Asplenium robustus, Davallia solida, Nephrolepis hirsutula. **Ferns (Epiphytic):** Davallia solida, Humata heterophylla, Nephrolepis hirsutula, Ophioglossum pendulum. **Vines:** Alyxia stellata (\*), Dioscorea pentaphylla (r), Flagellaria gigantea, Ipomoea macrantha, Jasminum betchei, Jasminum didymum, Merremia peltata, Morinda myrtifolia, Rourea minor. **Orchids (Terrestrial):** Eulophia pulchra. **Orchids (Epiphytic):** Dendrobium biflorum, Oberonia equitans, Phreatia micrantha. **Others:** Cordyline fruticosa, Peperomia pallida, Procris pedunculata, Tacca leontopetaloides. **Index of Disturbance:** 36%

Plot 14. Ahuafi Secondary Forest

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	46	16	6,905	21%
2. Syzygium inophylloides	kafika	29	10	5,793	17%
3. Macaranga seemannii	le	6	6	4,496	13%
4. Rhus taitensis	tavahi	3	3	3,674	11%
5. Elaeocarpus tonganus	malava	12	6	3,326	10%
6. Polyscias multijuga	tanetane	17	8	3,210	10%
7. Hibiscus tiliaceus	fou	5	2	1,001	3%
8. Pometia pinnata	tava	7	3	928	3%
9. Diospyros samoensis	kieto	5	1	733	2%
10. Celtis harperi	piliva	2	1	606	2%
11. Cocos nucifera	niu	1	1	572	2%
12. Glochidion ramiflorum	kahame	4	2	442	1%
13. Adenantha pavonina	pomea	4	0	407	1%
14. Dysoxylum forsteri	moota	1	1	380	1%
15. Pandanus tectorius	fa vao	2	2	378	1%
16. Syzygium dealatum	tuali	2	0	143	+
17. Tarenna sambucina	manono	2	0	88	+
18. Morinda citrifolia	nonu	3	0	86	+
19. Planchonella garberi	oluolu	1	0	79	+
20. Alphitonia zizyphoides	toi	1	0	50	+
21. Pittosporum brackenridgei	kuiti	1	0	50	+
22. Melicope retusa	kalakalai	1	0	38	+
23. Diospyros elliptica	kanume	1	0	28	+
24. Cordyline fruticosa	si	1	0	20	+
<b>Totals:</b>		<b>157</b>	<b>62</b>	<b>33,433 cm<sup>2</sup></b>	

**Other trees:** Baccaurea seemannii (s). **Ferns (Terrestrial):** Asplenium nidus, Davallia solida, Nephrolepis hirsutula, Psilotum (r), Schizaea dichotoma. **Ferns (Epiphytic):** Nephrolepis hirsutula, Phymatosorus grossus. **Vines:** Alyxia stellata, Dioscorea esculenta, Flagellaria gigantea, Jasminum betchei, Jasminum didymum, Morinda myrtifolia, Rourea minor. **Orchids (Terrestrial):** None Recorded. **Orchids (Epiphytic):** Dendrobium biflorum. **Others:** Cordyline fruticosa, Tacca leontopetaloides. **Index of Disturbance:** 43%



Plot 15. Maliholagi Secondary Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Rhus taitensis	tavahi	7	7	16,090	35%
2. Macaranga seemannii	le	16	16	11,921	26%
3. Syzygium samarangense	kolivao	62	11	9,081	20%
4. Polyscias multijuga	tanetane	22	1	1,580	3%
5. Alphitonia zizyphoides	toi	5	3	1,293	3%
6. Ficus scabra	mati	23	0	1,162	3%
7. Syzygium inophylloides	kafika	10	3	1,038	2%
8. Morinda citrifolia	nonu	13	1	903	2%
9. Elaeocarpus tonganus	malava	7	1	466	1%
10. Celtis harperi	piliva	2	1	444	1%
11. Dysoxylum forsteri	moota	4	0	347	1%
12. Ficus tinctoria	ata	3	0	336	1%
13. Pometia pinnata	tava	1	1	277	1%
14. Syzygium dealatum	tuali	3	0	248	1%
15. Planchonella samoensis	kanumea	7	0	246	1%
16. Adenantha pavonina	pomea	4	0	154	1%
17. Melicope retusa	kalakalai	5	0	150	1%
18. Heritiera ornithocephala	tafaki	1	0	79	1%
19. Diospyros samoensis	kieto	1	0	50	1%
20. Baccaurea seemannii	koka	1	0	20	1%
<b>Totals:</b>		<b>195</b>	<b>45</b>	<b>45,886 cm<sup>2</sup></b>	

**Other trees:** Glochidion ramiflorum (s), Micromelum minutum. **Ferns (Terrestrial):** Asplenium nidus, Asplenium robustus, Nephrolepis hirsutula, Phymatosorus grossus, Tectaria dissecta. **Ferns (Epiphytic):** Davallia solida. **Vines:** Alyxia stellata, Flagellaria gigantea, Jasminum betchei, Jasminum didymum, Merremia peltata, Rourea minor (\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** None recorded. **Others:** Cordyline fruticosa, Macropiper puberulum (r), Tacca leontopetaloides. **Index of Disturbance:** 72%

Plot 16. Anato Coastal Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	78	36	20,345	51%
2. Macaranga seemannii	le	8	8	3,638	9%
3. Barringtonia asiatica	futu	2	1	3,054	8%
4. Polyscias multijuga	tanetane	40	4	3,027	8%
5. Streblus anthropophagorum	atatu	19	8	3,017	8%
6. Macaranga harveyana	le hau	15	13	2,657	7%
7. Syzygium inophylloides	kafika	3	1	1,322	3%
8. Planchonella grayana	kalaka	12	2	1,279	3%
9. Elaeocarpus tonganus	malava	8	0	416	1%
10. Morinda citrifolia	nonu	5	0	402	1%
11. Celtis harperi	piliva	1	1	346	1%
12. Syzygium dealatum	tuali	1	0	133	+
13. Heritiera ornithocephala	tafaki	1	0	133	+
14. Diospyros samoensis	kieto	4	0	128	+
15. Canarium harveyi	ai	1	0	95	+
16. Tarenna sambucina	manono	1	0	38	+
<b>Totals</b>		<b>199</b>	<b>74</b>	<b>40,034 cm<sup>2</sup></b>	

**Other trees:** Chionanthus vitiensis (s), Diospyros elliptica (s), Glochidion ramiflorum (s), Micromelum minutum (s), Psychotria insularum. **Ferns (Terrestrial):** Asplenium nidus (\*), Nephrolepis hirsutula. **Ferns (Epiphytic):** Davallia solida. **Vines:** Alyxia stellata, Flagellaria gigantea, Ipomoea macrantha (\*), Jasminum betchei, Jasminum didymum, Rourea minor. **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** None recorded. **Others:** Tacca leontopetaloides.



Plot 17. Ana Coastal Forest

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	60	39	21,209	36%
2. Polyscias multijuga	tanetane	23	9	3,337	9%
3. Dysoxylum forsteri	moota	6	6	2,951	8%
4. Syzygium inophylloides	kafika	2	1	1,548	4%
5. Guettarda speciosa	panopano	1	1	1,550	4%
6. Diospyros samoensis	kieto	5	3	1,250	4%
7. Elaeocarpus tonganus	malava	5	3	1,029	3%
8. Alphitonia zizyphoides	toi	1	1	814	3%
9. Morinda citrifolia	nonu	11	1	797	3%
10. Glochidion ramiflorum	kahame	2	2	774	2%
11. Cocos nucifera	niu	1	1	572	2%
12. Macaranga seemannii	koka	1	1	491	1%
13. Syzygium dealatum	tuali	1	1	346	1%
14. Chionanthus vitiensis	hotoo	1	1	314	1%
15. Ficus prolixa	ovava	1	1	211	1%
16. Ficus tinctoria	ata	2	1	177	+
17. Pandanus tectorius	fa vao	1	1	174	+
18. Sterculia fanaiho	kanotuata	1	0	174	+
<b>Totals:</b>		<b>125</b>	<b>71</b>	<b>37,754 cm<sup>2</sup></b>	

**Other trees:** Adenantha pavonina (s), Barringtonia asiatica, Fagraea berteriana, Ficus scabra, Neisosperma oppositifolium (s), Pometia pinnata, Rhus taitensis (s), Tarenna sambucina (s). **Ferns (Terrestrial):** Asplenium nidus (\*), Davallia solida (\*), Nephrolepis hirsutula (\*), Schizaea dichotoma. **Ferns (Epiphytic):** Davallia solida, Ophioglossum pendulum (r). **Vines:** Abrus precatorius, Alyxia stellata (\*), Cassytha filiformis, Derris malaccensis, Dioscorea bulbifera, Dioscorea pentaphylla, Flagellaria gigantea, Ipomoea littoralis, Jasminum betchei, Jasminum didymum, Morinda myrtifolia, Rourea minor (\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** None recorded. **Others:** Cordyline fruticosa, Procris pedunculata, Tacca leontopetaloides.

Plot 18. Tautu Coastal Forest

Species	Niue name	No. Trees	No. 15cm+	Basal Area	Rel. Dom.
1. Syzygium dealatum	tuali	17	10	5,467	16%
2. Syzygium inophylloides	kafika	23	11	5,341	15%
3. Cocos nucifera	niu	6	6	3,843	11%
4. Elaeocarpus tonganus	malava	7	6	3,068	8%
5. Hibiscus tiliaceus	fou	17	4	2,190	6%
6. Chionanthus vitiensis	hotoo	11	5	2,187	6%
7. Heritiera ornithocephala	tafaki	1	1	2,027	6%
8. Fagraea berteriana	pua	2	2	1,703	5%
9. Polyscias multijuga	tanetane	8	3	1,386	4%
10. Glochidion ramiflorum	kahame	4	3	1,342	4%
11. Pittosporum brackenridgei	kuiti	3	1	997	3%
12. Macaranga seemannii	le	1	1	962	3%
13. Dysoxylum forsteri	moota	3	3	883	3%
14. Syzygium samarangense	kolivao	3	1	682	2%
15. Morinda citrifolia	nonu	11	0	568	2%
16. Sterculia fanaiho	kanotuata	3	1	500	1%
17. Terminalia catappa	telie	1	1	346	1%
18. Diospyros samoensis	kieto	2	1	310	1%
19. Artocarpus altilis	mei	2	1	304	1%
20. Ficus scabra	mati	2	0	174	+
21. Tarenna sambucina	manono	2	0	78	+
22. Ficus tinctoria	ata	1	0	64	+
23. Geniostoma rupestre	tete	1	0	20	+
<b>Totals:</b>		<b>131</b>	<b>60</b>	<b>34,742 cm<sup>2</sup></b>	

**Other trees:** Aleurites moluccana, Barringtonia asiatica, Diospyros elliptica (s), Grewia crenata (s), Micromelum minutum (s), Pandanus tectorius, Planchonella grayana, Rhus taitensis (s). **Ferns (Terrestrial):** Asplenium nidus (\*), Asplenium robustus, Davallia solida, Nephrolepis hirsutula. **Ferns (Epiphytic):** None recorded. **Vines:** Abrus precatorius, Alyxia stellata, Dioscorea bulbifera, Dioscorea pentaphylla, Flagellaria gigantea, Ipomoea macrantha, Jasminum betchei, Merremia peltata (\*), Mucuna gigantea, Pachygone cf. vitiensis, Rourea minor. **Orchids (Terrestrial):** Hetaeria oblongifolia. **Orchids (Epiphytic):** None recorded. **Others:** Cordyline fruticosa, Procris pedunculata, Tacca leontopetaloides.



Plot 19. Vaikona Coastal Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium samarangense	kolivao	43	27	22,440	60%
2. Polyscias multijuga	tanetane	21	12	3,405	9%
4. Syzygium inophylloides	kafika	4	4	2,587	7%
5. Rhus taitensis	tavahi	5	3	2,467	7%
6. Diospyros samoensis	kieto	2	2	2,378	6%
7. Dysoxylum forsteri	moota	2	2	1,301	3%
8. Syzygium dealatum	tuali	2	2	710	2%
9. Macaranga harveyana	le hau	2	1	704	2%
10. Elaeocarpus tonganus	malava	2	2	557	1%
11. Morinda citrifolia	nonu	3	0	253	1%
12. Glochidion ramiflorum	kahame	1	1	177	+
14. Sterculia fanaiho	kanotuata	1	0	154	+
15. Tarenna sambucina	manono	3	0	122	+
16. Ficus scabra	mati	1	0	38	+
<b>Totals:</b>		<b>92</b>	<b>56</b>	<b>37,293 cm2</b>	

**Other trees:** Alphitonia zizyphoides, Chionanthus vitiensis (s), Cocos nucifera (s), Ficus prolixa (s), Diospyros elliptica (s), Psychotria insularum. **Ferns (Terrestrial):** Asplenium nidus, Asplenium robustus, Davallia solida, Nephrolepis hirsutula, Psilotum nudum. **Ferns (Epiphytic):** Nephrolepis cf. biserrata. **Vines:** Dioscorea bulbifera, Dioscorea pentaphylla, Flagellaria gigantea, Jasminum betchei, Jasminum didymum, Merremia peltata (\*), Morinda myrtifolia, Rourea minor (\*). **Orchids (Terrestrial):** Didymoplexis micradenia, Hetaeria oblongifolia. **Orchids (Epiphytic):** None recorded. **Others:** Cordyline fruticosa, Tacca leontopetaloides.

Plot 20. Vaikona Littoral Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Barringtonia asiatica	futu	17	11	18,131	73%
2. Neisosperma oppositifolium	pao	26	10	4,421	17%
3. Polyscias multijuga	tanetane	6	2	1,026	4%
4. Macaranga harveyana	le hau	3	3	869	3%
5. Syzygium dealatum	tuali	2	1	610	2%
6. Terminalia catappa	telie	1	1	381	1%
7. Planchonella grayana	kalaka	1	1	227	1%
8. Heritiera ornithocephala	tafaki	1	1	227	1%
9. Chionanthus vitiensis	hotoo	1	0	79	+
10. Morinda citrifolia	nonu	1	0	28	+
<b>Totals</b>		<b>59</b>	<b>30</b>	<b>25,999 cm2</b>	
<b>Totals per 1000 m2</b>		<b>118</b>	<b>60</b>	<b>51,998 cm2</b>	

**Other trees:** Calophyllum inophyllum, Guettarda speciosa, Pandanus tectorius. **Ferns (Terrestrial):** Asplenium nidus (\*\*), Davallia solida, Nephrolepis cf. biserrata, Phymatosorus grossus. **Ferns (Epiphytic):** Asplenium nidus, Nephrolepis cf. biserrata, Tectaria latifolia. **Vines:** Clerodendrum inerme (\*), Flagellaria gigantea, Ipomoea macrantha (\*). **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** None recorded. **Others:** Procris pedunculata, Tacca leontopetaloides.

Plot 21. Tautu Littoral Forest

Species	Niue name	No. Trees	No.15cm+	Basal Area	Rel. Dom.
1. Syzygium dealatum	tuali	19	5	6,855	30%
2. Pisonia grandis	pukatea	3	2	5,316	25%
3. Calophyllum inophyllum	fetau	1	1	1,398	7%
4. Fagraea berteriana	pua	1	1	1,205	6%
5. Planchonella grayana	kalaka	1	1	1,151	6%
6. Ficus prolixa	ovava	2	1	880	4%
7. Guettarda speciosa	panopano	2	1	789	4%
8. Cocos nucifera	niu	2	2	774	4%
9. Macaranga harveyana	le hau	1	1	531	3%
10. Pittosporum brackenridgei	kuiti	5	1	519	2%
11. Morinda citrifolia	nonu	5	1	341	1%
12. Ficus tinctoria	ata	6	0	313	1%
13. Hibiscus tiliaceus	fou	2	0	277	1%
14. Polyscias multijuga	tanetane	2	0	151	1%
15. Neisosperma oppositifolium	pao	2	0	123	1%
16. Cordia subcordata	motou	2	0	99	+
17. Sterculia fanaiho	kanotuata	1	0	95	+
18. Pipturus argenteus	malege	1	0	79	+
19. Dysoxylum forsteri	moota	1	0	38	+
20. Ficus scabra	mati	1	0	20	+
<b>Totals:</b>		<b>60</b>	<b>18</b>	<b>20,954 cm2</b>	
<b>Totals per 1000 m2</b>		<b>120</b>	<b>36</b>	<b>41,908 cm2</b>	

**Other trees:** Diospyros samoensis (s). **Ferns (Terrestrial):** Asplenium nidus (\*\*), Asplenium robustus, Davallia solida, Nephrolepis cf. hirsutula. **Ferns (Epiphytic):** Asplenium nidus, Davallia solida, Nephrolepis cf. biserrata, Phymatosorus grossus. **Vines:** Clerodendrum inerme (\*), Flagellaria gigantea, Ipomoea macrantha (\*), Jasminum betchei, Jasminum didymum. **Orchids (Terrestrial):** None recorded. **Orchids (Epiphytic):** None recorded. **Others:** Cordyline fruticosa, Procris pedunculata.

\* Indicates that the species was common. \*\* Indicates that the species was common to abundant. (s) Indicates that only saplings or seedlings of that species were found there. (r) Indicates the species was rare in that plot.