A Guide to Pacific Wetland Plants

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Published by U.S. Army Corps of Engineers Honolulu District 1981
INTRODUCTION

This guide was prepared to assist in the identification of wetlands and important wetland plants in the Pacific Ocean region for the US Army Corps of Engineers regulatory activities. As currently defined by US Army Corps of Engineers regulations (33 CFR 323.2(c)), wetlands are "those areas inundated or saturated by ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and other similar areas."

Wetlands and wetland plants from the Hawaiian Islands, American Samoa, Guam and the Northern Mariana Islands and the high Caroline Islands are described in this guide. While not all wetland plants found in these island groups are included, the most common, indicative species are represented. This guide should be applicable to other island groups in the Central and Western Pacific Ocean region, although only wetlands and wetland plants from specific island groups were considered in the preparation of the guide.

The primary source materials and photographs used in preparing the guide were wetland surveys prepared for the US Army Corps of Engineers by Whistler (1976), Elliott and Hall (1977), Moore et al (1977), and Stemmermann and Proby (1978). In selecting representative wetland plant species for inclusion, it was necessary to exclude species with limited distribution and species more frequently associated with non-wetland vegetation. Furthermore, wetland and wetland plant delimitation is difficult and somewhat arbitrary on Pacific Islands with high average rainfall. The user of this guide may encounter plants in the field that are not addressed in this guide, since only the most common, indicative wetland plant species are included.

Wetlands serve many functions. They can serve as nursery grounds for marine organisms, including many commercially important species, and as recreational areas. Wetland crops, such as rice and taro, support much of the world's population. Some wetlands function in sewage treatment, flood control, groundwater recharge, wildlife habitat, pollution control and nutrient cycling, and others provide shore protection against storm erosion and damage. Certain mangrove vegetation have been considered agents in land construction.

Acknowledgements

The preparation of the guide was performed under US Army Corps of Engineers Contract No. DACWH4-70-C-0021. P00002, with Science Applications, Inc. The Departments of Botany at the Bernice Pauahi Bishop Museum and the University of Hawaii generously provided research materials used in completing the guide. Dr. Charles Lamoureux graciously helped to set up the design of the guide. Dr. Arthur Whistler helped to review the draft and kindly provided me with a photograph of Erythrina Ituna. Dr. James Maragoto, Corals of Engineers, was patient and encouraged the work to completion. Michael Lee, Roy Narahara, James Oda, James Duro, Lynn B. Martin and Margaret Elliott, Corps of Engineers, were instrumental in preparing the guide for publication. Lynn was particularly instrumental in completing the last few botanical illustrations. A special thanks is extended to Mr. Elizabeth Day for typing the original manuscript, and to Mr. Hugo deNevi's of Nick Kaara Design, for helping to organize and lay out the guide.

Photo Credits

Except as noted, the photographs used in this guide were taken by Lyn Stemmermann, Margaret Elliott, and Dr. Arthur Whistler under contract to the Corps of Engineers.
GLOSSARY

acute - pointed, with an angle less than 90°
alternate - parts not opposite; such as one leaf arising at a node
annual - a plant that grows from seed, sets seed and dies within the period of one year
apex - top, away from the attachment of an organ
appendage - flattened against another surface
aroid - a member of the ARACEAE, the taro family
ascending - rising upwards
awn - bristle or stout hair
axillary - arising from leaf or flower axis, an axis being the angle made by a pedicle or peduncle with the stem
base - bottom, near the attachment of an organ
bilaterally symmetrical - having one plane of symmetry, as in a pea or mint flower
blade - the flat part of a leaf
blue-green algae - algae without organized nuclei, some of which are capable of fixing nitrogen (incorporating atmospheric nitrogen into forms that can be used by plants)
bract - a structure borne below a flower, sometimes leaf-like but often colored
bristle - a stiff hair
calyx - the outermost whorl of floral parts which is often green as opposed to the other colored parts of the flower
canopy species - the tallest plants in a vegetation type that would be seen from aerial view
capitate - a dense head-like cluster
capsule - a dry fruit that splits (dehisces) at maturity
Caroline Islands - A cluster of five main islands and numerous atolls south of Guam and north of the equator. The main Caroline Islands are Truk, Ponape and Pohnpei (Eastern Caroline Islands) and Yap and Palau (Western Caroline Islands).
cattkine - a spike or spike-like inflorescence of usually unssexual flowers without showy flower parts
ciliate - a margin fringed with hairs as an eyelash
coastal strand - the area near the ocean where vegetation is affected by strand influences such as sandy substrate and salt spray
co-dominant - one of the two or more commonest species in a vegetation community
compound - with more than one part, as in a leaf with several leaflets or an inflorescence with many branches
cone - conical shaped
colloidal - a ground-up mixture, for example, the taro ‘root’ used throughout the Pacific as a source of food
corolla - all the petals spoken of as a unit
cross-pollination - of world wide distribution
creeping - habit of plant that roots at its nodes and remains a generally low stature
cylindrical - a long slender rod shaped structure round in cross section
dendemic - native to a given area and occurring nowhere else
dioecious - having separate ‘male’ and ‘female’ plants
dominant - the most conspicuous species in a vegetation type, often with the most biomass
epiphyte - a plant growing on the branches of another plant, but not obtaining
forested - dominated by predominantly woody species growing on soils more or less permanently saturated. These communities have often been disturbed in the past with natural vegetation of such areas persisting to some degree in some of the Caroline Islands, but usually represented by secondary vegetation dominated by robust succulent species in American Samoa, Hawai‘i and the Mariana Islands.

Outline of Wetland Vegetation Types in the Caroline & Mariana Islands, Hawai‘i & American Samoa

VEGETATION TYPES UNDER SALTWATER INFLUENCES

SA - Saltwater Aquatic - Vegetation consisting of permanently submerged seagrass beds and communities of macro and micro algae. This vegetation type is extensive and diverse throughout the Pacific.

SM - Saltwater Marsh (coastal marsh) - Vegetation characterized by predominantly herbaceous species (mostly sedges and grasses) or low woody species under tidal or estuarine influence. These wetland communities are found in each of the island groups.

SS - Saltwater Swamp ( mangrove forests) - Vegetation dominated by woody species under tidal or estuarine influence. These communities are extensive and diverse in the Caroline Islands, where they occur along the coasts of most of the major islands. In the Mariana Islands and American Samoa they are more localized and less diverse. In Hawaii they are colonizers of suitable, protected coastal areas.

VEGETATION TYPES UNDER FRESHWATER INFLUENCES

FA - Freshwater Aquatic - Permanently flooded by freshwater, the vegetation consisting of submersed, partially submerged or floating species without well-developed structural support. This wetland type is found in slow-moving streams and ponds in the Carolines, Marianas, and Hawaiian Islands, and is apparently of limited distribution in American Samoa.

FM - Freshwater Marsh - Vegetation characterized by emergent herbaceous species, especially sedges and grasses, growing under freshwater influence. This vegetation type occurs in each of the island groups considered and such areas have often been cultivated in the past. Montane bogs occurring in the uplands of New Guinea above 2000 ft elevation have not been included.

FS - Freshwater Swamp - Vegetation dominated by predominantly woody species growing on soils more or less permanently saturated. These communities have often been disturbed in the past with natural vegetation of such areas persisting to some degree in some of the Caroline Islands, but usually represented by secondary vegetation dominated by robust succulent species in American Samoa, Hawai‘i and the Mariana Islands.

C - Cultivated Wetlands - Vegetation of cultivated crops requiring wetland conditions such as taro or rice, and the associated weedy species. Taro and other aroid crops are cultivated throughout the Pacific - mostly as subsistence agriculture in family or community patches except in Hawaii where taro cultivation is more commercialized. Rice is presently grown commercially on Ponape and Kauai.

R -ruderal Wetlands - Disturbed areas such as ditches, wet roadides and bomb craters, vegetated primarily by obligate and facultative weedy wetland species. These communities are found in all the island groups considered.
PLANT GROUP DESCRIPTION: Algae are generally submerged and have no vascular system (vines in the "leaves"). Though widely represented in wetlands only one is included in the guide. Ferns can be readily recognized by the layman and are characterized by having spores on the undersides of some of their fronds, rather than flowers, as their reproductive structures. Monocotyledons are flowering plants which can be recognized by having usually parallel venation in their leaves, and flowering parts in multiples of three. Dicotyledons on the other hand can be recognized by usually netted venation in their leaves and with flower parts in multiples of four or five.

PLANT NAMES: Both scientific and common names of the plants are used in the guide. The scientific name is a Latin binomial (genus and species) followed by the name of the botanist who described the plant. Synonymous scientific names occur when two or more names have been accidentally applied to the same plant, or when there is disagreement among botanists as to whether a group of plants should be considered as one or two species. The synonyms listed in this guide are only those that have appeared in readily available literature to which the user of the guide may have access.

GLOSSARY:

involve - a structure associated with, but below an inflorescence, as involucral leaves below the inflorescence
key - a numbered outline used to identify species by the process of elimination; in the PANTANALACEAE one of the segments of the fruit
leaflet - much longer than broad, with the broadest part near the base
leaf - an often green flat structure found below a bud on a stem and generally consisting of a petiole (stalk) and a blade
leaves - one part of a compound leaf
legume - a member of the pea family, the LEGUMINOSAE

linear - a long narrow shape
linden - rounded projections on a leaf or fruit
mangrove - a member of the mangrove family, the RHizophORACEAE; which occurs in saltwater-influenced swamp vegetation dominated by members of the RHizophORACEAE; other species occurring in such vegetation
marianna Islands - The archipelago of islands north of the Caroline Islands including Guam, Tinian, Rota, Saipan and several smaller islands to the north.
march - a wetland vegetation type dominated by herbaceous rather than woody species
micronesia - one of the three major divisions of the Pacific comprising the small islands north of the equator, east of the Philippines and west of Polynesia
midrib - the central nerve in a leaf
monotypic - with only one species
native - naturally occurring in an area without the aid of man
naturalized - introduced to an area, but growing without the aid of man
node - the joint where a leaf is attached
nut - a dry, hard, one-seeded fruit
oblong - much longer than broad with the apical portion wider than the base
oblong - wetland species - a plant requiring wetland conditions for its survival, establishment and reproduction

nutrients from its support as would a parasite

* erect - upright

* estuary - the area of tidal mixing with river waters

* arctic - intentionally or accidentally introducted into an area from somewhere else by man's activities

* facultative wetland species - a plant found in wetland conditions, but not wholly dependent upon those conditions for survival and reproduction

* family - a grouping of related genera, the family name usually ends with the suffix "aceae"

* fertile - bearing reproductive material such as pollen, spores, or fruit

* fronds - the leaves of ferns, palms and some other plants are often referred to as fronds

* genus (pl. genera) - a grouping of related species, the first of two words in a plant name, e.g. Colocasia is the genus of taro, Colocasia esculenta

* germinant - a young plant

* germinate - to begin to grow from seed

* glabrous - without hairs, smooth

* glaucous - with whitish film often caused by wax on leaf and fruit surfaces

* globose - 3-dimensional globe shaped

* grass - a member of the grass family, the poACEAE, or a plant resembling a grass

* halophyte - a plant able to grow in salty environments

* hypocotyl - part of the elongating stem of a germinating plant

* Hawaiian Islands - The northernmost island group of Polynesia forming an Archipelago with eight main islands (Hawai, Maui, Molokai, Kahoolawe, Oahu, Lanai, Kauai and Niihau) and a longward chain of islands including Midway,

* indigenous - rather to a particular area and also found elsewhere

* inflorescence - the arrangement of a group of flowers

* interface - the boundary between two zones

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<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Page</th>
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<tbody>
<tr>
<td>Water chestnut</td>
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<td>Water fern</td>
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<td>Water lily</td>
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<td>Water reed</td>
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<td>Waterweed</td>
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<td>Columbiana</td>
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<td>Xylococcus</td>
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<td>Granatum</td>
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<tr>
<td>Induccents</td>
<td>12.92</td>
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</tbody>
</table>
Rhizophora coriacea is a Yapesse stone fishtrap on reef flat dominated by seagrasses.


REFERENCES
Victoria.
Degener, O. 1932-present. Flora Hawaiiana, the New Illustrated Flora of the Hawaiian Islands. Privately Published.
Kanehira, R. 1933. Flora Micronesia. South Seas Bureau under the Japanese Mandate. [Japanese but with Latin binomials and well illustrated].

SALTWATER SWAMP VEGETATION
Saltwater swamps are vegetated by woody species under brackish or saltwater influence. In the Pacific Islands these swamps are generally dominated by members of the mangrove family Rhizophoraceae, and therefore can be referred to as mangrove or mangal swamps.
Mangrove swamps generally occur on small or sometimes coraline substratum in sheltered bays or of sheltered land areas protected from wave action by land or islands. Mangrove swamps are also found in dunes, alluvial flats and estuaries, and suspended silts and accumulates around the mangroves. Because of this, mangroves have sometimes been implicated in land formation. Mangrove swamps are also important in protecting coasts from storms and wave damage. They are economically important in many Pacific Islands, providing food and firewood and providing habitat for many organisms such as fish, mollusks, crabs, and in the Pacific Islands coconut, and in Palau, crocodiles (Crocodylus porosus), the estuarine crocodile and the New Guinea crocodile, Crocodylus nova guineae. A low number and diversity of birds also frequent mangrove vegetation of Pacific Islands.
Mangroves are woody species with morphological and physiological adaptations for survival in a periodic or continuous exposure to saltwater through many species, each species occurring at the landward edge of the mangrove, carrii grow in freshwater. These adaptations often include elaborate and specialized root formations that do not only support in the loose mud or sand substrata, but also, since they are above the water at low tide, allow for the gaseous exchange required for root functioning and metabolism. Mangrove root systems vary from prop roots in the genus Rhizophora, thick knee-shaped pneumatophores (breathing roots) in Bruguierea, slender knee-shaped pneumatophores (breathing roots) in other genera such as Avicennia and Ceriops, and large conical roots in Sonneratia, to elaborate curtain-like buttress roots in Xylocarpus.
Another adaptation to the saltwater environment is the fruits of certain mangrove species that germinate while still attached to the parent tree. This allows the young plant to develop sufficiently to improve its chances for successful establishment in the otherwise hostile environment of flowing saltwater. In these viviparous species, the wind-shaped root axis (hypophloesis) of the young plant can grow to 1 m before finally falling to the mud or water surface. Should the young plant fail at low tide, it is emboxed in the mud and begins to grow, otherwise it may drift in the saltwater for some time before finally lodging in mud. In some coral rubble, where growth can resume. Another mangrove adaptation is the thick leathery character of the leaves of most species. The leaves often have a thick wax or cuticle layer that protects the leaf from exposure to saltwater.
Mangrove vegetation occurs naturally in Samoa, the Mariana and Caroline Islands. Though no species are native to Hawaii, they are naturalized there and are becoming increasingly widespread. The mangroves of the Caroline Islands are more diverse and extensive than those in the other areas. In the Caroline Islands there is often a distinct stratification of species with certain species occurring most seaward usually Rhizophora mangles, but sometimes Sonneratia. Species in the midline portion include Bruguierea, and Rhizophora mangles, and Secur crashes. In the Caroline Islands mangroves the trees usually form a closed canopy at 15-25 m tall and are often laden with epiphytes. However, in some areas, vegetation toward the middle of an extensive mangrove consists of dwarfed Rhizophora apiculata that forms an open canopy at 2-4 m. This generally occurs where much sunlight has occurred and water circulation is reduced. These two factors lead to reduced nutrient cycling and aeration. Other species that occur further inland and in estuarine situations include Lumnitzeria, Xylocarpus, Nipa and Avicennia mixed with Bruguierea. Still other species, as indicated in the following table, occur where rivers enter the mangrove, at the margin of the mangrove and freshwater swamps, or at the mangrove-coastal stand interface.
The distribution of species in the mangroves of the Mariana Islands is similar to that of the Carolines, although in the Carolines, mangrove forests generally have a lower canopy and fewer species. Only 2 mangrove tree species, Rhizophora mangles and Bruguierea gymnothorax. are commonly present in American Samoa with Rhizophora being the most seaward, and Bruguierea preferring the inner mangrove and estuarine habitats.

The same distribution is found in Hawaii. However, Bruguierea is far more restricted in distribution than Rhizophora which readily colonizes suitable coastal areas.
Following is a list of representative wetland species found in mangrove vegetation. Species which are often abundant in an extensive mangrove have been omitted as they are usually not restricted to mangrove vegetation, and cannot be considered obligate or facultative wetland species.
### Representative Species of Saltwater Swamp Vegetation

<table>
<thead>
<tr>
<th>Family</th>
<th>Habitat</th>
<th>Species</th>
<th>Caroline Islands</th>
<th>Malaya Islands</th>
<th>American Islands</th>
<th>Hawaiian Islands</th>
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<tr>
<td>FT</td>
<td>m</td>
<td>Acrostichum aureum</td>
<td>1-3</td>
<td>x</td>
<td>x</td>
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<td>CY</td>
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<td>Scopodenion hookeri</td>
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<td>x</td>
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<tr>
<td>PL</td>
<td>m</td>
<td>Nypa fruticans</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>PN</td>
<td>m</td>
<td>Pandanus kenikeni</td>
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<td>x</td>
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<tr>
<td>PN</td>
<td>m</td>
<td>Pandanus spp.</td>
<td>1-5</td>
<td>x</td>
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</tr>
<tr>
<td>AC</td>
<td>m</td>
<td>Acantus obtusifolius</td>
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<td>x</td>
<td>x</td>
<td></td>
</tr>
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<td>BA</td>
<td>m</td>
<td>Barringtonia racemosa</td>
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<td>x</td>
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</tr>
<tr>
<td>BG</td>
<td>m</td>
<td>Dolichandrone spinosa</td>
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<td>x</td>
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<tr>
<td>CM</td>
<td>s</td>
<td>Lumnitzera littorea</td>
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<td>x</td>
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<td>EU</td>
<td>mc</td>
<td>Excoecaria agallocha</td>
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<td>x</td>
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<td>LY</td>
<td>mc</td>
<td>Pemphis aculea</td>
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<td>mc</td>
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<td>ME</td>
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<td>Ceriops tagai</td>
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<td>Heteria littoralis</td>
<td>1-5</td>
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<td>VB</td>
<td>s</td>
<td>Avicennia marina</td>
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<tr>
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<td>m</td>
<td>Cleopatran imera</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
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</tr>
</tbody>
</table>

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**Avicennia marina**

The mangrove vegetation with grey gums, Avicennia, and other species is bounded by higher land vegetated with coconut, Palau.

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**Clerodendron inerme (L.) Gaertn.**

**Vernacular** Chamorro "fodudog"; Konare 'Tawale', 'uyap', Pseud "tob", Truk 'ulo', 'apobou', Pohn 'toby', Yap 'iurub', Palau 'embou', 'buteberech', 'umb-rene', Samoa 'alofo tar'.

**Descriptions** Shrub or woody climber. Climbing to 2-8 m tall. Leaves opposite or in whorls of 3, ovate or oblong, the blades 4-13 cm long x 1.5-7.5 cm across; Fls white, 2.5 x 2.5 cm long (not including stamens) with 5 petals, the 4 red stamens exerted 1.5-3 cm beyond corolla; Frs black, oblong, to 1.4 cm long.

**Habitat** (GMF) This species grows at the edge of the mangrove and Pseudalocasia doliomutha swamp, in coastal margins, in the coastal strand, and occasionally in lowland secondary vegetation.

**Distribution** (CM) Indigenous to Indo-Malaysia, Australia, and the Western Pacific.
Dicotyledons - UMBELLIFERAE

Hydrocotyle verticillata L.
 Vernacular: Hawaii "poo popeco", English "marsh pennywort".
 Description: creeping herb to 12 cm high; Lvs obovate, oblanceolate 1-5 cm diameter on stalk to 12 cm long; Fts minute, borne in a spike shorter than the leaves; Frl 3-4 mm long flattened.

Habitat: (FS, FA, R, C, O) From freshwater muddy places.
 Distribution: (R) Native to Europe and naturalized in Hawaii.

Avicennia marina (Forsk.) Vierh.
 Description: Trees to 12 m tall; Lvs opposite, elliptic, the blade 7-10 cm long x 2.5-4 cm across, olive-green above and white below; Fts yellow, orange, 3-4 mm in diam; Fruits globose, borne in panicles of spikes; Frl 8-10 mm, floating capsule.
 Habitat: (SS, O) Avicennia is found in the middle to landward sections of the mangrove.
 Distribution: (C, M) Indigenous from Malaysia to some of the Pacific Islands including Guam, Palau and possibly Yap.

Mangrove stand, Kosrae

Xylocarpus roots, Santau River, Ponape

Lukop, Ponape

Dicotyledons - VERBENACEAE (AVICENNIACEAE)

[Images of mangrove environment]
### FRESHWATER AQUATIC VEGETATION

Freshwater aquatic vegetation is characterized by submerged, partially emergent, and floating-leaved species. Among these, well-developed structures support Aquatic plants growing in freshwater ponds. Slow-moving streams, irrigation ditches of wetland cultivation, open bodies of water surrounded by freshwater marshes, and, especially in Micronesia, bomb craters. Many aquatic plants are an important food source for wildlife, and the smaller plants are easily dispersed by birds. While some aquatic species are perennial, many are annuals that live in puddles or ponds that may dry for part of the year. The plants germinate from seed, flower and set seed during the wet period of the year.

A few aquatic species have the potential of becoming noxious weeds that block waterways (e.g., Eichhornia, Nymphapha, Pistia and Hygrophila). Others are rather free-floating plants that naturalized plants in aquatics and water gardens.

**Water lilies in Waolama Canal, Hilo**

### Representative Species of Freshwater Aquatic Vegetation

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Carolinian Islands</th>
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**Dicotyledon** - **SONNERATIACEAE**

*Sonneratia alba* J.E. Smith

*Sonneratia* laden with epiphytes including the carnivorous Nepenthes acuta.

**Herritiera littoralis** Dryand.

*Vernaculars: Chamorro "ula"; Kosrae "yam"; Ponape "margarite"; Truk "zwob"; Yap "yumb"; Yap "ram"*; Pala' "skabokek"; English "looking-glass tree".

**Description:** A tree to 15 m tall with slightly buttressed trunk. Lvs. alternate, oval to elliptic, 6-30 cm long x 3-12 cm broad, the lower surface silvery white, and the upper surface often covered with lichens and bryophytes; Fls. unisexual, 4-6 mm long, borne in axillary spikes; Frs. a keeled, hard, woody fruit 5-7 cm long x 3-5 cm broad, greyish turning brownish, single or in close clusters of up to 5.

**Habitat:** (SS/FS) Found at the landward edge of the mangrove, along channels of the mangrove, and occasionally at the mangrove-coastline transition and in lowland forests.

**Distribution:** (CI, MI) Indigenous from Southern Asia to the Pacific.

---

1. *Sonneratia* laden with epiphytes including the carnivorous *Nepenthes acuta*.
2. *Herritiera littoralis* Dryand., a Rosaceae, known as the mangrove tree.*Sonneratia alba*, also known as the "looking-glass tree," is indigenous to Micronesia.
3. *Vernaculars: Chamorro "ula"; Kosrae "yam"; Ponape "margarite"; Truk "zwob"; Yap "yumb"; Yap "ram"; Pala' "skabokek"; English "looking-glass tree."
Dicotyledons - SIMAROUBACEAE

Spondias indica Gaertn.
Syn. Ceylon indica Gaertn. Ilmenocarpus

Vernacular: Palau “ekoam”

Description: Small tree to 20 m tall. Lvs alternate, palm in whorls, 12 - 30 cm long x 4 - 12 cm broad, with distinctive glands at leaf base and scattered spiny-tipped tooth surfaces and other plant parts. F1s vivid red and subepicarp. To 1 cm in length petals and sepals 4. Flowers borne in umbels of up to 10 per inflorescence, 10 cm long. Fr 1 or rarely up to 4 together, flat, thick, acuminate at both ends, glabrous, 3 - 5 cm long.

Habitat: (F.S.O) Found in swamp forests in Palau, and to some extent, along muddy banks of channels through the upper part of the mangrove.

Distribution: (C) Indigenous only to Palau in the Caroline Islands. It is also known from Madagascar to Malaysia.

Sonniera alba J. E. Smith


Description: Mangrove tree to 30 m tall and occasionally to 1.5 m diameter, with spiny-toothed conical pinnate phyllaries 20 - 60 cm high emerging from the mud (see front cover). Lvs opposite, entire, leathery, oblong to oblanceolate, 6 - 12 cm long x 4 - 8 cm across, often with a notched apex. Stems 2 - 1.5 cm long with white petals and numerous white stamens, the stamens falling early in the day and exposing the 6 - lobed greenish calyx, Fr 3 cm high x 4 cm broad

Habitat: (S.S.O) This species grows on mud or sand and is found in the seaward, middle and inland areas. It is one of the largest trees in a well-developed mangrove swamp and is often festooned with epiphytes, more so than Rhizophora sp. or Bruguiera sp.

Distribution: (C) This species is known from Indo-Malaysia to the Western Pacific.

Note: The white as opposed to reddish white, Fr 3 cm long, a race that has been frequently transplanted to the Micronesian islands.

DICOTYLEDONS - SONNERATIACEAE

Sedges, grasses, and similar plants are the conspicuous components of freshwater marsh vegetation. Through the Pacific islands freshwater marsh vegetation can be found in both the olanders and uplands. Lowland freshwater marsh vegetation may be just inland of similar vegetation under saltwater influence, with some species found in both. Probably most, if not all, necessary occurring behind freshwater marsh vegetation. Due to the wide range of possible environmental conditions, this vegetation has been cultivated in the past. It is possible that some present marshes were at one time swampy forests that had been cleared for the purpose of cultivation, subsequently abandoned, but now re-codified by woody species. In the Caroline and Mariana Islands these marshes are often dominated by dense Phragmites patches. In some instances, where the marsh vegetation is firmly rooted in saturated soil, the marsh probably represents a successful stage toward vegetation dominated by woody species.

In other instances where there is a central open body of water, the substratum may be deep, with the vegetation surrounding the central pond not rooted but floating and forming a denses mass of sedges, ferns, and other plants. Such marshes are often a favorite resting place of migratory birds. These masses of floating vegetation (budu) may shift location from time to time, as can be seen by comparing aerial photographs taken during different years of small such as Kawainui marsh, Dahu and Lake Narko, Palau. Filled in craters, such as Kau Crater, Oahu, and Auna’s Ulter, Saipan, represent this sort of vegetation.

On most Pacific islands, upland marsh vegetation is often similar in species composition to that of the lowlands. However, in Yap and Palau in the Caroline Islands, and similar pockets of vegetation on Guam, there are savannah wetlands that have a distinct species composition. These areas have probably resulted from massive disturbances to naturally occurring forests. These wetlands have a characteristic scenario of a relatively dense, versatile system with a wide range of soil characteristics. Even within the savannah wetlands however, are pockets of marsh vegetation not unlike those of low-lying coastal areas. Montane bog, which occurs in Hawaii generally above the elevation of 4000 ft, have not been considered here. Discussion of that vegetation can be found in Carluquist (1975). On the island of Hawaii between 2000 and 6500 feet elevation there are marshy areas surrounded by forest which are vegetation by bushes and sedges. These areas are often associated with a declining ola forests and probably represent a succession stage vegetation type correlated with soil changes which take place over time. Soils are rich in organic material and are accumulated. Both freshwater and swamp marshes are important waterbird habitat.
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**Dicotyledons - SCROPHULARIACEAE**

**Limonaphila fragrans** (Forst.) Seem.
Syn: *Abaca americana*

**Vernacular:** Chamorro: "go'go' samoyarit"; Palau: "skatetak"; Samoan: "tamole vali".

**Description:** C.w. weak, somewhat aromatic
to 30 cm high; Lvs opposite, dotted, sessile, 1 - 2 cm long x 1 - 3 mm wide with serrate margins; Fls 6 - 8 mm long, white

with faint purple veins, borne solitary and sessile in the leaf axils. Fr: a globose capsule 2 - 5 mm across.

**Habitat:** (C.R.O) Found rooted in mud of marsh habitats and taro parcels.

**Distribution:** (C.M.S) Indigenous from Australia and Melanesia to some of the Pacific Islands.

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**Limonaphila indica** (L) Drue.

**Vernacular:** Chamorro: "go'go' ve'gi".

**Description:** Herb to 25 cm tall; Lvs 1 - 2.5 cm long, opposite or whorled, the lower ones many times divided, the upper ones 3 lobed or entire; Fls purplish, 6 mm long on distant stalks to 8 mm; Fr: an ellipsoid capsule. The entire plant smells of turpentine.

**Habitat:** (F.A.C) Found in freshwater habitats, sometimes partially submerged.

**Distribution:** (C.M) Known from Malaysia to some of the Pacific Islands.

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**Photo courtesy of John Ford, Cross of Engineers.**
Bacopa monnieri (L.) Pennel
Vernacular: English “water hyssop”.
Description: Creeping herb to only 5 cm high but with long stems rooting at the nodes. Lvs: 1–2 cm long x 5 mm wide, obovate, sessile, slightly crenate; Fls: auxiliary, 1 cm long with 5 white to pale lilac petals; Fruits: about 5 mm long and encased by the calyx.
Habitat: (SM, F) From coastal marshes to wet sites exposed to brackish water.
Distribution: (M, H) Indigenous to some Pacific islands.

Limnopilia aromatica (Lmk.) Merr.
Vernacular: Palau “yami”.
Description: Erect semi-aquatic herb emergent to 30 cm high. Lvs: opposite or whorled in 3’s, dotted, tinged to incanescence, 1–4 cm long x 1–4.5 mm wide, sessile; Fls: 1 cm long, solitary, white, 4–5 mm apart at the leaf axils or stalk 3–13 mm long; Fruits: about 5 mm long.
Habitat: (F, A, C, U) Found growing in standing water, or very loose mud in cultivated or abandoned taro patches.
Distribution: (C) Known from Malaysia, and at least Palau in the Carolines Islands.
FRESHWATER SWAMP VEGETATION

Freshwater swamp vegetation of the lowlands is characterized by predominately woody species growing on permanently or periodically inundated or waterlogged ground. These swamps occur in depressions or other bodies of water where freshwater vegetation may have been quiescent. Though they are not as extensive in the lowlands as in the past, however, lowland vegetation has been severely altered and farming has occurred. This certainly applies to areas that may have at one time been submerged by the swampy habits of Sphagnum, the classic "swamp moss" in Polynesian and Micronesian diets. Therefore few, if any, undisturbed watersheds are left. The present vegetation of these areas is generally of cultivation or secondary growth, characterized by species that reoccupy the area after the original vegetation has been removed. The secondary vegetation is also present for a long period before primary forest species become significant components of the vegetation again.

Secondary growth freshwater swamp vegetation occurs in most Pacific island groups, and is characterized especially by Hibiscus fruticosus. Where disturbance has been relatively recent in freshwater swamps of the Caroline and Mariana Islands, the reed Phragmites karac also common (see photograph illustrating successional fages from cultivation inundated wetlands, page 23).

Hibiscus fruticosus is not exclusively a component of secondary vegetation and is probably a drier swamp vegetation of the islands. It is the sole representative of a native swamp forest species in both the Mariana islands and Hawaii, and forms dense stands in swampy areas of all three island groups. The reed Phragmites karac, another species. Erythrina lutea, is also dominant. In the Mariana Islands several components of the primary forest persist although this vegetation has certainly been as disturbed as the swamp. Swamp forests dominated by components of the primary forest are found to some degree on all the high Caroline Islands, being least extensive in the Truk group.

Each of the high Caroline Islands have distinct swamp forest communities often with different dominant canopy and undercanopy species. These swamp forests are mostly confined to flat, peaty soils behind the mangrove. Like mangrove species, certain swamp forest plants have root systems adapted for aeration under wetland conditions—with looped pneumatophores or prop roots occurring in some species. The canopy is closed and often high, 20 m or more, and because the lower forest is dense, it often does not support dense vegetation. Few sedges, ferns and seedlings are found in the understory. Several freshwater swamp forest species are found in high hummocks near the landward edge of the mangrove. Additionally, there is a distinct flora associated with freshwater rivers that run through the swamp forests, as indicated in the following table. Hünckwel (1952, 1971) presents detailed discussions of these vegetation types on the Caroline Islands. He stresses the need for preservation which is important due to the widespread disturbances in these areas. Swamp forests dominated by components of the primary forest are only those that are found on several islands, or those that consistently have the mangrove included.

Also included in the table are several woody herbaceous species from muddy spots in upland forests of the Hawaiian Islands. These swampy areas are often the result of disturbance by feral animals or man rather than nature occurrences. The swamps are colonized and characterized by woody, herbaceous species tolerant of the wetland conditions, rather than a woody flora. Only a few of these species is listed here and should be considered strictly a representative sample. It is noted that the moribund bog swamps of the Hawaiian Islands have been totally excluded as have montane swampy areas of the other island groups.

**Dicotyledones - RUBIACEAE**

Scyphiochora hyalococcae Gaertn.

Vernacular: Yab "pluvin", "goutu"; Palau "koi"; guam "galiu".

**Description:** Shrubs of small tree to 5 m tall.

Lvs: opposite, broadly ovate, 4-6 cm long, 2-3 cm broad, glabrous, with entire margins. Fls: tiny, green, 10-12 between the petals. Frs: 3 mm long, including the calyx, truncate to rounded, 4, borne in many flowered clusters. Fets: 1-1.5 mm long, cylindrical, greenish with the persistent calyx at the fruit apex.

**Habitat:** (SSO) Found along mangrove channels in the mud to landward edge of mangroves, sometimes pole- and strand-forested in shallow freshwater swamps and small creeks. Often found growing with Lumnitzera littorea.

**Distribution:** Known only from Maysap to New Caledonia. Restricted only to Yab and Paleu in the Caroline Islands.
Dicotyledons - RHIZOPHORACEAE

Rhizophora mangle L. (Mangrove Sap). Shrubby or small Tree, 15-25 m tall, with warty, brown bark. Leaves long and slender, linear, 10-25 cm long, with 3-7 leaflets, 2-4 cm long. Flowers yellow, borne in clusters. Fruit a red, fleshy drupe, 3 cm wide. Prop roots take root and continue to grow, forming a buttressed root system. Prop roots vary in size from 15 cm up to 1 m long. Prop roots are used for holding the plant in place in the shallow water of tidal creeks. Rhizophora mangle is usually found in the southern part of the island and in the southwestern part of the island.


Description: Mangrove trees to 25 m tall with straight or arching prop roots. Leaves in clusters of 2-3, with 3-5 leaflets. Flowers yellow, borne in clusters. Fruit a red, fleshy drupe, 3 cm wide. Prop roots take root and continue to grow, forming a buttressed root system. Prop roots are used for holding the plant in place in the shallow water of tidal creeks. Prop roots vary in size from 15 cm up to 1 m long. Prop roots are used for holding the plant in place in the shallow water of tidal creeks.

Habitat: (SS, O) This is one of the most widespread mangroves in the Caroline Islands. Distribution: (C, M) Indigenous to the Old World Tropics from Africa to Malaysia, Melanesia, and Micronesia. Note: The prop roots of Rhizophora mangle are used for holding the plant in place in the shallow water of tidal creeks. The prop roots vary in size from 15 cm up to 1 m long. The prop roots are used for holding the plant in place in the shallow water of tidal creeks.
Rhizophora apiculata Bl.

Vernacular: Chamorro: "mattege"; Kosrae: "tskapak; Ponape: "sap; "sakapak"; Pohnpei: "tagal".

Description: Mangrove tree to 35 m tall with straight to arching prop roots. Lvs ovate-oblong, leathery, elliptical 8 - 16 cm long x 3 - 7 cm across, dark green and shiny above, dull and dotted below, spiny scutes with stiff points; margins not ridged around; Fls paired or sometimes solitary or short thick peduncles to 1.5 cm long, shorter than the petiole, petals and sepals; fr. petals falling shortly after opening of flowers; Hypericodium cylindric, growing to 36 cm long x 12 cm broad before falling.

Habitat: SS(O) This species is often one of the most abundant components of the mangrove forest.

Distribution: (C,M) This species is known from SS, Lanka and southeastern Asia to the western Pacific.
Dicotyledons - RHIZOPHORACEAE

Bruguiera gymnorrhiza (L. Link)

Description: Mangrove tree to 25 m with knobby, brown prop roots. Prop roots: Roots opposite, elliptic, leathery, 5 - 20 cm long. With red stipules sheathing the new leaves. Fls. 2 - 4 cm broad, spirally in leaf axils. Calyx with 10 - 14 mm, glossy tubes, red, or rarely white. As long as flower petals 10 - 14. Petals 12 - 20 mm, yellowish or greenish, slightly angled, reaching 15 - 25 cm long x 1.5 - 2 cm broad before falling. Habitat: (SS.Q) Mangrove forests, one of the tallest and commonest trees of the middle to landward edge of the mangrove. Distribution and Uses: (C.M.S.H) Indigenous from Indo-Malaysia to the Pacific, introduced and naturalized in Hawaii. The wood is used for timber.

Cerios tagal (Perr J.C.B. Rob)

Verbenaceae: "Tagal"

Description: Small tree to 15 m tall, with well-developed prop roots. Leaves opposite, oblanceolate or elliptic, blade 5 - 10 cm long x 3 - 6 cm broad, margins entire, rolled under, apex slightly notched. Fls yellowish-green. 5 parted. 2.7 - 1.0 cm long. Pubescent in 4 - 10 flowered clusters. Hypocotyl to 15 - 35 cm long before falling. Habitat: (SS.Q) Found in the middle portion of the mangrove and along channels through the mangrove. It is always rooted in mud and associated with other mangrove species. Distribution: (C) It occurs naturally from Africa to Melanesia. Indigenous to Palau and possibly Yap.

Verbenaceae: "Palauan"

Description: Small tree to 15 m tall, with well-developed prop roots. Leaves opposite, oblanceolate or elliptic, blade 5 - 10 cm long x 3 - 6 cm broad, margins entire, rolled under, apex slightly notched. Fls yellowish-green. 5 parted. 2.7 - 1.0 cm long. Pubescent in 4 - 10 flowered clusters. Hypocotyl to 15 - 35 cm long before falling. Habitat: (SS.Q) Found in the middle portion of the mangrove and along channels through the mangrove. It is always rooted in mud and associated with other mangrove species. Distribution: (C) It occurs naturally from Africa to Melanesia. Indigenous to Palau and possibly Yap.

Dicotyledons - RHIZOPHORACEAE

People of the Pacific have traditionally depended on avoids crops as their staple and rice is an important staple in much of the world. Wetland conditions are required for avoid growth. In the Carolines, avoid is grown both in Puerto Rico and in Micronesia during the Japanese occupation. Rice is also cultivated on the island of Kwajalein. Today, most wetland cultivation in the Pacific is still of tara (Colocasia). Some crop plants are higher cultivated throughout the Pacific, mostly in family or community patches in wet fields in the lowlands. C. jucunda, which has much larger tubers than Colocasia, is widely cultivated in the Caroline Islands to a lesser degree in the Mariana Islands, and rarely in American Samoa (on Swains Island). Even in the Carolines where C. jucunda is more widely cultivated than Colocasia, Colocasia is generally preferred. C. jucunda is an important food crop in Palau, and it is said that Colocasia is frequently grown at the edges of gardens. In all areas the degree to which weeds invade tara patches is dependent in part on the degree of cultivation a given patch receives. Generally, the cultivated species comprise the majority of the wood flora of cultivation. In addition there are a few plants that seem to be characteristically weedy species, such as Cynodon intermedius. This term may also be used to refer to species that are cultivated in the absence of cultivated species. When a cultivated patch is abandoned, the first weeds are herbaceous and semi-woody species, including numerous sedges and Littorella octovalvis, with successively woody species becoming established. Eventually, the plant communities become dominated by a few species. If the substrate is not sufficiently fertile to support woody vegetation, marsh vegetation takes over. Following is a representative list of cultivated crop and weeds of cultivation. Crops of cultivated cultivation are also included, including Alocasia which is only rarely eaten and has been cultivated in the past to be eaten in small amounts on Guam, and tara, which is grown commercially in Palau.
Cultivated Wetlands

Representative Species of Cultivated Wetlands

<table>
<thead>
<tr>
<th>Family</th>
<th>Habitat</th>
<th>Species</th>
<th>Ceyloni Islands</th>
<th>Mariana Islands</th>
<th>American Samoa</th>
<th>Hawaii Islands</th>
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<td>TH</td>
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<td>AL</td>
<td>c</td>
<td>Sagittaria sagittifolia</td>
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<td>w</td>
<td>C. nutans</td>
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<td>w</td>
<td>E. geniculata</td>
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<td>w</td>
<td>P. orbiculare</td>
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<td>Ludwigia hypophylla</td>
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</tbody>
</table>

Dicotyledons - ONAGRACEAE

Ludwigia palustris (L.) EJ
Vernacular: English "water purslane"
Description: Perennial creeping herb with rosette of leaves, and branching to 30 cm long. Flowers solitary and sessile in the leaf axis, about 2 mm long, petals absent
Habitat: (FA,S,R,C,O) Muddy disturbed ground and including disturbed areas in the forest.

Polyguttalum spp. (P. punctatum "tall, var. procerum" (Banana) Stoddard, "J. plicatilis" (H. H. Clark) (In Hawaiian, "tala")
Vernacular: Chamomo "mamaka", Truck (tala""); Puaa: "tala"; Hawaii: "kula"; English "smartweed".; "knotted"
Description: Low herba in 1m tall Lvs usually 5-17 cm long by 0.5-3 cm wide, often with a cilia (fringed) margin, alternate with a distinctive membranous sheath 1.5-2.5 cm long surrounding the stem above and below. It is a plant of the beach, 3-4 mm long, white or pink in loose or congested clusters of spikes 5-30 cm long. Fruit 2-3 angled, about 1 mm long.
Habitat: (FA S R C O) Many species of Polyguttalum are obligate wetland plants of muddy disturbed places in forests, or even cultivated areas.

Dicotyledons - Polygonaceae

Polyguttalum minit var. procerum is known from the Carolines and Mariana Islands. Polyguttalum plagiophylloides (Syn. P. deminutiflora) which is a perennial with prostrate and erect stems. P. hydropiper, an annual with erect stems, and several other species are known from Hawaii. The taxonomy of this widespread genus is somewhat confused.
**Ludwigia hyssopifolia** (G. Don) Exell.

**Vernacular:** Chamorro "ttimo", "charquan asiluyan"; Pohnpeian "telurik".

**Description:** Herbs to 1 m tall. **Lvs** alternate, lanceolate, 1.5 - 9 cm long x 0.5 - 3 cm across with entire margins. **Fls** borne in leaf axils, 1 cm diameter with 4 yellow petals acute to rounded at their tips, but not notched, ephemeral. **Fr** a cylindrical capsule to 3 cm long x 2 cm wide, with 4 persistent sepals at the fruit apex.

**Habitat:** (P.C.F) Muddy disturbed ground.

**Distribution:** (C,M,S,H) Neotropical.

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**Ludwigia octovalvis** Jacq. Raven

**Vernacular:** Pohnpeian "muleluk", "telurak", "telurik"; Truk "kionogep", "kollu", "peleo", "peeple", Yap "tallay", Palau "ekey"; Taiwanese "Iao mak", "ltaw", Hawaiian "lumeke", English "primrose willow".

**Description:** Semi-woody herb to 2 m tall. **Lvs** mostly alternate, elliptic to narrow-lanceolate, 3 - 15 cm long x 0.5 - 2.8 cm across with entire margins. **Fls** borne in leaf axils, 0.5 - 3 cm diameter, with 4 petaloid, yellow petals, **Fr** a cylindrical ribbed capsule to 3 cm long x 0.5 mm wide with the 3 sepals persistent at the fruit apex.

**Habitat:** (F.M.R.C.F) This species is associated with taro patches and wet riparian environments. It is sometimes dominant in recently abandoned taro patches.

**Distribution:** (C,M,S,H) This species is pantropical in distribution and naturalized throughout the Pacific.

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_**CULTIVATED WETLANDS**_

Aerial view of lowland cultivation in Yap illustrating a Cyrtosperma patch. Note Pigreemites, a weed which invades recently abandoned patches, and *M. triploides* (invasive). In the picture that eventually colonizes wet lowland areas. Taro cultivation of a lowland tidal marsh behind the village of Aumuu, Samoa.
**RUDERAL WETLANDS**

Species characteristic of ruderal wetlands invade disturbed wetlands or normally drier areas that are periodically flooded due to disturbances by man or nature. Roads are often temporary in nature. Ponds, living in ruderal wetlands are generally circumneutral, often annual, weedy, facultative wetland species that are capable of living in repeatedly disturbed habitats, often by virtue of a short life cycle. A preponderance of weedy herbaceous species in any vegetation is indicative of recent or periodic disturbance. Therefore, areas dominated by a large proportion of ruderal wetland species can be determined to be both wet and disturbed. Ruderal wetland habitats are usually man-made and include roadside ditches and other areas of impeded drainage.

Any area where there is standing freshwater, including ruderal wetlands, private habitat for tadpoles, mosquito larvae and wildlife.

**Nymphea spp.**

**Vernacular:** Hawaiian "Kalala-kahawai"; English "water lily".

**Description:** Aquatic herbs rooted in submersed mud. Stems circular, peltate, floating with deep basal indentation more than 2/3 the distance to the pedicel attachment. Leaf also Nelumbonaxa. Flower red, blue or white. 8-20 cm diameter with numerous petals, stamens and stigmas. Fruit 2-10 cm across, ripening under water.

**Habitat:** (F&A) Found in freshwater streams and ponds.

**Distribution and Uses:** (C.M.H) Several species have often introduced as ornamentals throughout the Pacific and have become sparingly naturalized.

**Nelumbo nucifera Gaertn.**

**Vernacular:** English "lotus"; Japanese "haku".

**Description:** Aquatic herb with roots bearing edible tubers having follow canals. Stems peltate, circular, rooted at or above the surface of the water, 30-90 cm diameter, and without basal indention (see *Nymphaea*). Flower 10-25 cm diameter with numerous white to roze-colored petals, fragrant. (An American species, *N. lutea* has yellow flowers). Fruit Bowmanize the surface of the water in an oval flat topped structure with many holes - each hole containing an ellipsoid fruit-like fruit 2 cm long.

**Habitat:** (F&A) Found in still ponds and streams.

**Distribution and Uses:** (H) Originally from Asia, cultivated for its edible roots, and sparingly naturalized in Hawaii.

Typha growing in sitting basin at Kapaa sanitary landfill.

Photo courtesy of Margaret Efford, Corps of Engineers.
Yxocarpus granatum Koen
(Syn. Carapa oviflora B1) and
X. molucensis (L., Ma) Roem.

musen’, ‘bruk’, ‘blik’, ‘blik’; Bunapini ‘yapi-
yang’, ‘yamagur’, ‘yamagur’; Pali ‘bubububub’; ‘Bunapini ‘yapi-
yang’, ‘yamagur’, ‘yamagur’; Pali ‘bubububub’; ‘Bunapini ‘yapi-
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yang’, ‘yamagur’, ‘yamagur’; Pali ‘bubububub’; ‘Bunapini ‘yapi-
yang’, ‘yamagur’, ‘yamagur’; Pali ‘bubububub’; ‘Bunapini ‘yapi-
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yang’, ‘yamagur’, ‘yamagur’; Pali ‘bubububub’; ‘Bunapini ‘yapi-

Description: X. granatum, a true tree, is 5-20 m tall with striking smooth white bark, red wood, and elaborate curving ivory buttressed roots (see pg. 13). It is grown pri-

Note: Distinctive, usually found in dry, sandy areas near water. PLs about 7 x 10 cm long, joined together by their stalks into a short, ciliated tube, are arranged in a group of 2-7 cm long. It consists of a brown capsule 10-15 cm diameter with 5-15 peculiarly angled wees.

Habitat: It is found near the landward edge of the mangroves, often in dense stands and in swamps.

Distribution: It is found throughout the Indo-Malay region to the Pacific, including the Caroline and Marianas Islands, and is known from American Samoa and from one collection from Palau in addition to Malaysia. The wood is red, and used for lumber, and the fruit is sometimes a child’s toy.
Algae - CHARACEAE

Chlorella spp.
Description: Submerged, limp, freshwater, blade-like green algae, 1 mm diameter with whorled branches arising from nodules, these being repeatedly whorled. The characteristics separating the species and genera of this family are difficult to observe without magnification.
Habitat: (F-A) Often found mats of submersed vegetation in bodies of freshwater, ferns, patches and ditches.
Distribution: (C.M.H.) This is a cosmopolitan genus.

Note: Another submerged plant with whorled branch-like leaves is the freespore blue-green algae which forms bright green colonies in marshy and stagnant water habitats.

Aziolla filiculoides Lmk.
Vernacular: English "water fern", "aziolla".
Description: Small floating fern with dangling roots and overlapping scale-like leaves often tinged with red, each leaf to 3 mm long.
Habitat: (F,A,C) Floating or rooted on very wet mud in lagoons or rice patches or other still freshwater ponds. Members of this genus harbor nitrogen fixing blue-green algae which contribute to the productivity of some of these wetland crops.
Distribution and Uses: (H) Cosmopolitan, and naturalized in Hawaii. Used as a green vegetable.

Note: Living, another floating aquatic fern is an aquarium plant that is called "water fern" or "aziolla". A fresh-water species, it is used for landscaping and as a water fern, and is native to eastern Asia and the Pacific. In Hawaii, it is often found in the north shore areas and the Kohala mountains. The leaves of this fern are also used as a treat for fish.

Ferns - AZOLLACEAE (or SALVINIACEAE)

Hibiscus biliaceus L.
Description: Small tree to 15 m tall often with tangled branches. Leaves alternate, heart-shaped, often wider than long, 10 - 20 cm across, dark green above and white below. Flowers 5 - 7 cm long, 5 petals, yellow to orange-red in a raceme or cymose panicle. Fruit a long, slender, orange capsule 2.5 cm long with spines into 5 parts when mature.
Habitat: (F-S) This Hibiscus grows in dense thickets in the lowlands where it can be found along stream banks, in mangrove swamps, and on slopes as well. It is also frequently planted as an ornamental or food source.
Distribution and Uses: (C.M.S.H.) Invasive throughout the Pacific region. The fibrous bark is used for cordage and is made into the "grass" skirts of many Pacific Islands. In Pomoce, sakal was the traditional drink made from Pellea methysticum, a

Thespesia populnea (S.)Solander
Description: Small tree 5 - 20 m tall. Leaves alternate, heart-shaped, the blade 15 - 25 cm wide, glossy, and without petiole while pinnate leaves are 15 - 20 cm long with deep red spots at base of petal, calyx cupules, flower including calyx 6.5 - 8.5 cm long, Fruit a globose, woody, brown capsule 3 cm across.
Habitat: (S-S) Found in the coastal strand, and sometimes along rivers at the interface of the mangrove/oak salt flat interface exposed to tidal influence.
Distribution and Uses: (C.M.S.H.) Known from most of the Pacific Islands. The wood of this species is often used for coir weaving.

Dicotyledons - MALVACEAE

Thespesia populnea (S.) Solander
Vernacular: Kao"panu" "panu", "pehua", "hokupa", Pomoce "one", "pue", "hokopa", "onca", "maka", "hawi" "milo", Chomono "banalo", "koli", "kolu", "samoa" "milo".
Description: Small tree 5 - 20 m tall. Leaves alternate, heart-shaped, the blade 15 - 25 cm wide, glossy, and without petiole while pinnate leaves are 15 - 20 cm long with deep red spots at base of petal, calyx cupules, flower including calyx 6.5 - 8.5 cm long, Fruit a globose, woody, brown capsule 3 cm across.
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Cuscoa carthagenensis (Jacq.) Madr.,

Vernacular: Hawaiian “puakamilo”;

Description: Erect perennial slightly woody herb 20 - 50 cm tall often with reddish stems. 

Leaves: opposite, 1 - 3 cm long, oval to lanceolate, hairy, sometimes sticky. 

Flowers: 6 - 7 mm long with 6 purplish oblong petals. 

Habitat: F&S,C,R,F Found in mucky, frequently disturbed areas. 

Distribution: C,M,S,N Native to Tropical America, naturalized and established on many Pacific Islands.

Pemphis acidula J.R. & G. Forst.

Vernacular: Hawaiian “kusagai”;

Description: Shrub or small tree to 4 m tall. 

Leaves: opposite, elliptic to oblong, 2.5 - 3.5 cm long x 0.4 - 1.0 cm wide, glabrous, pubescent with white silky hairs on leaves and young branches. 

Flowers: 1 - 1.5 cm diameter, solitary or paired in leaf axils. 

Habitat: 5S\, F This is often found in the coastal strand and on coraline substrate, but sometimes found growing at the mangrove interface exposed to tidal influence. 

Distribution: (C,M,S) Distributed from East Africa to the Pacific, and indigenous throughout the Caroline and Mariana Islands, with a few collections from Samoa (including Swains Island).

Ceratopteris thalictroides (L.) Brongn. 

Vernacular: “L." (Latin)

Description: Weak stemmed aquatic fern. 

Frond: dimorphic, the fertile fronds 30 - 60 cm tall, erect, much dissected, each cylindrical base 3 mm across with a continuously reduced rachis. 

Stipules: sepals, borne along the rachis, the sterile fronds shorter, with half-fronds borne more or less horizontally. 

Habitat: F A,C,T This fern grows floating, partially submerged, or on the surface of wet mud in taro patches, rice fields, ditches and other still, shallow freshwater locales. 

Distribution and Uses: C,M,S Native to Tropical America, naturalized and established on many Pacific Islands.
Acrostichum aureum L.

Vernaculars: Chamorro "langawal", Truk "fqueen", Yap "unpangate", Palau "okwaen", Samoan "taloto", "ulu taloto".

Description: Robust fern with scales to 4 cm long on midrib and base of spore-bearing fronds. The costa occasionally to 3 m, the pinnate leaflets elliptic to linear, 12-20 cm long x 2.5 cm across. Fertile fronds similar in sterile fronds but with lower surface of upper several pinnae completely covered with golden brown spores.

Habitat: (SM, FM 0) This wetland species of fresh or somewhat brackish water is found rooted in coastal marshes, at the margin of mangrove swamps, in lagoons, and sometimes in large floating masses in freshwater.

Distribution: (CAM, SI) Pan-tropical in distribution. Indigenous to Samoa, the Mariana Islands and Palau, Yap and Truk in the Caroline Islands, but not naturally occurring in Hawaii.

Ammania bacillifera L. and A. coccinea Roth.

Description: Erect herbs to 60 cm tall. Lvs opposite, 1-60 cm long, lanceolate or often roundish. Fls minute, less than 2.5 mm long and borne in sessile axillary clusters. Fig and borne in sessile axillary clusters. Ammania bacillifera with leaves narrow toward the base, and lacking petals, can be distinguished from A. coccinea which has a broad leaf base along the stem, and minute pink petals.

Habitat: (RO) These two species, along with others in the genus, are obligate wetland species usually of ruderal habitats.

Distribution: (CAM) Ammania bacillifera is known from Malaysia and at least Palau in the Caroline Islands, with A. coccinea reported from the Marianas.
**Dicotyledons** - **LEGUMINOSAE**

*Synthyris loihi* Lour.  
**Vernacular**: Porange "pehli"; Samoan "g'late", "galapa"  
**Description**: Tree 10 - 30 m tall with thorny branches; Lvs: trifoliate with the leaflets oval to the top leaflet 9 - 16 cm long x 5 - 10 cm broad, silver-gray green on lower surface. Fls: 5 cm long borne in racemes 20 - 30 cm long on pedicel 0.5 cm; 3 cm long, the longest terminal 1 - 2 cm long, the terminal leaflet 5.5 cm long x 3.6 - 4.5 cm across, Fragrant, the flower bud 15 - 25 cm long with up to 11 dark brown seeds.  
**Habitat**: FS.O, Lowland, freshwater, sandy ground, often near taro patches.  
**Distribution**: (C.S) Known at least from Mangaia and Tarapu'a in the Caroline Islands and Samoa, but not apparently from the Mariana Islands or Hawaii.  
**Notes**: The petals should not be confused with the leaves which have a pronounced midrib, with a 23 x 73 cm leaflet, leaves that are oval to rounded, which has a prominently midrib, borne on petioles 15 - 25 cm long x 2 - 5 cm wide.  

Photo courtesy of Dr. Arthur Thomas.

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**Ferns** - **THELIPTERIDACEAE**

*Cyclosorus interruptus* (Willd.) H. Irwin  
**Vernacular**: Porange "pehli"; Samoan "g'late", "galapa"  
**Description**: Fern with creeping rhizome 8 mm diameter covered with brown scales. Fronds stiff, erect, pinnae, to 1 - 2 m long, stripe 30 - 90 cm, dark at base; blade 30 - 60 cm long with 20 - 50 pairs of pinnae and no reduced pinnae at base; each to 12 cm long x 1 - 2 cm broad, the margins with rounded teeth cut one-third towards the midrib, sometimes hairy, often with orange glands on lower surface; Sori round, in two converging rows on margin of each pinnae tooth.  
**Habitat**: (F.M, C.F) This species is often found in marshy areas such as abandoned taro patches and sometimes should be considered indicative of previous cultivation, especially where large masses are found.  
**Distribution**(C.M, C.H) Occurring throughout the Pacific Islands.

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**Sagittaria sagittifolia** L.  
**Vernacular**: English "arrowhead".  
**Description**: Aquatic herb to 70 cm tall. Lvs: oblong to ovate, veins erected, arrowhead shaped with downward pointing leaflets, each leaf to 20 cm including leaflets. Fls: with 3 white petals 12 - 15 mm long, borne in whorls of 3 on a raceme to 50 cm, the lower flowers; the upper flowers: Fragrant, the flower bud 15 - 25 cm long in round heads to 1 cm.  
**Habitat**: (F.M. F.A. C.D)  
**Distribution and Uses**: (D.H) Known from China to Japan and Malaysia and introduced to Hawaii where the starchy tubers are sometimes eaten. Another species, *S. sobolifera* subsp. is known from Guam which has submerged linear leaves, and rooting lanceolate 5-nerved leaves. It has racemes of white flowers about 1 cm long.
Dicotyledons - LEGUMINOSAE

Casimia stricta L.

 Vernacular: Pounape "truve-n-kili-mayo"; Truk "tareak"; Saq "gingiu saqen"; Palau "wena besiakak"; Sarcia "ikrei fai lata	yomoro "take-mele"; English "candle bush".

descriptions: Shrub; 2 - 4 m tall; Lvs palmate, with 5 - 20 pairs of leaflets each 5 - 15 cm long; Fls 2 cm long with 5 yellow petals, and borne in showy racemes 40 - 60 cm long; Frs a dark brown winged pod to 19 cm long x 2.5 cm broad (including the wings).

Habitat: (FS, SF, F) This species occurs in wet spots of secondary forest vegetation and at the margins of cultivated areas.

Distribution and Uses: (C, M, S, H) Native to America but naturalized on many Pacific Islands. It is used in the treatment of ringworm.

Cytosperma chamissonis (Schott) Merr.

 Vernacular: Kosrae "pahshik"; "heshehi"; Ponape "masu"; Truk "pulu", "pashon", "bura", "tanar", "huaus", Yap "lack"; Palau "braik", Chamorro "babba".

Description: Very large plants to 5 m tall with enormous edifice form and without a developed above ground stem. Lvs to 6 m long borne on spiny petioles to 4 m long, not petiolate, spines pointing skyward, basal lobes, acute, about same length as leaf apex (both measured from petiole attachment); Fls borne in a many-flowered spadix surrounded by a yellowish spathe.

Habitat: (C, M) Apparently can tolerate some exposure to brackish water.

Distribution and Uses: (C, M) Widely cultivated for its form throughout the Caroline Islands, uncommon in Guam, and rarely cultivated in Polynesia. Trunks, like other members of the family must be very well cooked before being eaten.

Cytosperma ramiflora L.

 Vernacular: Chamorro "gulon"; Ponape "kanamor"; "kanahlan".

Description: Trees to about 16 m tall; Lvs even-pinnate with 2 - 4 pairs sometimes 4 leaflets, 5 - 15 cm long x 3 - 8 cm broad; pink when young; Fls borne in short racemes to 1 cm long, white; Frs roundish up to 3 cm long, usually wrinkled.

Habitat: (S, LS, F, P) This plant grows along rivers and in swamp forests at the landward edge of the mangrove associated with Brachytagona radicosa and Hehneria nitidissima. It is also found in low elevation, relatively undisturbed forests.

Distribution: (C, M) Indigenous from Malaysia to the Western Pacific.

Dicotyledons - LEGUMINOSAE

Monocotyledons - ARACEAE
Monocotyledons - ARACEAE

*Vernacular:* English "water lettuce".

**Description:** Floating aquatic herb with rosette of leaves and abundant dangling dark roots. *Lvs* light green, with velvety pubescent, obovate, 3 - 12 cm long x 2 - 8 cm across with spongy base to 2 cm thick; *Fls* borne in spadix attached to short leaf-like spathe partially hidden by leaf bases.

**Habitat:** (FAO) This is a wetland plant found in slow moving fresh or somewhat brackish water. It has the potential for being a noxious weed that can form dense mats of vegetation and block canals and waterways. Naturalized in at least Hawaii and Guam.

**Distribution and Uses:** (M-H) Introduced to the Pacific presumably as an ornamental. Known from Tropical and subtropical Africa and Asia.

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Dicotyledons - HALORAGACEAE

*Vernacular:* English "perioli's feather".

**Description:** Weak stemmed dioecious herb growing to 30 cm tall out of water. *Lvs* feathery, in whorls of 4 - 5, *Fls* in head in axils of submerged leaves.

**Habitat:** (FAO) Cultivated and escaped; found in freshwater ponds, streams, taro patches and marshy areas in upland forests.

**Distribution and Uses:** (H) Native to Chile, probably introduced as an ornamental and now naturalized in Hawaii, especially on the island of Hawaii.

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**Burmannioides lessoniana** (L.) Hook. f.

**Description:** Small, delicate annual herb to 20 cm tall. *Lvs* mostly reduced to scales, but basal leaves to 2.5 cm long. *Fls* terminal, solitary or clustered, 2 - 3 cm long x 1 - 3 mm wide, 4 - 6 petals, 4 - 5 stamens.

**Habitat:** (C) A wetland plant of the savannah wetlands of the Islands and Palau.

**Distribution:** (C) Indigenous to Yap and Palau in the Caroline Islands; also known from Malaysia.

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**Stemorhina australis** (Kunze) Blume

**Vernacular:** Pirau "ammul", "mokekeiak".

**Description:** The 10 - 25 cm tall with looped, knee-like pseudopiths. *Lvs* alternate, fleshy, epigone to obovate, 0.5 - 15 cm long x 4 - 6 cm across, *Fls* with foliaceous bracts borne in axillary umbels. *Frt* ellipsoid, 4.5 cm long subtended by the persistent cupulate calyx.

**Habitat:** (FS) Found in swamp forests adjacent to mangrove where it is often the dominant understorey tree.

**Distribution:** (I) Indigenous to Palau, Micronesia and New Guinea.

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**Dicotyledons - ICACINACEAE**
Calophyllum chlorodictaches Laut.

Vernacular: Palau "cholorochitches", "akaleka", "kasimorik".

Description: Tree to 25-m tall. Lvs glabrous, opposite, ovate to elliptic, 5 - 10 cm long by 2.5 - 5 cm across. Numerous secondary veins arising from midrib parallel to each other and 1 mm apart. New leaves red. Fls 1 cm diameter, borne in axillary thyrses. Frs stipitate 2 cm long, drying off then falling.

Habitat: (F.S.O) Found along rivers at low elevations, in swamp forests, and at the landward edge of the mangrove.

Distribution: (C) Endemic to Palau.

Burmannia ledermannii Junk.

Commelina diffusa Burm. f.

Vernacular: Bako "mau'i tops", Hawaii "honohongo", "honohonowai", "makolokoku", Yap "tanu".

Description: Creeping, prostrate, grass-like herb. Lvs ovate, to 4 cm long by 2 cm across, with parallel venation. Fls fragile, with 3 bluish petals borne in a reflex boat-shaped bract.

Habitat: (F.M. C. R.F)

Distribution: (C.M.H.S) Pantropical, introduced throughout the Pacific.

Monocotyledons - BUERMANIACEAE

Monocotyledons - COMMELINACEAE
**Dicotyledons - CRUCIFERAE**

**Nasturtium microphyllum** Bourn.

**Vernacular**: English “watercress”; Hawaiian “ulike ke oke o”

**Description**: Aquatic perennial herb with prostrate or erect stems rooting at the nodes; 
Leaves: small, ovate or obovate, 6–11 cm long x 3.5–7 mm across, dark green and glossy above, 
white beneath. 
Flowers: 4 white petals. 
Fruit: a slender erect linear capsule.

**Habitat**: (FA-CO) This is the cultivated watercress which has become naturalized in some streams in Hawaii.

**Distribution**: (H) Native to Europe.

**Exococca agallocha** L.

**Vernacular**: Truk “loosu”, “rolus”; Yap “bat”; Palau “las”, “ayas”

**Description**: Small dioecious tree to 10 m tall with copious acid milky sap; 
Leaves: alternate, ovate or oblong, 6–11 cm long x 3.5–7 mm across, dark green and glossy above, 
white beneath. 
Flowers: small, white. 
Fruit: a 3-lobed capsule 8 mm in diameter.

**Habitat**: (SSM-F) Coastal marshes, mangrove channels and sheltered coasts.

**Distribution**: (C,M) Indigenous from India to Polynesia, known from Truk, Yap and Palau in the Caroline Islands, and reported from Guam in the Mariana Islands.

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**Dicotyledons - EUPHORBIAEAE**
**Isomoea aquatica** Forsk.

**Vernacular:** Chinese: "long choy"; Chamorro: "jahghen"; Thai: "deei"; Filip: "kahpet"; Malay: "kongkum"; English: "sweet morning glory".

**Description:** Creeping or floating glabrous vine without twining stem. Lvs. alternate, arrow to heart-shaped, 4 - 10 cm long x 1 - 4.5 cm broad; Fls funnel-shaped, 4.5 cm long with 6 mm long sepals, corolla pale purple with deep purple throat for entirely white and thinner with broader leaves. Frt. an ovoid capsule 8 - 10 mm long.

**Habitat and Uses:** (R.C.O) This morning glory grows in and around land patches and roadside ditches. It is also cultivated as greens, especially the white flowered form.

**Distribution:** (C.M.H) Indigenous to the Old World Tropics and introduced throughout the Pacific, probably by early oriental laborers.

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**Isomoea pas-cappae** (L.) Sweet ssp. **brasiliensis** (L.v.Ootst.)

**Vernacular:** Hawaii: "pohuehue"; Palauean: "ke bea"; Chamorro: "walaq-båli"; "walaq-låri"; Polynesian: "ue noa"; English: "beach morning glory".

**Description:** Glabrous creeping, non-twining vine. Lvs. 6 - 12 cm long, often folded, lustrous with deeply notched apex; Fls. funnel-shaped, pinkish-purple with darker throat, 3 - 5 cm long. Frt. an ovoid capsule 1.5 cm long, bearing woolly seeds.

**Habitat:** (S.M.F) This plant is usually restricted to the coastal strand but often found in lowland marshes as well.

**Distribution:** (C.M.H) Indigenous throughout the Pacific.

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**Dimorphoteca**

**Monocotyledons - CYPERACEAE**

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**Scirpus**

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**Cyperus**

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**Eleochoris**

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**Fimbriostylis**

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**Dicotyledons - CONVOLVULACEAE**
Cladium leptostachyum Nees & Meyen
vernacular: Hawaiian, "lua'i"; English, "native sawgrass.

Description: Large, coarse, perennial sedge to 3 m tall with creeping rhizome 1 cm diameter. Leaves, borne along the stem, 2 m long x 8 mm broad, sickle-like, cutting teeth on margins and midrib. Inflorescence 70 cm long bearing numerous light brown spikelets 3-4 mm long.

Distribution: Cladium leptostachyum is considered to be endemic to Hawaii, however, some botanists do not consider the Hawaiian plant distinct from other populations throughout tropical Asia, Africa, Malaysia and X and S America.

Habitat: (FMF) This forms dense masses in some freshwater marshy areas.

Psycias indica (L.) Less
vernacular: English, "Indian marsh fea-
ture"; "Indian pitchfork"; "putty-bush.

Description: Branched woody shrub to 2 m tall. Leaves 2.5 - 6 cm long x 1 - 3 cm wide, alternate, oblanceolate, subcoriaceous, toothed, aromatic with glandular hairs. Inflorescence to 7 mm diameter, glabrous, purple, borne on short, leafy, reddish stems. Habitat: (FMF) Margins of coastal marshes, and other brackish areas where it sometimes forms dense thickets. This species often occurs with Bara maho in Hawaii.

Distribution: (CMH) Native from India to Malaysia, introduced throughout the Pacific near the coast.

Cyperus alternifolius L.
vernacular: Hawaiian, "lua'i wa'aaha'", English, "umbrella plant".

Description: Perennial sedge with slightly 3-angled stems 1 - 1.5 m tall. Leaves, the basal ones reduced to Blackbecks-sheaths 10 - 20 cm long, involucral leaves numerous, all nearly equid in length to 25 cm long x 12 mm across, flatish, Inflorescence unbranched consisting of many spikes, the lowest to 7 cm, and subscinduous by an involucral leaf, spikelets flattened, 3 - 9 mm long with 6 - 30 scales each 2 mm long, stigma and stamens are 3-angled, 3 mm long.

Habitat: (FMF) Cultivated as an ornament- ite and naturalized in streams, marshes and other wet areas.

Distribution: (CMH) Introduced throughout the Pacific.
Dicotyledons - COMBRETACEAE

Lumnitzera littorea (Jack) Vogt
Description: Tree to 25 m tall with slender reddish brown shaped pneumatophores covered with pores. Lvs alternate and clustered at the branch tips. Glabrous, glossy, semi- succulent, oblanceolate, 8-12 cm long x 1.5-2 cm across, entire. Fls clustered in terminal spikes, brilliant red, 2.5 cm long, Frs ellipsoidal, ribbed, green turning black, 2 cm long, crowned by the persistent calyx.
Habitat: (S.S.O) Found in the middle to landward edge of the mangrove.
Distribution: (C.M) Indigenous from Indo-Malaysia to the Western Pacific.

Cyperus buxbaumii (Rottb.) Hasak.  
Vernacular: Yap - "nikomy": Hawaii "kalapaloo", "manu ne"; English "kilinga".
Description: Perennial creeping sedge with stems to 40 cm tall. Lvs with basal rings of sheaths. Lvs 1-2 stems, 1.5-10 cm diameter, of numerous spikelets 3 mm long each having 1-2 scales, 1-2 stamina and 3 stigmas. Nut 2 sided, yellowish brown, <2 mm long.
Habitat: (F.M, R.C.F) Widely distributed throughout the tropics including most of the Pacific Islands.
Note: Another sedge, Cyperus leei E. Endl. (syn. Cyperus monstrocochus P. Rottb.) is very similar to it. Distinguish except that the inflorescence is a white umbel, ovaries are usually present throughout tropical lowland areas of the Pacific Islands.

Eclipta alba (L.) Hasak
Vernacular: Chamorro "tilmo", English "false daisy".
Description: Branching upright or procumbent herbs to 50 cm tall. Lvs 3-8 cm long x 1-2.5 cm across, opposite, sessile, elliptic to lanceolate with appressed white hairs. Flower heads white 0.5-1 cm diameter, borne singly or paired in the leaf axils on peduncles to 3 cm long. Frs green turning black.
Habitat: (C.R.F)
Distribution: (C.M.S.H) Pan-tropical, presumably introduced throughout the Pacific.

Cyperus difformis L.
Description: Annual clumped sedge with 3-angled stems to 60 cm tall. Lvs, life basal ones long, shorter than stem, the internodes long, 3-angled stems. Inflorescence consisting of 3-9 primary rays, 1-4 cm long, each with either short secondary rays, or directly bearing light clusters of flattened spikelets, the clusters 5-15 mm across with the spikelets 2-6 mm long with 10-32 scales each <1 mm long, stamens 1-2, stigmas 3. Nut 3-angled, shiny yellowish or pale brown, <1 mm long.
Habitat: (R, C.O) Known from wet lowland areas.
Distribution: (C.M.H) Pan-tropical, naturalized throughout the Pacific.
Cyperus haspan L.

Description: Slender weak-stemmed perennial sedge with 3-angled stems to 40 cm tall (or to 100 cm in sap, in rare cases). Leaves, the basal ones often reduced to bladeless sheaths 2 to 10 cm long; the 2-3 insculpted leaves to 10 cm long. Inflorescence 2-3 times compound, the primary rays to 15 cm long, spikes arranged in an umbel in clusters of 3-10, each spikelet flattened. 5-10 mm long x 1-2 mm broad.

Habitat: FS, FM, CR, RF. This is a wetland species found as a weed in taro patches, wet fields, and, especially on the island of Hawai‘i, in montane forests in the forest resulting from disturbance.

Distribution: CR Pan-tropical in distribution.

Dolichochondron spathaceae (L.) K. Schum.

Description: Tree 5-10 m tall. Leaves each 6-22 cm long x 3-10 cm across. F: 5. Falling by mid-morning, white, tubular, funnel shaped, about 20 cm long in stems 4. F: 1 slightly flattened capitule 25-60 cm long x 2-3 cm across in heads with corky wings.

Habitat: GB. These trees naturally occur at the sandward edge of the mangrove and other somewhat swampy windward areas.

Distribution: GB (Indigenous only to Yap and Pohnpei in the Carolinian Islands and India through Malaysia to New Guinea.)

Drymaria cordata (L.) Willd.

Description: Low creeping herb with slender stems. Leaves opposite, orbicular, 0.5-2 cm diameter. F: 1-4 mm long with 5 petals and sepals. Fruit a thin-walled sticky capsule to 4 mm long.

Habitat: FS. RF. A weed of disturbed places including cultivated and ruderal habitats, and muddy openings in the forest resulting from disturbance.

Distribution: F. This is an American species naturalized in Hawaii.

Monocotyledons - CYPERACEAE

Cyperus jaccoudii Houtt.

Description: Perennials with slightly 3-angled stems 40-100 cm tall. Leaves, the basal ones numerous, longer than the stem, 8-12 mm across, conspicuously gray-green with rough leaflets margins, the involucral leaves 5-8, up to 75 cm long. Inflorescence compound, to 15 cm across, primary rays 6-12, up to 10 cm long, secondary rays numerous, longer than the stem, 5-12 mm across arranged in spines with 6-12 leaflets, each 15-20 mm long, yellowish brown or brownish gray, stiff and stiff leaves; F: 3, Nut 3, B: 3, S: 3, S: 3, 3-angled, flat, dark brown or black, 1.5 mm long.

Habitat: GSF. Often found in coastal marshes exposed to salt or brackish water at the mangrove coastal intertidal interface, and an occasional weed in lowland taro patches.

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Monocotyledons - CYPERACEAE

Cyperus haspan L.

Description: Slender weak-stemmed perennial sedge with 3-angled stems to 40 cm tall (or to 100 cm in sap, in rare cases). Leaves, the basal ones often reduced to bladeless sheaths 2 to 10 cm long; the 2-3 insculpted leaves to 10 cm long. Inflorescence 2-3 times compound, the primary rays to 15 cm long, spikes arranged in an umbel in clusters of 3-10, each spikelet flattened. 5-10 mm long x 1-2 mm broad.

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Distribution: CR Pan-tropical in distribution.

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Habitat: FS. RF. A weed of disturbed places including cultivated and ruderal habitats, and muddy openings in the forest resulting from disturbance.

Distribution: F. This is an American species naturalized in Hawaii.

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Habitat: GSF. Often found in coastal marshes exposed to salt or brackish water at the mangrove coastal intertidal interface, and an occasional weed in lowland taro patches.

Monocotyledons - CYPERACEAE

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Description: Low creeping herb with slender stems. Leaves opposite, orbicular, 0.5-2 cm diameter. F: 1-4 mm long with 5 petals and sepals. Fruit a thin-walled sticky capsule to 4 mm long.

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Distribution: F. This is an American species naturalized in Hawaii.

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Habitat: FS, FM, CR, RF. This is a wetland species found as a weed in taro patches, wet fields, and, especially on the island of Hawai‘i, in montane forests in the forest resulting from disturbance.

Distribution: CR Pan-tropical in distribution.

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Habitat: GB. These trees naturally occur at the sandward edge of the mangrove and other somewhat swampy windward areas.

Distribution: GB (Indigenous only to Yap and Pohnpei in the Carolinian Islands and India through Malaysia to New Guinea.)

Drymaria cordata (L.) Willd.

Description: Low creeping herb with slender stems. Leaves opposite, orbicular, 0.5-2 cm diameter. F: 1-4 mm long with 5 petals and sepals. Fruit a thin-walled sticky capsule to 4 mm long.

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Distribution: F. This is an American species naturalized in Hawaii.

Monocotyledons - CYPERACEAE

Cyperus jaccoudii Houtt.

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Habitat: GSF. Often found in coastal marshes exposed to salt or brackish water at the mangrove coastal intertidal interface, and an occasional weed in lowland taro patches.
Belis maritima L.
Verneuillia; Hawaii: "Sukluk-kai", English "saltwort", "pickle weed".
Description: Deciduous, woody stemmed, spreading, succulent shrub with erect young branches; <1 in long. Lvs: dioecious, succulent, linear to oblong; Fls: minute; borne in axillary clusters to 3 cm long; Fr: fleshy, 1 cm long consisting of the seedlet - inflorescence.
Habitats: (SM-F) Belis is a colonizer of lowland mud flats and fish ponds, often forming a virtually monotypic salt marsh vegetation. It is also found in other areas under tidal influence, as on raised coraline beach rock, and often occurs with Rhipheus indicus.
Distribution: (H) Native to the New World Tropics, introduced to Hawaii; Not naturally occurring throughout the Pacific Islands.

Cyperus leucipogon L. (Cyperaceae: Cyperoideae: Sparganothae)
Verneuillia: Hawaii: "ehu/sewa", "mahakoa".
Description: Perennial creeping sedge with roundish stems; 10 - 70 cm tall x 0.3 - 0.5 cm diameter. Lvs: the basal ones often reduced to sheaths, the blade, when present, 1 - 2 cm long, 1 - 3 per stem. Inflorescence a tight umbel; 10 - 60 mm long of 2 - 15 spikelets, each spikelet with 10 - 14 scales; 2 - 2.5 mm long; styles 2, stamens 3; Nut 1 mm long.
Habitats: (SM, FM: 0) Known from coastal marshes.
Distribution and Uses: (H) Known from many tropical areas, but not widely distributed in the Pacific. This fine, highly prized rice from the island of Niue, Hawaii were made from this sedge. Its stems were also used to strain sawa, a drink made of Pipturus methysticum.
**Cyperus figularis L.**

Description: Robust, tufted, perennial sedge with sharply pointed stems 30-80 cm tall. Leaves, the basal ones as long or longer than the stems, grey-green with cutting edges. Inflorescence compound, umbel-like, with 2-12 rays each to 10 cm long. Spikelet cylindrical, 4-6 mm long with 2-6 scales 2.5-3 mm long, the spikelets spreading from the axis and borne in dense spikes obscuring the axis. Stamens 3; Nut 3-sided, obovate, 1.5 mm long, brown.

Habitat: (DM FM SC) Known from wet coastal areas.

Distribution: (M) Known from Tropical Africa and America, and reported from Guam in the Marianas.

**Barringtonia racemosa (L.) Britton and B. samoensis Gray**


Description: Small to medium-sized trees. Leaves succulent, obovate, 15-30 cm long with 8-10 cm across, margins serrate or entire. Flowers with 4 petals 2.5-3 cm long, and numerous conspicuous white to pinkish (or in Palau, sometimes magenta) stamens 3-4 cm long. Fruits are clustered forming a "head" and are flattened or angled, bearing 2-4 persistent sepals at the top.

Habitat: (FS F) This species is found along streams, flood plains, swamp forests, and sometimes at the landward edge of mangrove vegetation.

Distribution: (C M S P) Reports of birds nesting also very common along the coast and in shallow water. Forests with the cays open at the top in tract. White F. philippinensis is found in mangrove forests in the Philippines. F. racemosa is common in mangroves in the Philippines and in the Pacific Islands. F. samoensis is common in mangroves in the Philippines and in the Pacific Islands. No species are used as a fish poison.

**Cyperus odoratus L.**

Vernacular: Ponepe "supe-nat", Truk "tagopon", Hawaiian: "pololak", "mao-lo-lo-lak".

Description: Annual or perennial sedge with triangular stems 20-100 cm tall. Leaves, the basal ones shorter than the stems. Flattish, the 1-5 evoluted leaves to 90 cm long. Inflorescence loose to dense, the several primary rays to 20 cm long, bearing secondary rays and finally cylindrical spikelets 10-25 mm long x 1.5-1.5 mm broad, the spikelets spreading, yellowish-green with 10-20 scales, each 2-3.5 mm long; stamens and stigmas 3; Nut 1.5-2 mm long, greyish brown to black. 

Habitat: (FM R C P) Known from wet ditches, fields, marshes and along rivers.

Distribution: (C M S P) Pan-tropical in distribution including most of the Pacific Islands.

**Dicotyledons - BARRINGTONIACEAE**

(**LECYTHIDACEAE)**

**Monocotyledons - CYPERACEAE**
**Senecio portulacastrum**

**Vernacular:** Hawaiian: ‘alii; English: sea purslane.

**Description:** Succulent, herbaceous halophyte; Stems prostrate, from 0.5 to 1 m long; Leaves linear, pinnate, 4-6 cm long; Flowers small, yellow, 8-12 mm long; Seeds ellipsoid, glossy, 2-4.5 cm long; Fls. often solitary in leaf axils or with 3 sepals; 5 mm long, pink on the inside and green on the outside; Frt. an ovoid capsule which splits along a circular line about the middle.

**Habitat:** SM.F. Grows in coastal wetlands and other coastal areas including mud flats and areas of soil rich in sandstone, which are periodically exposed to saltwater or salt spray.

**Distribution:** M.H. Found near the coast throughout the Pacific.

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**Alternanthera sessilis** (L.) R. Br.

**Vernacular:** English: "sessile joy weed"; Pacific: ‘okura below reach.

**Description:** A variable creeping or occasionally floating herb; Lvs. sessile or almost so, opposite, 1-5 cm long x 0.4-1.5 cm across, oblong-lanceolate, acute; Fls. in sessile white axillary clusters; Frs. sessile without bracteoles, becoming the persistent style between the lobes.

**Habitat:** C.R.F. Found as a weed in cultivated or ruderal habitats.

**Distribution:** C.M.H.S. Alternanthera is a pantropical herb found throughout the Pacific Islands.

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**Cyperus papyrus** L.

**Vernacular:** Egyptian: "papyrius.

**Description:** Perennial sedge 1-5 m tall with roundish to slightly angled stems; 1-3 cm thick; Lvs. the basal ones reduced to bladeless sheaths, the involucral leaves are much shorter than the florets; Inflorescence compound with numerous slender spikelets; Spikelets linear, 6-10 mm long x 1 mm across bearing 5-20 scales; Stems 1-2; Nut oblong, 3 angled.

**Habitat:** C.R.F. Known from streams and swampy areas, also cultivated as an ornamental.

**Distribution:** Native to Africa and Madagascar, and sparingly naturalized in Hawaii and other Pacific Islands.

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**Cyperus polygonatus** Rottb.

**Vernacular:** Bonin: "spadix in rectiusfiae.

**Description:** Tufted sedge with erect 3-angled stems 10-60 cm, x 1-2 mm diameter; Lvs. the basal ones shorter than the stem; the 3-5 involucral leaves to 20 cm and overlapping the inflorescence; Inflorescence a compact, regularly spaced cluster 2-5 cm across, usually without long rays, or occasionally with rays to 7 cm; Spikelets flattened, linear, 1-2.5 cm long x 1.5-2 mm across, bearing 10-45 yellow-brown scales, each 1 mm long x 0.1-0.5 cm across; Stems 2; Stems 1-2; Nut dark brown, about 1 mm long.

**Habitat:** C.R.F. Sometimes found under occasional influence of brackish water.

**Distribution:** C.M.S.H. Pantropical, including most of the Pacific Islands.
**E. acicularis**

**Description:** Perennial sedge with erect stems 3 - 20 cm tall. **Lvs** reduced to basal sheaths, **Inflorescence** a single cylindrical spikelet 12 - 18 mm long x 3 mm across with numerous scales 1.5 - 3 mm long, bristles 3 - 4, stemma 2 - 3, styles 2 - 3. **Nut** ovoid, yellow or pale brown, 1.5 - 3 mm long.

**Habitat:** (FM, C, R, F)

**Distribution:** (C, H) Also known from North America, Europe, Asia and probably elsewhere in the Pacific.

**Notes:** This specie is used as a food source as the roots and shoots are edible.

**E. geniculata**

**Typha angustata** Bory & Chau.

**Description:** Shrubs 1 - 2 m tall. **Lvs** opposite, 10 - 20 cm long x 4 - 6 cm across. Inflorescence a spike 7 - 10 cm long of white flower heads 2 - 2.5 cm long. **Nut** a capsule 2 - 2.5 cm long x 0.75 - 1 cm across.

**Habitat:** (O, C, O) Found toward the landward edge of mangrove vegetation, and along tidal banks and mangrove channels under marginal tidal influence.

**Distribution:** (C, H) Indigenous to Malaysia and Palau.

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**Acanthus ebracteatus** Vahl

**Vernacular:** Palau “koliti”

**Description:** Shrub 1 - 2 m tall. **Lvs** opposite, 10 - 20 cm long x 4 - 6 cm across. **Inflorescence** a spike 7 - 10 cm long of white flower heads 2 - 2.5 cm long. **Nut** a capsule 2 - 2.5 cm long x 0.75 - 1 cm across.

**Habitat:** (O, C, O) Found toward the landward edge of mangrove vegetation, and along tidal banks and mangrove channels under marginal tidal influence.

**Distribution:** (C, H) Indigenous to Malaysia and Palau.
Rupplia marina L. (Hailing rupplia St. John & Fosk.)

 Vernacular: English "leak fassel", "widgit grass"

 Description: Submerged grass-like herb with slender, branched, whitish stems to 1.5 m long. Lvs alternate with a basal sheath, the blade 2 - 20 cm x 1 mm or less broad. Inflorescence at first spike-like but later umbel-like and borne on a stalk to 1 m long, this coiling after flowering. Fls small. Frs ovoid, 2 - 3 mm long.

 Habitat: (SA, O) Braiding streams, lily ponds and marshes, often exposed at low tide.

 Distribution: (M, H) Widely distributed throughout the world with the variety known from the Philippines to Polynesia including the Caroline Islands. It may get harvested from American Samoa or the Carolines.


 Vernacular: English "spike rush"

 Description: Annual tufted sedge with slender, erect stems 5 - 40 cm tall. Lvs reduced to basal sheaths. Inflorescence a firm globule to oblong spikelet 4 - 8 mm long x 3 - 3.5 mm across with numerous scales. 2 mm long and 6 - 8 bristles; stamens 2 - 3; styles 2; Nut 2 sided, obovate, shiny black, <1 mm long.

 Habitat: (FMO, ROI)

 Distribution: (C, M, S, H)

 Note: This species with shiny black nuts strongly resembles E. microcarpa which has anther filaments black and a nut which is long and not as widespread as E. germinata.

 Typha imputata Bory & Chev.

 Vernacular: English "cattail"

 Description: Robust perennial sedge-like plant with branched rhizome to 3 cm diameter bearing erect stems 1 - 3 m tall. Lvs 20 - 150 cm long x 0.5 - 3 cm wide along the stem with the leaf sheaths overlapping. Inflorescence cylindrical brown, terminal on the stem and bearing tightly packed flowers, the densely woolly portion of the inflorescence borne below the male portion, the 2 separated by about 2 cm. Frs dispersed by the hairs of the female flowers.

 Habitat: (GM, FMO) A species of fresh or sometimes brackish marshes, ponds and slow-moving streams.

 Distribution: (H) Native to Eurasia and naturalized in Hawaii.

 Note: Another species? 7 varieties is also known from this area. They are often found in the same or similar habitats.

 Eleocharis ochrosaechys Steud.

 Vernacular: Ponape "mahitmat"; Palau "kernimes"

 Description: Perennial sedge with erect pithy stems 35 - 70 cm tall. Lvs reduced to basal sheaths. Inflorescence a cylindrical spikelet 10 - 20 cm long x 3 - 4 mm across, with numerous brown to yellowish brown scales 4 - 6 mm long and 6 - 7 bristles; stamens 2 - 3; styles 2; Nut 2 sided, shiny brown to gray 1.5 - 2 mm long, obovate.

 Habitat: (F, M, O) In Ponape it is often found as a co-dominant with the club moss, Lycopodium centunum, in standing water of old cultivated fields.

 Distribution: (C) Native to Asia; naturalized in the Caroline Islands.
Monocotyledons - CYPERACEAE

Fimbristylis cymosa R. Br.

Vernacular: Truk "menekke".

Description: Perennial sedge with erect 3-sheathed stems 10 - 50 cm tall. Leaves, the basal ones, flatish, shorter than the stem, 1.5 - 3 mm wide, without a membrane or row of hairs between blade and sheath, the 2 - 3 involucral leaves 0.5 - 1 cm long. Inflorescence with 3 - 8 primary rays 1 - 4 cm long, spikelets single or clumped 3 - 6 mm long 2 mm across, with many scales, each 1.5 - 2.25 mm long, stamens 1 - 3, stigmas 2 - 3, Nut 2 - 3, obovate, brownish, < 1.1 mm long.

Habitat: (SM, R, F) A wetland species from coastal marshes and ruderal habitats.

Distribution: (C, S, M, H) Pan-tropical, known from most of the Pacific and American tropics.

Note: This is a quite variable species, and different authors have various taxonomic changes, including its synonymy with F. hawaiiensis.
Eichornia crassipes (Mart.) Solms
Vernacular: English "water hyacinth".
Description: Floating herbs to 60+ cm tall with masses of black roots. Lvs oval with inflated petioles. Fls borne in a spike 40 cm long, each made up of less siblings flower 5 cm diameter with 6 pale violet petals, the uppermost with a yellow blotch.

Habitat: (FA.O) This rapidly multiplying aquatic herb thrives in streams and ponds and even occasionally in brackish water. In some parts of the world it is a serious pest due to its tendency to block waterways.
Distribution and Uses: (C.M.H) Native to the New World tropics. It is introduced in the Pacific. The young leaves, leaf stalks and flowering parts can be cooked and eaten.

Monochoria vaginalis (Burn.) Presl
Description: Aquatic perennial herb, emergent to 30 cm tall with short submerged rhizomes roiled in mud. Lvs of young plants submerged and without a developed blade, in older plant leaves emergent, the blade ovate or oblong 5-15 cm long x 0.5-10 cm across. Fls 11-15 mm long with none or 6-8 of having a yellow spdt, all opening at once and surrounded by 2-3 ovate bracts 3 of flowered racemes, Fr a capsule 1 cm long.
Habitat: (FA.O) Found in slow-moving streams, ponds and ditches.
Distribution: (P) Native to Asia and Malaysia. Introduced to Hawaii presumably as an ornamental and sparingly naturalized there.

Fimbristylis globulosa (Retz.) Kunth
Description: This species has an umbel-like inflorescence of ovate spikelets, similar to F. littoralis (see description). But F. globulosa is often taller, to 60 cm tall with leaves mostly reduced to just the basal sheaths. Spikelets consist of ovate spikelets 4-9 mm long having ovate scales 2-3.5 mm long and borne on primary rays up to 10 cm long.
Habitat: (FAR.C.O)
Distribution: (C.M.H) Known from 5.E. Asia to the Pacific.

Fimbristylis littoralis Gaud.
Description: Annual or perennial tufted sedge with stems 4-5 angled and 10-80 cm tall. Lvs bases with blades to 35 cm long. Inflorescence compound, umbellate, with branches up to 7 cm; spikelets globose 2.5 mm long with numerous ovate scales 1.5 mm long; styles 3; stamens 1; 2, Nut obvolute, 3 angled 0.5-1 mm.
Habitat: (F.M.R.C.F)
Distribution: (C.M.H) Pan-tropical.
Note: The species is often misclassified as F. littoralis by those not familiar with this naturalized species.
Fuirena umbellata Rottb.

 Vernacular: Yap "yellow"

 Description: Perennial erect, sedge to 1 m tall; the stems 4-5 angled; leaves in whorls, 5-nerved. 20 cm long and to 1.3 cm wide with 5 nerves; Inflorescence a terminal, dense often with axillary branches along the stem, the spikelets in dense, ovate to ellipsoid, clusters 4-10 mm long; these arranged in umbellike cymes strongly nerved; 2-2.5 mm long; Nut 3 angled, obovate, brown, about 1 mm long.

 Habitat: (FM, C, R:O) This is a wetland species commonly found in taro patches, bomb craters, abandoned areas of cultivation and ruderal wetlands. It is often associated with Rhyncophorus corymbosa

 Distribution: C: Mi Pan-tropical in distribution

 Pandanus omlimensis in the savannah wetland, Gagl-Tomil, Yap.
**Pandanus spp.**

**Description:** Members of this genus are characterized by being shrubs or trees often with prop roots and having strap-like leaves with cutting, toothed margins and midrib. They are often used for mailings and basketry. Numerous species of Pandanus are known throughout the Pacific. Mostly they are lowland trees of coastal areas and should not be confused with wetland plants. Some are found in mangrove areas. Pandanus *kanehira* Maire, which grow at mangrove margins in Palau and are characterized by having leaves to 10 cm across and raceme clusters of yellow-orange globose heads 9 - 15 cm in diameter which have numerous indistinctly and deeply grooved keys (sections) +4 cm across. Several facultative wetland species are slender trees found in swampy forests with leaves 2 - 5 cm across, these with keys (segments) <5 mm across. These uncarpellate species having only one stigmatic surface (raised bump) on each segment include *P. comosus* Henst., from Palau and New Guinea known as "malual" on Palau; *P. jarabensis* Mart. from Yap, "tineh"; *P. macrocarpus* Mart. from Palau, "ongor" and "tush"; *P. amakinenki* Mart., and *P. amakiensis* Schult., also from Palau. The common coastal pan-Pacific species *P. odoratissimus* L. is occasionally found near wetlands, but usually is on dry land. However, some closely related taxa which resemble it are wetland species such as *P. lomansii* Kanehira from the savannah wetlands on Yap. The whole genus is taxonomically difficult with entire clusters of fruits and entire leaves (without a broken tip) needed for identification.

**Habitat:** (FM, FS) [especially for C (F & O)]

**Distribution:** (C, M, S, H) The wetland species are more common in the Caroline Islands than other areas discussed in this guide.

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**Lasiorhiza articulata** (Retz.) Domin

**Description:** Upright tough, gray-green sedge to 1.5 m tall having hollow stems with prominent crosswalls; *LS* reduced to basal sheaths 10 - 30 cm long; *Inflorescence* a many-flowered spikelike, 1 - 2 cm long x 5 - 8 mm across apparently arising from the side of the stem with brown, broadly oblong-elliptic bracts 4 - 6 mm long, *Nut* 3 - 4 mm long, obovoid, brown.

**Habitat:** (FM, O) Found as a dominant in certain upland marshes where it apparently fills shallow ponds, and is only found in thin mud or standing water.

**Distribution and Uses:** (C) cultivated in Southern China, Taiwan and perhaps, Malaysia for matting. In the Caroline Islands it apparently is not actively cultivated and found only on Yap.
Monocotyledons - CYPERACEAE

Mapania spp.

Description: Rootstems to 2 m tall, sometimes resembling small Pandanus plants. Live tough, 0.6 - 2.6 m long x 1.5 cm wide, usually with 3 prominent nerves, and with saw-toothed, cutting margins. Inflorescences terminal on a main stem or leaf stalk. Inflorescences small, 5 - 12 mm long, nuts obvoid, 5 - 7 mm long.

Habitat: Forests, swamps and coastal dunes. Known from lowland upland freshwater swamps.

Distribution: Known from lowland swamps in the Solomon Islands, Vanuatu, New Caledonia, Fiji, and the Philippines.

Uses: The leaves are sometimes used for making mats.

Top photo: Mapania macrocephala
Bottom photo: Guanche with Mapania beneath Pandanus in Palau.

Monocotyledons - LEMNACEAE

Lemna, Spirodela and Wolffia

Description: Duckweeds are small floating herbs of widespread distribution known from many freshwater habitats. They usually have small roundish fronds that reproduce by budding and form large floating colonies. The genera known from the Pacific region can be distinguished in the following key.

1. Roots present, fronds > 1 mm, flat
2. Roots usually more than one per frond, the fronds 5 - 8 mm long, often tinged with purple or brown
   + Spirodela
3. Roots one per frond, fronds 2 - 5 mm long, green
   - Lemna

Habitat: (PACIFIC) Known from the Pacific, Lemna reported from the Hawaiian Islands as naturalized in Hawaii. Lemna is known throughout the Pacific where it often is found in lagoons. The two species of Lemna are: L. minor, which has a thinly winged root sheath and L. minor that has a root sheath without lateral wings. L. minor is common of the two but is often mistaken for L. minor.

Lemna minor

Hypa fruticans Wurmb

Vernacular: Kosea "kaia", "kaiaa"; Panage "pahian"; Truk "kuaia", "kaia", Yap "aien"; Palau "flauw"; "foeia", "foeia"; English "nipa";

Description: Palm to 7 m tall with prostate, usually submerged fronds. Fronds pinnate, 3 - 7 cm long, erect. Inflorescence borne near the ground. Flowers in a golden cylin- drical spike, flowers in a globular head; Fruit a globose mass 12 - 30 cm diameter, each individual fruit obovate, 2 - 4 ridged; 9 - 10 cm long, dark brown.

Habitat: (SSS) Found rooted in mud at the landward edge of mangrove swamps and along estuaries in brackish or saltwater, or occasionally upstream apparently not far from influence.

Distribution and Uses: Native throughout the Caroline Islands, naturalized but not common in Guam. The fronds of this palm are used for thatching and the young inflorescences are a source of a sugary sap that can yield an alcoholic drink.

Note: See photograph on back cover.
**Thalassia hemprichii** (Ehrenb.) Aschers.

**Vernacular:** English "turtle grass", "seagrass".

**Description:** Pinnate aquatic marine herb with spiral creeping rhizome. Lvs strap-like, 10 - 40 cm long x 4 - 11 mm across; Fls 7 - 8 mm long, on stalks 5 - 6 cm cm long, with ovary (excluding spiral ) to 4 cm long. Fruits 2 - 3 cm, elongating after flowering. Fru green, globose to cylindrical 0.9 cm diameter, splitting into about 30 segments.

**Habitat:** (SAO) Groves submerged in shallow coastal bays, rooted in sand, mud or in pools of tidal flats. Found in extensive seagrass meadows with other seagrasses, and sometimes exposed at low tide.

**Distribution:** (C,M,S) Tropical regions from Africa to the Western Pacific. Known from the Caroline Islands, and possibly from Guam in the Marianas.

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**Juncus effusus** L.

**Vernacular:** English "soft rush".

**Description:** Sedge-like plant with densely tufted round leaf-like stems to 1.5 m tall. Lvs, the true ones reduced to basal sheaths, only 4 - 15 cm long. Inflorescence a lax cluster 2 - 10 cm long borne near the tops of the stems and bearing flowers 2 - 4 mm long, with 6 yellowish or greenish purple-like parts having a membranous margin. Fru ovate, 2 - 4 mm long, 1.5 - 2 mm wide.

**Habitat:** (FSQ) Found in disturbed muddy places in forests.

**Distribution:** (H) It is worldwide in distribution and is naturalized in Hawaii.

**Note:** Other species are known from many coastal areas in the tropics and subtropics. Some are tall, some are more shrubby, some are aquatic, and some are terrestrial. The simple, sheathed leaves distinguish them from sedges.
Scirpoideae ghaier (Gaertn.) Merr.

**Vernacular**: Pongape “poliek”; Samoa “alu folofo”.

**Description**: Large, perennial sedge to 2 m tall. Lvs 1 - 5 mm x 2 - 6 cm across, tough, nodulate, saw toothed on the midrib and margins. 3 prominent nerves, the midrib being more prominent than the lateral nerves on the lower surface. Inflorescence with sessile, brown spikelets in a congested head-like cluster 6 - 12 cm long and 5 - 8 cm across. Fls mostly hexagonal 10 - 15 mm long, 6 - 8 mm wide, brown.

**Habitat**: (FG,PM,SS,O) Found in freshwater swampy forests and also at the landward edge of mangrove swamps exposed to brackish water. Scirpoideae is always rooted in mud, and can be found as a dense understory, or as a few scattered individuals.

**Distribution**: (C) Known from Ceylon to Micronesia and Polynesia.

**Halophila ovalis** (R. Br.) Hook. and **H. micror (Zoll.) den Harstog**

**Vernacular**: English “seagrass”.

**Description**: Dioecious aquatic marine herbs with slender creeping rhizome. Lvs opposite, ovate to oblong. Fls borne within 2 bracts at base of paired flowers. - Flower with 3 styles and ovary 1 - 2 mm long, flowers with 3 stamens. The sexes can be distinguished by the following characters:

- Leaf blades 10 - 40 mm long with 12 - 25 pairs of secondary veins. 
- H. ovalis Leaf blades 5 - 20 mm long with 6 - 12 pairs of secondary veins.

**Habitat**: (SA,O) Both species are found in saltwater aquatic wetlands where they grow rooted on sheltered, sandy or muddy substrates, or sometimes coral reefs. Though usually submerged, both species may be exposed at low tide.

**Distribution**: (C,M,H,S) Halophila ovalis is reported from the Caroline Islands, Samos and Hawaii, though some authors choose to recognize the Hawaiian plants as distinct under the name Halophila hawaiiana. The second species, H. micror has been reported from the Caroline and Mariana Islands in addition to Samos (see table of species under discussion of the Saltwater Aquatic Vegetation type, page 6).

**Hydrida verticillata** (L.) Royle

**Vernacular**: English “waterweed”.

**Description**: Dioecious submerged herb with slender stems. Lvs whorled with 3 - 8 at a node. 6 - 40 mm long x 1 - 5 mm broad, usually sessile; Fls 2 - 3 mm long, the sessile in leaf axis but detaching and floating to water surface at time of flowering. Stamens 3 - borne in leaf axis and remiging on a stalk 1 - 6 cm long to water surface when floating. 2 pairs of bracts.

**Habitat**: (F,A,O) Found in ditches, ponds and streams.

**Distribution and Uses**: (M,H) From southern Europe and Africa, through to Asia and Australia. Introduced through the Pacific where it has become naturalized in some areas including Guam. It is a fairly common aquarium plant, and is a troublesome pest in some areas because of its dense growth which clogs waterways.

**Note**: This plant has two forms with flowers and without flowers and both forms with flowers and without flowers are found.

**Monocotyledons - HYROCHARITACEAE**

**Egeria**

**Hydrilla**
Egeria densa (Rancho)

Vernacular: English "dense waterweed"

Description: Dichotomous much branched submerged herb. Leaves: 3-6 mm at a node. 15-30 mm long x 2-5 mm across. Fine serrate. Flats: 6-10 mm long and 3 mm res. Flowers with 9-10 stamens; 3 fertile at the base with 3 sterile stamens; Fert 7-8 mm long.

Habitat: (FA.O) Found in ditches, ponds and streams.

Distribution and Uses: (NM) Native to South America; cultivated in aquaria and ornamental lakes and ponds, where it sometimes becomes an aquatic weed.

Notes: Purchased are typically younger smaller 3-4 mm long and 2 mm res. (see notes)

Scirpus spp.

This genus is common in marshy areas throughout the world with a few species known from the Pacific. Provided here is a key to the most common species of Scirpus in the Hawaiian Archipelago (H), Carolines (C), and Mariana (M) Islands. None have been reported from Samoas.

1. Inflorescence lateral with the stem appearing to extend above the inflorescence; basal leaves reduced to bladdersheaths.

2. Spikelets borne on rays, not sessile on the main stem; plants usually > 1 m tall.

3. Bristles below ovary 5-6, backwardly barred (use hand lens)

4. Plants 1-2 m tall, dark green .................. S. californicus (H)

5. Plants 0.6-1.5 m tall, gray-green .................. S. stellatus (M)

6. Spikelets sessile on the stem, not borne on developed rays; plants <90 cm tall; ................. S. juncoideus (H, C, M)

1. Inflorescence appearing terminal, with drooping involucral leaves present; basal and stem leaves with a true blade .... S. maritimus var. paludosus (H)

Enhalus acoroides (L.) Rich.

Vernacular: English "seagrass"; Ponape "goat".

Description: Dioecious aquatic marine herb with solid creeping rhizome densely covered with stiff black bristles which are the persistent fibrous portions of old leaves. Fert straplike, 1-15 cm long x 1-2 cm across, with thick margins; Flats 1-11 mm long, borne on stalk. 6-11 cm long, breaking off and floating to water surface to effect pollination. 4-6 cm long, borne on a stalk to 50 cm, and floating on water surface at time of pollination. Their drawn under water by coiling of the flower stalk. Fert 5-7 cm, green, splitting irregularly.

Habitat: (SA/O) Found in saltwater wetlands rooted on reef flats and forming dense patches with other seagrasses. These communities are the habitat for the endangered Dugong in Palau.

Distribution and Uses: (CM) From the Indian Ocean to the Western Pacific. The stiff black hairs at the base of this plant were the strongest Ponapean fibers.

Scirpus californicus (C.A. Meyers) Studd

Vernacular: English "California bulrush"

Description: Stout perennial sedge to 4 m tall with rounded stem. Leaves reduced to basal sheaths. Inflorescence loosely umbellate to 10 cm across with narrow spikelets 5-10 mm long having numerous ovate, reddish-brown pointed scales to 3 mm long; 2-4 reddish-brunette present below the ovary.

Nut 4-6 sided, 2 mm long.

Habitat: (FM/O, D) Found in streams and lowland marshes.

Distribution: (4) Native to N. America and naturalized in Hawaii, but apparently not as common as S. latifolius var. valida.
**Monocotyledons - CYPERACEAE**

*Sporobolus virginicus* (L.) Kirt.  

**Vernacular:** Chamorro "totoquit". T'aik "marar". Hawai'i "aki". Mānene-nadii".  

**English:** "beach dropseed". "saltgrass".  

**Description:** Perennial grass with tufted stolons and direct branches to 30 cm tall.  

**Habitat:** (SMF) Found in coastal marshes and other coastal habitats, usually rooted in sand.  

**Distribution:** (C.M.H.) Known from Madagascar through Asia to Australia and some of the Pacific Islands. The var. roxii (Kiew.) Koyama & Stone is possibly indigeneous to Hawai'i, but probably not sufficiently distinct from the species to warrant recognition.  

**Blyxa sp.**  

**Description:** Submerged aquatic herbs rooted in mud.  

**Habitat:** (FM, FAO) Found in freshwater aquatic wetlands such as reservoirs, ditches, bomb craters, and marshes.  

**Distribution:** (G) Known from Africa to Australia, and in S. Asia. Probably easily dispersed by water.  

Note: The species of *Blyxa* are distinguished by other characteristics than the shape of the leaves and flowers.  

**Monocotyledons - GRAMINEAE**

**Vernacular:** English "bulrush".  

**Description:** Tufted swamp with erect round or slightly angled stems 30 - 90 cm tall.  

**Habitat:** (FSM) Found in coastal marshes, marshy areas, and ditches.  

**Distribution:** (C,M,H) Known from Madagascar through Asia to Australia and some of the Pacific Islands. The var. roxii (Kiew.) Koyama & Stone is possibly indigeneous to Hawai'i, but probably not sufficiently distinct from the species to warrant recognition.  

**Monocotyledons - HYDROCHARITACEAE**
Phragmites australis (P. a.)

VERNACULAR: Chamorros "K%Hiap", Kosrae "Tal", Pohnpeia "Ilara", Yap "Ilo"; Chuuk "Uboi";
Yap "O'chei", Palau "Akedo"

DESCRIPTION: Tall reed to 5m tall; the stem to 2cm diameter at the base. LVS with blades flat, 40-70cm long × 2-4cm apical.

INFLORESCENCE: a much branched panicle 30-70cm long of 3-flowered spikeslets 3-8mm long, with abundant silky hairs.

HABITAT: [FM: C;R;F] Found in freshwater or brackish water marshes, also in overgrown abandoned cultivated wetlands.

DISTRIBUTION: (C;M;S;S) Indigenous to Africa & the Western Pacific.

Scirpus lotschertii Schrad. (Including var. hawaiianus Franch.)

VERNACULAR: English "bulrush".

DESCRIPTION: Perennial sedge with round to slightly 3-angled grayish green stems 60-150cm tall arising in a row from a nonrooting rhizome. LVS reduced to basal sheaths. INFLORESCENCE appearing on the side of the stem and consisting of small spikeslets borne along the spikeslet axis; the spikelet axis is 3-5 mm long with many oblong scales 3.5-4mm long and 3-5 fringed bristles among the 2-3 anthers; stylus 2; nut elliptic to obovate, flattened, brown to black, 2mm long.

HABITAT: (S;M;S;S) Known from brackish, marshy places.

DISTRIBUTION: (M) Native from Europe and Africa to Asia. It is reported in the Pacific from Guam in the Marianas, but not from the Carolines, Hawaii or Samoa.
**Scirpus meridiorum** L. var. paludosus (A. Nels.) Kuk.

_N._ var. _paludosus_ is a var. of _Scirpus meridiorum_, which is a common species in wetland areas. It is distinguished by its low stature and broad leaves, which help it to thrive in marshy conditions.

**Veronica spicata** (L.)/scaposa (A. Nels.)

_V._ spicata_ and _V._ scaposa_ are both species of the _Veronica_ genus, which are typically found in meadows and open grasslands. They are known for their distinctive spikes of flowers and are often used in ornamental gardens.

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**Paspalum distichum** L.

_G._ distichum_ is a type of grass that is characterized by its parallel leaf blades. It is commonly found in wetlands and along shores. The flowers are small and usually go unnoticed, but they are important for pollinators.

**Paspalum orinophilum** Forst. f.

_G._ orinophilum_ is a grass species that is particularly adapted to dry, rocky environments. Its leaves are tough and fibrous, allowing it to survive in areas with limited water availability.

**Poa stricta** (L.) var. _trivialis_ (L.)

_P._ stricta_ is a grass species that is known for its dense, tufted growth habit. It is often used as a lawn grass and is valued for its resistance to drought and wear.
**Monocotyledons - GRAMINEAE**

**Panicum repens L.**

** Vernacular:** English "Torpedo grass", "quick grass"; Hawaiian "Wainako grass".

**Description:** Erect perennial grass 20 - 80 cm tall with creeping rhizomes. Leaves with fall or winter blades 6 - 20 cm long. Inflorescences 1 flowering, to 3 mm long.

**Habitat:** Found in freshwater or brackish water ponds and streams. The grass can sometimes obstruct waterways.

**Distribution:** Pan-tropical, naturalized in Hawaii, especially on the island of Oahu, but not widely distributed through the Pacific.

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**Scirpus tabulaeforme L.**

** Vernacular:** Hawaiian "mānao", "mānao-kī"; English "sword rush", "turtle rushes".

**Description:** Perennial sedge with flat to sheared leaves 1 - 3 cm tall. Leaves reduced to basal sheaths. Inflorescence 6 - 10 cm long consisting of several sori appearing on the side of the stem and bearing clusters of small spikelets 5 - 10 mm long, deep brown with many scales, each ovate scale 3 - 4 mm long, 5 - 6 bristles present; stamens 3; nut obovate and pointed on the sides, grayish black, 2 mm long.

**Habitat:** Found along streams in freshwater marshy areas, and sometimes found exposed to brackish water.

**Distribution:** Native to North America and Asia, but apparently not widely distributed in the Pacific. It is naturalized and rather common in Hawaii. It is apparently an important food for wading birds.

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**Paspalum conjugatum Berg.**

** Vernacular:** Korean "mesilhade", Pongpe "nem-wali"; Japanese "nem-umamabai"; Samoan "va'ava'u"; Hawaiian "Hi'o grass" (manu o mana'i); English "I" grass.

**Description:** Drooping dioecious grass to 50 cm tall. Leaves with blades 8 - 15 cm long x 8 - 12 mm across. Inflorescence 2 spreading 1-several racemes 6 - 12 cm long, drooping at their tips and bearing yellow or white spikelets 1.5 mm long.

**Habitat:** (FS,F.M,FW,CF) This is found in many different habitats including places with saturated soil. In forests it is often found in muddy patches resulting from disturbance by animals or man.

**Distribution:** (C.M.S.H) Pan-tropical, naturalized throughout the Pacific.

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**Monocotyledons - CYPERACEAE**

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**Monocotyledons - GRAMINEAE**

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Scleria spp.

Description: There are numerous species of Scleria that are not easily distinguishable and the taxonomy of the group is somewhat confused. They are usually erect sedges having 3 – 4-ranked leaves with cutting margins, and shiny, papery white glabrous flower. One species, S. carioca, differs from the rest by being a creeping annual <10 cm high which forms tussocks in wet places. Other species include S. arenifugus (Boott), S. sevensi (Steudel), S. hawaiensis (Kirkbride), S. macrocarpa (Baker), and S. schizophylla (C. B. Clarke), which are generally 10 – 60 cm tall and have leaves <5 mm across. A third group, including S. calycina (Mackay), S. pulchra (Boott), and S. micrantha (Mey.), are generally 0.5 – 1.5 m tall and have leaves 2 – 5 mm across.

Habitat: (F.M.C.F) All should be considered facultative wetland species of marshes and periodically disturbed freshwater wetlands such as abandoned cultivated areas.

Distribution: (C.M.S.H) The genus is widely represented in the Manana and Caroline Islands. Scleria arenifugus and S. macrocarpa are known from Samoa, but not characteristically from wetlands, and another species, S. carioca (Reed), is known from low elevation, moist areas on the windward side of the islands of Hawaii.

Isachne confusa (Oswal 1871, 1893)

Description: Clumped grass to 50 cm tall; base with leaf sheaths having rounded basal leaf sheaths and acutely pointed leaf, margins ciliate and with ciliate leaf sheaths. Flowers in prominent spikes. Inflorescence is a lax pedicel 2 – 5 mm long with 2 flowers.

Habitat: (F.M.C.F) Known from upland freshwater marshes and savannah wetlands on poorly drained soils.

Distribution: (C) Endemic to the Caroline Islands.

Oryza sativa L.

Vernacular: Chamorro “fai”; English “rice”.

Description: Erect grass to 1 m or more tall; leafless to 40 cm long x 0.8 cm across; inflorescence a rather dense, drooping panicle to 40 cm long; spikelets 1 flowered, 7 – 10 mm long.

Habitat: (C.F) Many forms of rice have been developed, most being obligate wetland plants that require intensive cultivation.

Distribution and Use: (C.M.H) Cultivated throughout the tropics for its edible grains. The outline of the rice crop on the Hawaiian continent and on the island of Kauai, Hawaii. Rice was apparently brought to Guam by early Micronesians, but is now rarely cultivated there.
**Echinochloa colona** (L.) Link
Vernacular: Chamorro “chaguan-hagga”;
English “jungle rice”

**Description:** Annual grass to 70 cm tall; Lvs 5 - 20 cm long x 3 - 7 mm wide; inflorescence a globular head to 7 mm diameter borne on a stalk to 40 cm tall, with the numerous closely overlapping white scale-like bracts each bearing a minute flower.

**Habitat:** (F,M,R,C,F) Found in disturbed areas and a weed of cultivated areas.

**Distribution:** (C,M,S,H) Pan-tropical, naturalized in the Pacific.

**Eriocaulon spp.**

**Description:** Herbs to 40 cm tall; Lvs linear, grass-like, 5 - 45 cm long and to 8 cm wide; inflorescence a globular head to 7 mm diameter borne on a stalk to 40 cm tall, with the numerous closely overlapping white scale-like bracts each bearing a minute flower.

**Habitat:** (F,M,G) These species are found in freshwater marsh vegetation, especially savannah wetlands.

**Distribution:** (F,C) Known from Yap and Palau in the Caroline Islands, and recently collected, but rare on the island of Hawai’i.

Note: From the nomenclatural and botanical point of view this species is difficult to define.
Hapsonoe malayana (Jack) Mier.

Vernacular: Papau "rata", "wokai".

Description: Large erect dioecious herb to 1.5 m tall. Leaves (indivisible): 1 x 18 cm. Inflorescence, a much branched panicle to 15 cm long. Flowers: 2 - 3 mm across, greenish white or yellow. Distributions: Known from Yap and Palau in the Caroline Islands and also from Malaysia.

Cylindropuntia polypli L.

Vernacular: Filipino "bilin"; Truk "teun amun"; Pala "savai", "demaiu", "ma pila"; Samoa "sasaangga", Hawaii "hokololone ohe", "poli kile". English "Jack".

Features: A robust erect grass to 0.2 m tall. Leaves: 15 - 60 cm long x 2 - 4 cm across with rounded basal lobes. Inflorescence: each consisting of a single flower arising from black or reddish bead-like involucres 8 - 10 mm long, containing the - spiklets, and surmounted by a - spikelet protruding from apex of the involucre. Habitats: Known from disturbed stream beds, ditches and freshwater marshy habitats.

Distribution and Uses: (C.M.H.S.) Pan-tropical. Naturalized rather than native through much of the Pacific. The hard bead-like involucres are often stripped into shells.
Monocotyledons - FLAGELLARIAEAE

Haplopappus malyana (Jack) Meeh.

Vernacular: Puaau 'otsi', 'yasik'.

Description: Large erect dioecious herb to 1.5 m tall. Lvs spathulate, 1 x 15 cm. Inflorescence a much branched panicle to 30 cm long. Fls 2 - 3 mm across, greenish, usually incepted.

Habitat: (FMU) This plant is rooted in the mud of freshwater marshes and abandoned taro patches, or occasionally forms floating islands in blocked ditches or large freshwater areas.

Distribution: (C) Known from Yap and Pauau in the Caroline islands and also from Malaysia.

Monocotyledons - GRAMINEAE

Cyperus lachrymaculatus L.

Vernacular: Filipino 'tienan'; Truk 'toen manam'; Padau 'lakai', 'demush', 'napa nipaj'; Samoan 'sagasaiga'; Hawaii 'hoa po'oleone'; Pala'ikalea. English 'Jacks tears'.

Description: (FMU) Robust erect grass to 1.2 m tall. Lvs with sheaths 15 - 60 cm long x 2 - 4 cm across with rounded basal lobes. Inflorescence each consisting of a single hard achenes to black or reddish bead-like involucres 5 - 10 mm long, containing the - spikellets, and swelling several - spikellets protruding through apex of the involucres.

Habitat: IFM (C,H,S) Pan-tropical, naturalized rather than native through most of the Pacific. The hard bead-like involucres are often strongly imbedded.

Brachiaria mutica (Forsk.) Stapf

Vernacular: English 'California grass', 'tara grass'.

Description: Large, coarse perennial grass forming dense patches to 2.5 m tall. Lvs with hairy sheaths and blade, the blade to 25 cm long x 1 - 1.5 cm across. Inflorescence a lax panicle of 1 - 3 racemes, each spikelet 1 flowered and not awned, apparently flowering once a year.

Habitat: IFM (C,M,F) This species is found in pastures and on marshy ground.

Distribution and Uses: (C,M,S,H) Native to Africa and naturalized throughout the Pacific. Sometimes used for fodder.

Baccharis mutica (Forsk.) Stapf

Vernacular: English 'Bermuda grass'.

Description: Dense grass to 40 cm tall. Lvs with sheaths 1.5 - 10 cm long and 2 - 4 mm across. Inflorescence consisting of 3 - 5 spikelets at anthesis 2 - 3 cm long, spikelets overlapping, 2 mm long.

Habitat: IFM This forms meadows in blackish marshes.

Distribution: (C,M,F) Native to the old world tropics, now pantropical. This is a common lawn and pasture grass found throughout the Pacific. But apparently only occurs as a weedy plant in Hawaii. The form found in blackjack habitats is somewhat more robust and considered a distinct variety by some botanists. It is dominant in some blackish marshes in Hawaii such as at Kahans Pond on Maui.
Echinochloa colona (L.) Link
Syn. Panicum colona L.
 Vernacular: Chamorro "tagalan-eggaga";
 English: "jungle rice"
 Description: Annual grass to 70 cm tall;
 Lvs 6.5 - 20 cm long x 3 - 7 mm across;
 Inflorescence several racemes;
 Each raceme several flowers;
 Lvs 1 - 2 cm long, pointed;
 Inflorescence 2 - 3 mm, green or purplish, not awned.
 Habitat: (F, M, C, R, F) Found in disturbed areas
 and a weed of cultivated areas.
 Distribution: (C, M, S, H) Pan-tropical,
naturalized in the Pacific.

Eriocaulon spp.
 Description: Herbs to 0.4 m tall;
 Lvs linear, grass-like, 0.1 - 0.4 m long and to 0.8 cm wide;
 Inflorescence a globular head to 7 mm diameter borne on a stalk to 20 cm tall,
 with the numerous closely overlapping white scales each bearing minute flower.
 Habitat: (F, M, G, S) These species are found in wetland and marsh vegetation,
 especially savannah wetlands.
 Distribution: (H, G) Known from Yap and
 Pohnpei in the Caroline Islands, and recently
 collected, but rare on the island of Hawaii.
 Note: From the morphological and taxonomic anatomy of this species,
 it is uncertain whether it is a true Eriocaulon species or in need of
 further study for definition.
Scleria spp.

Description: There are numerous species of Scleria that are not easily distinguishable and the taxonomy of the genus is somewhat confused. They are usually erect sedges having 3–4-ranked leaves with cutting margins and shiny, pearly white glabrous nuts. One species, S. carolinensis, differs from the rest by being a creeping annual <10 cm high which forms tussocks in wet places. Other species include S. nana-Johannestiae Böseck, S. sedes Retz., S. laua R. Br., S. bifolia R. Br., S. nigra R. Br., and S. sphaginifolia (L.) Stev., which are generally 10–60 cm tall, have leaves <5 mm across. A third group, including S. diversifrons, S. phyllocladus Böseck, and S. denticulata Needl. & Mey., are generally 0.5–1.5 m tall and have leaves 5–25 mm across.

Habitat: (RE, M, C, F) All should be considered facultative wetland species of marshes and previously disturbed freshwater wetlands such as abandoned cultivated areas.

Distribution: (C, M, S, H) The genus is widely represented in the Marianas and Carolines Islands. Scleria sphenocaulon and S. paludosa are known from Samoa, but not characterizedistically from wetlands, and another species, S. denticulata Needl., is known from low elevation, moist areas on the windward side of the island of Hawaii.

Jasminum confusum Ornd.

Description: Clumped grass to 50 cm tall, leaves with toothed lamina having rounded basal (lobed and axially pointed tips), margins ciliolate (bristly) with ciliate hairs on axillary veins as prominent as midrib. Inflorescences a lax pedicel 1.5–2 cm long, spikelets to 2 mm long with 2 flowers.

Habitat: (F, M, D) Known from upland freshwater marshes and savannah wetlands on poorly drained soils.

Distribution: (C) Endemic to the Caroline Islands.

Oryza sativa L.

Vernacular: Chamorro "fas"; English "rice".

Description: Erect grass to 1 m or more tall; leaves to 40 cm long x 0.8 cm across; inflorescence a rather dense, drooping panicle to 60 cm long; spikelets 1 flowered, 7–10 mm long.

Habitat: (F) Many forms of rice have been developed, most being obligate wetland plants that require intensive cultivation.

Distribution and Uses: (C, M, H) Cultivated throughout the tropics for its edible grain; the area where the wet abandoned fields are quickly taken over by Blackberry ochnaceae and sundews, and on the island of Kauai, Hawaii. Rice was apparently brought to Guam by early Micronesians, but is now rarely cultivated there.
Panicum repens L.

**Vernacular:** English "Torpedo grass"; "quick grass"; Hawai'i "Waianako grass".

**Description:** Erect perennial grass 20 - 80 cm tall with creeping rhizomes. Leaves with blades 8 - 15 cm long, flowering culms 20 - 30 cm long, spikelets 1-flowered, to 3 mm long.

**Habitat:** (F, M, S, F) Freshwater or brackish water ponds and streams. This grass can sometimes obstruct waterways.

**Distribution:** Pan-tropical, naturalized in Hawai'i, especially on the island of Hawai'i, but widely distributed throughout the Pacific.

Grass of a similar description is likely "Paspalum conjugatum" Berg.

**Vernacular:** Ko'olau "mishistale"; Ponge (Ko'olau) "morwali"; U'lele "mâhâwa"; Samoan "mâhâwa"; Hawai'i "Hilo grass" (mano 'umâhilâ); English "T"-grass.

**Description:** Drooping stoloniferous grass to 50 cm tall. Leaves with blades 6 - 15 cm long x 8 - 12 mm wide; Inflorescence 2 spreading 1-flowered racemes 6 - 12 cm long, drooping at their tips and bearing yellow spikelets 1.5 mm long.

**Habitat:** (S, F, M, C, F) This grass is found in many different habitats, including wetlands, forests, and areas with saturated soil. It is often found in muddy patches resulting from disturbance by animals or man.

**Distribution:** (C, M, S, H) Pan-tropical, naturalized throughout the Pacific.

Scirpus validus (Grah.) Koyama

**Vernacular:** Hawai'i "welai"; "heikulai"; "manalele"; English "great bulrush"; "turtle".

**Description:** Perennial sedge with undulated leaves 1.5 - 3 mm long. Inflorescence 6 - 10 cm long consisting of several spikelets appearing on the side of the stem. Seed bearing clusters of ovate spikelets 5 - 10 mm long, deep brown with many scales, each ovate scale 3 - 4 mm long, 5 - 6 bristles present; stamens 3, nut oblong and pointed on the side. Grayish black, 2 mm long.

**Habitat:** (F, M, C) Found along streams in freshwater marshy areas, and sometimes found exposed to brackish water.

**Distribution and Uses:** (H) Known from North America and Malaysia, but apparently not widely distributed in the Pacific. It is naturalized and rather common in Hawai'i. It is apparently an important food for wetland birds.
Scirpus maritimus L. var. paludosus (A. Nelson) K. Fuk

Vernacular: Hawaiian “makas”.

Description: Perennial sedge with biennial stems 40 to 120 cm tall. Leaves basal; leaf blade 1 - 1.5 mm wide, the 2 - 5 awn-tipped bristles, ovary with 2 - 3 styles. Nut 2 cleft, 3 - 4 mm long.

Habitat: SM/F

Distribution: Indigenous to Hawaii and known from many areas of Europe, Asia, and the Americas.

Paspalum distichum L.

Vernacular: Hawaiian “limu”; English “knotgrass,” “saltgrass,” “knotweed.”

Description: Tufted perennial grass to 1 m tall. Leaves with 11 - 12 broad blades 4 - 15 mm wide; the 1 - 5 awn-tipped bristles, ovary with 2 - 3 styles. Nut 2 cleft; 3 - 4 mm long.

Inference: Usually 2 - 1-sided racemes 3 - 5 cm long, more 1 - 5 mm-long, and 1 together, more spreading; spikelets 2.5 - 3.5 mm long. See also: Sporobolus virginicus.

Habitat: CM/F

Distribution: Indispensable throughout the Pacific.

Note: The shape of the stem of the blade and its density can be used to distinguish the two Sporobolus species.

Paspalum orbiculare Forst. f.

Vernacular: Hawaiian “gare”; English “rice grass.”

Description: Tufted perennial grass to 1 m tall. Leaves with 12 - 40 cm wide 3 - 12 broad blades. Inflorescence 2 - 3-sided racemes, each 2 - 5 mm long, containing 2 rows of orbicular spikelets, 1.8 - 2 mm long.

Habitat: CM/F

Distribution: Found in natural freshwater wetlands, as a weed in cultivated areas.

Note: Native to Asia and native or naturalized throughout the Pacific.
Phragmites australis (Trin.) Trin
Description: Tall reed to 5m tall, the stem to 2 cm diameter at the base. Lvs with blades flat, 40-70 cm long x 2-4 cm apical.
Inflorescence a much branched panicle 30-70 cm long of 3-flowered spikelets 3-8 mm long, with abundant silky hairs. Habitat: F.M.C.R,i.C.R.o. Found in freshwater or brackish water marshes, also a commoner of abandoned cultivated wetlands.
Distribution: (C.M.) Indigenous from Africa & the Western Pacific.

Sacciolepis indica (L.) Chase
Vernacular: Hawaii “Glenwood grass”
Description: Bladder annual to 80 cm tall. Lvs with flat blades 3-15 cm long x 2-3 mm across. Inflorescence a cylindrical spikelet panicle to 10 cm long bearing ovate spikelets 3 mm long with 1 fertile floret.
Habitat: F.M.F.S.C.R.P. Found as a weed in disturbed places including muddy places in forest openings that result from disturbance by man or animals.
Distribution: (C.M.S.H.) Widespread in the tropics including most of the Pacific Islands.

Scirpus triqueter Schrad. (including var. spinosus Trin.)
Vernacular: English “bulrush”
Description: Perennial sedge with round to slightly 3-angled grayish green stems 60-120 cm tall arising in a row from a nonrigid rhizome. Lvs reduced to basal sheaths. Inflorescence appearing on the side of the stem and consisting of one terminal spikelet borne along the stem. Spikelet 3-5 mm long with many oblong scales 3.5-4 mm long and 3-5 hinged bristles among the 3-5 anthers. Nut ellipsoid to obovate, flattened, brown to black, 2 mm long.
Habitat: (S.M.A.S.) Known from brackish, marshy places.
Distribution: (M) Native from Europe and Africa to Asia. It is reported in the Pacific from Guam in the Mariana’s, but not from the Carolines, Hawaii or Samoa.
Monocotyledons - CYPERACEAE

Sporobolus virginicus (L.) Kurth
Vernacular: Chamorro "totopuap". Truk "niarar", Hawaiian "akai", "maunene-naloi". English "beach dropseed", "saltgrass".
Description: Perennial grass with broad leaves and erect branches to 30 cm tall. Leaves narrow, bluish gray, rolled blades 2 - 10 mm long. Inflorserence a congested spike-like panicle 2 - 5 cm long.
Habitat: Found in coastal marshes and other coastal habitats, usually rooted in sand.
Distribution: Known from lowland marshes, tidal and cultivated patches, and along trails in wet forests, especially in the island of Kauai, Hawaii.

Monocotyledons - GRAMINEAE

Blyxa sp.
Description: Submerged aquatic herbs rooted in mud. Leaves arranged in a rosette, each leaf 0.1 - 0.5 cm long x 0.3 - 1.5 mm wide. Flowers in spikes on peduncles with bristles. Fruits borne in a sac to 6 cm on a long stalk, sometimes emergent from water at time of flowering.
Habitat: Freshwater aquatic wetlands such as reservoirs, ditches, bomb craters, and marshes.
Distribution: Known from Africa to Australia, and F. Asia. Probably easily dispersed by water.
Note: The species of Blyxa are distinguished by other characteristics, such as the shape of the leaf and flower. In B. aequale and B. tambala, the leaves are known from the Caricaceae family.
Egeria densa (Richter)\n
Vernacular: English "dense waterweed".

Description: Dioecious, much branched submergent herbs. Leaves, 2-3 cm long, 2-5 mm across, finely serrate. Flowers with 9-10 stamens; fruit, 6-8 mm long.

Habitat: Rich in ditches, ponds and streams.

Distribution and Uses: Native to South America and cultivated in aquaria and ponds in Hawaii and Guam, where it sometimes becomes an aquatic weed.

Scirpus spp.

This genus is common in marshy areas throughout the world with a few species known from the Pacific. Provided here is a key to the most common species of Scirpus in the Hawaiian (H), Carolinian (C), and Marianas (M) Islands. None have been reported from Samoa.

1. Inflorescence lateral with the stem appearing to extend above the inflorescence. Basal leaves reduced to bladesheds.

2. Spikelets borne on rays not sessile on the main stem; plants usually >1 m tall.

3. Bracts below ovary 2-4, flattened, fringed or feathered (pseudo-hand lens).

4. Spikelets sessile on the stem, not borne on developed rays; plants <1 m tall.

Habitat: In the same or an adjacent marsh.

Enhalus acoroides (L.) Rich.

Vernacular: English "sea grass".

Description: Dioecious aquatic marine herb with solid creeping rhizomes densely covered with stiff black bristles which are the persistent fibrous portions of old leaves. Fruit scattered, 2-3 cm long, borne on a stalk 2 cm long, and floating on water surface at time of pollination. The flower stalk, Fruit, 2-5 cm, green, splitting irregularly.

Habitat: Rich in saltwater wetlands rooted on reef flats and forming dense patches with other seagrasses. These communities are the habitat for the endangered Dugong in Palau.

Distribution and Uses: Micronesia. From the Indian Ocean to the Western Pacific. The stiff black hairs at the base of this plant were the strongest Enhalus fiber.

Scirpus californicus (C.A. Meyen) Stuck.

Vernacular: English "California bulrush".

Description: Stout perennial sedge to 4 m tall with rounded spike. Leaves reduced to basal sheaths. Inflorescence loosely umbellate to 10 cm across with narrow spikelets 5-10 mm long having numerous ovules. Reddish-brown pointed scales to 3 mm long. 2-4 reddish bristles present below the ovary.

Habitat: Rich in saltwater wetlands.

Distribution: (M) Native to N. America and naturalized in Hawaii, but apparently not as common as S. maritimus var. paludinosus (H).
**Scirpoideae**

*Scirpoides glaeri* (Gaertn.) Merr.

**Vernacular** Ponope "polkée"; Samoa "alu fofolatu".

**Description:** Large, perennial sedge to 2 m tall. *Lvs* 1 - 5 mm long x 2 - 5 cm across, tough, nodded, saw toothed on the midrib and margins. 3 prominent nerves, the middle being more prominent than the lateral nerves on the lower surface. **Inflorescence** with sessile, brown spikelike in a congested head-like cluster 6 - 12 cm long and 5 - 8 cm across. **Fl** mostly hexagonal 10 - 15 mm long, 6 - 8 mm wide, brown.

**Habitat:** (FL.PM.SS.OI) Found in freshwater swampland forests and also at the landward edge of mangrove swamps exposed to breaking water. *Scirpoides* is always rooted in mud, and can be found as a dense understorey, or as a few scattered individuals.

**Distribution:** Known from Ceylon to Micronesia and Polynesia.

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**Halophyloidea**

*Halophyloidea ovale* (R. Br.) Hook. and *Halophyloidea microcaroliniana* (Zoll.) den Harff

**Vernacular:** English "seagrass".

**Description:** Dioecious aquatic marine herbs with slender creeping rhizome. *Lvs* opposite, ovate to oblongate *Fls* borne within 2 bracts at base of paired leaves. *Fls* with 3 styles and ovary 1 - 2 mm long. *Flowers* with 3 stamens. The hermaphroditic species can be distinguished by the following characters:

- Leaf blades 10 - 40 mm long with 12 - 25 pairs of secondary veins.
- *H. ovale*: Leaf blades 5 - 20 mm long with 6 - 12 pairs of secondary veins.
- *H. minor*: Both species are found in saltwater aquatic wetlands where they grow rooted on sheltered, sandy or muddy substrates, or sometimes coral reefs. Though usually submerged, both species may be exposed at low tide.

**Distribution:** (C.M.H.S) *Halophyloidea ovale* is reported from the Caroline Islands, Samos and Hawaii, though some authors choose to recognize the Hawaiian plants as distinct under the name *Halophyloidea hawaiiensis*. The second species, *H. minor* has been reported from the Caroline and Marianas Islands in addition to Samos (see table of species under discussion of the Saltwater Aquatic Vegetation type, page 60).

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**Hytrilla verticillata** (L.) Royle

**Vernacular:** English "waterweed".

**Description:** Dioecious submerged herb with slender stems. *Lvs* whorled with 3 - 9 at a node. 8 - 40 mm long x 1 - 5 mm broad, usually sessile. *Fls* 2 - 3 mm long, the sessile in leaf axils but detaching and floating to water surface at time of flowering. *Stamens* 3 - borne in leaf axils and resting on a stalk 1 - 6 cm long to water surface when mature. **Habitat:** (FA.O) Found in ditches, ponds, and streams.

**Distribution and Uses:** (M.H) From southern Europe and Africa, through to Asia and Australia, introduced through the Pacific where it has become naturalized in some areas including Guam. It is a fairly common aquarium plant, and is a troublesome pest in some areas because of its dense growth which clogs waterways.

**Note:** This plant has minute flowers with 3 stamens and can be distinguished from *Eugenia* which has larger flowers and 9 - 12 stamens.
Thalassia hemprichii (Ehrenb.) Aschers. Vernacular: English "turtle grass", "seagrass".
Description: Pinnate aquatic marine herb with slender creeping rhizome. Lvs strap-like, 1.0 - 4.0 cm long x 4 - 11 mm across; Fls 7 - 8 mm long, on stalks 5 - 6 cm long, with ovary (excluding spiral petiole) to 4 cm long; Inflorescence a cymose spike 1 - 2 cm, elongating after flowering; Fru green, globose 2 - 3 mm diameter, splitting into about 30 segments.
Habitat: (S.A.O) Groves submerged in shallow coastal bays, reared in sand, mud or in pools of tidal flats. Found in extensive blanket meadows with other seagrasses, and sometimes exposed at low tide.
Distribution: (C.M.P) Tropical regions from Africa to the Western Pacific. Known from the Caroline Islands, and possibly from Guam in the Marianas.

Rhynchospora corymbosa (L.) Britton Vernacular: Panice "malamata", "truk" "mopoe", "Nga no" "selaselesele", "va" "selaselesele", "la" "selaselesele".
Description: Perennial, erect, mainly sedge to 1.5 m tall with branched stems. Lvs with blades folded flat, flattened above; 20 - 70 cm long x 6 - 20 mm wide. Inflorescence globose-like, a much branched, terminal, golden-brown panicle with tan-colored bracts 6 - 8 mm long with 5 - 7 scales; Nut ovoid obovate, 2.5 - 3.5 mm long x 2 mm across, brown.
Inflorescence (F.M.C.O) Found fairly common in cultivated and recently abandoned taro patches.
Distribution: (C.M.S) Pan-tropical in distribution.

Juncus effusus L.
Vernacular: English "soft rush".
Description: Sedge-like plant with densely tufted round leaf-like stems to 1.5 m tall. Lvs, the true ones reduced to basal sheaths; only 4 - 15 cm long. Inflorescence a lax cluster 2 - 10 cm long borne near the tops of the stems and bearing flowers 0.4 - 4 mm long, with 6 yellowish or greenish petal-like parts having a membranous margin; Fru ovoid, 2 - 4 mm long.
Habitat: (F.S.O) Found in disturbed muddy places in forests.
Distribution: (H) It is worldwide in distribution and is naturalized in Hawaii.
Note: Other species are known from Hawaii, but this species is one of the most common and widespread. It can be identified by its slender, narrow leaves and its small, tightly packed flower heads. It is often found in estuarine habitats and can be distinguished from other species by its distinctive long, narrow leaves and compact flowering structure.
Mapania spp.

Description: Sudden shocks to 2 m tall sometimes reseeding small Pandanus plants. Live tough, 0.6 – 2.6 m long x 1.5 cm wide, usually with 3 prominent nerves, and with saw toothed, cutting margins. Inflorescence nodate (as M. macroloma) of lax, spikelike with one or more scales and 5 – 8 flowers. The two species of Mapania are common in the Carolines (C.I., Marianas, N.M.), and Samoan (S.S.).

1. Inflorescence capitulate 5 – 7 cm diameter, irregularly lobed with the rays obscured by the spikelike, spiky scales 9 – 12 mm long, nuts obvoid, 5 – 7 mm long; M. macroloma (C.I.)

2. Inflorescence 10 – 20 cm diameter, lax with the rays not obscured by the spikelike, spiky scales 3 – 4 mm long; nuts 3 – 5 angled, obtuse, 3 mm long; M. pandanophylla (C.M.)

Habitat: (F.S.F.) Known from lowland upland freshwater swampy Habitats.

Distribution: (C.I.S.) Mapania macroloma (Guad.) K. Schum. (including M. pandanophylla (F. Muell.) Dorn and Mapania pandanophylla (F. Muell.) Dorn) is known from lowland swamp forests on the Caroline Islands, and from montane rain forests in Saroao. Mapania pandanophylla (F. Muell.) K. Schum. (Syn. Pteros-tachyphylum pandanophyllum (F. Muell.) Dorn) is known from swamp forests in the Caroline Islands and from a collection from Rota, Marianas Islands. Both of these species and a few others are also known from Malaysia.

Uses: In Malaysia, the leaves of some species are used for making mats.

Top photo: Mapania macrocaphala. Bottom photo: Guich with Mapania beneath Pandanus in Palau.

Lemma, Spirodela and Wolffia

Description: Duckweeds are small floating herbes of widespread distribution known from many freshwater habitats. They usually have small roundish fronds that reproduce by budding and form large floating colonies. The genera known from the Pacific region can be distinguished in the following key:

1. Roots present, fronds > 1 mm, flat
   2. Roots usually more than one per frond and the fronds 5 – 8 mm long, often tinged with purple or brown; Spirodela

1. Roots absent, fronds < 1 mm, globose;
   Wolffia

Habitat: (P.A.C.O) Wolffia columbiana is naturalized in Hawaii. Lemma is known throughout the Pacific, where it often is found in lagoon patches. The two species of Lemma reported from the Pacific, are L. purpurata that has a slightly winged root sheath and L. minor that has a root sheath without lateral wings. L. minor is common of the two but is often mistaken for L. minor.

Nipa fruticans Wurmb


Description: Palm to 7 m tall with protruding, usually submerged fronds. Fronds pinnate, 3 – 7 cm long, erect; Inflorescences borne near the ground. Flowers in a golden cylindrical spike, 6 – 8 flowers in a globular head. Fertile globos mass 12 – 30 cm diameter, each individual fruit obovate, 2 – 3 ridged. 9 – 10 cm long, dark brown.

Habitat: (S.S.O) Found rooted in mud at the landward edge of mangrove swamps and along estuaries in brackish or saltwater, occasionally upstream apparently out of tidal influence.

Distribution and Uses: (C.M) Native throughout the Caroline Islands, and naturalized but not common in Guan. The fronds of this palm are used for thatching and the young inflorescences are a source of a sugary sap that can yield an alcoholic drink.

Note: See photograph on back cover.
Pandanus spp.
Description: Members of this genus are characterized by being shrubs or trees often with prop roots and having strap-like leaves with cutting, toothed margins and midrib. They are often used for making and building. Numerous species of Pandanus are known throughout the Pacific. Mostly they are lowland trees or coastal shrubs and should not be confused with mangrove plants. Some are, however, found in mangrove environments such as* Pandanus karehneae*, which grow at mangrove margins in Palau and are characterized by having leaves to 10 cm across and racemose clusters of yellow-orange glossy heads 9 - 15 cm in diameter which have numerous intricately and deeply grooved keys (sections) 4+ cm across. Several facultative wetland species are slender trees found in swampy forests with leaves 5 - 7 cm across and have racemose borne ovate or cylindrical heads of 2 - 5 cm across, these with keys (segments) <5 mm across. These uncarpellate species having only one stigmatic surface (raised bump) on each segment include *P. comosus* Henri. from Pohnpe and Tnuk, known as "kotal" on Pohnpe; *P. jussieui* Mart. from Yap, "thiie". A macronurienrte Mart. from Palau, "orang" and "tush". *P. amkanitutu* Mart. and *P. suaveolens* Schtr., also from Palau. The common coastal pan-Pacific species, *P. odontosomatus* L. is occasionally found near wetlands, but usually is on dry land. However, some closely related taxa which resemble it are wetland species such as *P. tomentosa* K. K. K. from the savannah wetlands on Yap. The whole genus is taxonomically difficult with entire clusters of fruits and entire leaves (without a broken tip) needed for identification.

Habitat: (FM, FS) especially for C, F & O.) Distribution: (C, M, S, H.) The wetland species are more common in the Caroline Islands than other areas discussed in this guide.

Lasiorina articulata (Retz.) Domin
Description: Upright tough, gray-green sedge to 1.5 m tall having hollow stems with prominent crosswalls; Lvs reduced to basal sheaths 10 - 30 cm long; Inflorescence a many-flowered spikelet, 1 - 2 cm long x 0.5 - 1.5 cm across apparently arising from the side of the stem with brown, broadly ovate, oblong, brown, Nut 3 - 4 mm long, oblong, brown.

Habitat: (FM, O) Found as a dominant in certain upland marshes where it apparently fills shallow ponds, and is only found in thin mud or standing water.

Distribution and Uses: (C) Cultivated in Southern China, Taiwan and perhaps, Malaysia for making Inhe Carinian Islands it apparently is not actively cultivated and found only on Yap.
**Fimbrinea umbellata** Rottb.

**Vernacular:** Yap. "yellow".

**Description:** Perennial erect, sedge to 1 m tall; the stems 4-angled, epyriform in cross section, 5-nerved; 20 cm long and 5-13 cm wide with 5 nerves; Inflorescence terminal, paniculate, often with axillary branches along the stem, the spikelets in dense, ovoid to ellipsoid clusters 4-10 mm long, these arranged in umbrelliform spikes strongly nerved; 2-3.5 mm long.

**Habitat:** (FM,G,R.O) This is a wetland species commonly found in taro papers, bomb craters, abandoned areas of cultivaton and ruderal wetlands. It is often associated with Rhynchospora corymbosa.

**Distribution:** (C,M) Pan-tropical in distribution.

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**Pandanus tettense** in the savannah wetland, Gagil-Tomil, Yap.

**Pandanus tettense** from swamp forest on Yap.
Eichhornia crassipes (Mart.) Solms
Vernacular: English “water hyacinth”.
Description: Floating herbs to 60+ cm tall with masses of black roots. Lev ovate with inflated petioles. Fls borne in a spike 40 cm long, each with more or less sessile flower 5 cm diameter with 6 pale violet petals, the uppermost with a yellow blotch.
Habitat: (FA.O) This rapidly multiplying aquatic herb thrives in streams and ponds, and even occasionally in brackish water. In some parts of the world it is a serious pest due to its tendency to block waterways.
Distribution and Uses: (C.M.H) Native to the Neotropics and tropicis, and introduced in the Pacific. The young leaves, root stalks and flowering parts can be cooked and eaten.

Monochoria vaginalis (Burm.) Presl
Description: Aquatic perennial herb, emergent to 30 cm tall with short submerged rhizomes rotted in mud. Lev of young plants submerged and without a developed blade, in older plant leaves emergent, the blade ovate or oblong 2-13 cm long x 0.5-10 cm across. Fls 11-18 mm long with none or 6 petals having a yellow spot, all opening at once and changing to scales 50-2(0) flowered racemes, Fr a capsule 1 cm long
Habitat: (FA.O) Found in slow-moving streams, ponds and ditches.
Distribution: (M.H) Native to Asia and Malaysia, introduced to Hawaii presumably as an ornamental and sparsely naturalized there.

Fimbriaria globulosa (Reut.) Kurth
Description: This species has an unobtrusive inflorescence of ovate spikelets, similar to P. nutans (see description) but P. globulosa is often larger. The inflorescence consists of ovate globular spikelets 4-8 mm long having ovate scales 3-3.5 mm long and borne on primary rays up to 10 cm long.
Habitat: (F.R.C.O)
Distribution: (C.M.H) Known from SE Asia to the Pacific.

Fimbriaria littoralis Gaud.
Description: Annual or perennial tufted sedge with stems 4-5 angled and 10-80 cm tall. Lev leaves with blades to 35 cm long.
Inflorescence compound, umbellate, with 1-4 cm long primary rays up to 7 mm; spikelets globose; 2.5 mm long with numerous ovate scales 1.5 mm long; styles 3; stamens 1; Nut ovovate, 3 angled 0.5-1 mm
Habitat: (F.R.C.O)
Distribution: (C.M.H) Pan-tropical
Note: This species is often misidentified referred to as P. nutans or a similar species due to its ovate spikelets 4-5 mm long that often aremist in disarticulated state.
**Fimbristylis cymosa (R. Br.)**

**Vernacular:** Truk "nenenko".

**Description:** Perennial sedge with erect 3 - 10 cm tall. **Leaves:** linear, lighter than the stem, 1.5 - 3 mm wide, without a membrane or row of hairs between blade and sheath, the 2 - 3 lateral leaves 0.5 - 1 cm long. **Inflorescence:** 3 - 8 primary rays 1 - 4 cm long, spikelets single or clustered 3 - 6 mm long 2 - 2.5 mm wide, oval, with many scales, each 1.5 - 2.5 mm long; **stamens:** 1 - 3, **styles** 3 - 3, **Nut:** 2 - 3, ovate, obovate, brownish, 0.1 - 0.5 mm long.

**Habitat:** (SM, RF) A wetland species from coastal marshes and ruderal habitats.

**Distribution:** (CM, MS, H) Pan-tropical, known from most of the Pacific.

Note: This is a quite variable species, and different accessions are recognized according to several forms, including F. pseudocylindrica from Hawaii.

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**Fimbristylis dichotoma (L.) Vahl**

**Vernacular:** Ponape "matamai", English "tail fringe rush".

**Description:** Tufted sedge to 60 cm tall. **Leaves:** slender, stiff or limp, shorter than the stems and 3 mm wide. **Inflorescence:** lax, umbellate; **spikelets:** 7 mm long, scales broadly ovate, 2 - 4.5 mm long with a distinct keel (ridge). **Nut:** obovate, usually pale, 1 - 1.25 mm long.

**Habitat:** (FM, FS, RF) This is a common sedge.

**Distribution and Notes:** (CM, MS, H) Pan-tropical and widespread in the Pacific. Another larger species, F. aristata, with stems to 104 cm tall, slender leaves, and ovoid spikelets 6 - 10 mm long is a facultative wetland species known from the wetlands of Faisu and Yap, and savannahs in Guam.

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**Fimbristylis gramineus (L.) Zoll. & Mor.**

**Vernacular:** Ponape "tchepaik", English "tall rush".

**Description:** Close to Perrieri, and very similar. **Leaves:** linear, lighter than the stem, 1.5 - 3 mm wide, without a membrane or row of hairs between blade and sheath, the 2 - 3 lateral leaves 0.5 - 1 cm long. **Inflorescence:** 3 - 8 primary rays 1 - 4 cm long, spikelets single or clustered 3 - 6 mm long 2 - 2.5 mm wide, oval, with many scales, each 1.5 - 2.5 mm long; **stamens:** 1 - 3, **styles** 3 - 3, **Nut:** 2 - 3, ovate, obovate, brownish, 0.1 - 0.5 mm long.

**Habitat:** (SM, RF) A wetland species from coastal marshes and ruderal habitats.

**Distribution:** (CM, MS, H) Pan-tropical, known from most of the Pacific.

Note: This is a quite variable species, and different accessions are recognized according to several forms, including F. pseudocylindrica from Hawaii.
Ruppiaria marina L. (Collecting from: St. John, St. Croix)

Vernacular: English "leak fassel", "wetland grass"

Description: Submerged grass-like herb with slender, branched, whitish stems to 1.5 m long. Lvs alternate with a basal sheath. The blade 2 - 20 cm x 1 mm or less broad; Inflorescence at first spike-like but later umbel-like and borne on a stalk to 1 m long, this coiling after flowering; Fls small; Frs ovate, 2 - 3 mm long.

Habitat: (SA.O) Braiding streams, lilyponds and marshes, often exposed at low tide.

Distribution: (M.H) Widely distributed throughout the world with the variety known from the Philippines to Polynesia including New Zealand. It's spikes are as long as the occurrence of this plant in Guam, and it has not yet been matched from American Samoa or the Carolines.

Eleocharis geniculata (L.) R. & S. (Stem: St. John, St. Croix; Carpet-bane, Royal Pothaka)

Vernacular: English "spike rush"

Description: Annual tufted sedge with slender, erect stems 5 - 40 cm tall. Lvs reduced to basal sheaths. Inflorescence a linear globe to oblong spikelet 4 - 8 mm long and 0.5 - 0.75 mm across with numerous scales 2 mm long and 6 - 8 bristles; Stamen 2 - 3; styles 2; Nut 2 seeds, oblong, shiny black, <1 mm long.

Habitat: (F.M.O.R.O)

Distribution: (C,M,S,H)

Note: This species with short black nuts strongly contrasts with E. crus-galli, which grows in similar habitats on the eastern seaboard of the U.S. and Hawaii, but is not as widespread as E. geniculata.

Typha latifolia Bory & Chao.

Vernacular: English "cattail"

Description: Robust perennial sedge-like plant with branched rhizome to 3 cm diameter bearing erect stems 1 - 3 m tall. Lvs 20 - 150 cm long x 0.5 - 3 cm wide along the stem with the leaf sheaths overlapping. Inflorescence cylindrical brown, terminal on the stem and bearing tightly packed flowers, the densely woolly portion of the inflorescence borne below the male portion, the upper separated by about 2 cm. Frs dispersed by the hairs of the female flowers.

Habitat: (SM.F.M.O.A) A species of fresh or sometimes brackish marshes, ponds and slow-moving streams.

Distribution: (H) Native to Eurasia and naturalized in Hawaii.

Note: Another species, T. angustata is also known from the Hawaiian Islands. The tips and branches of the inflorescence are not accepted by the sea, being borne immediately next to each other.

Eleocharis ochrostachys Steud. (Vernacular: "mahatam", Palau "khermilles"

Description: Perennial sedge with erect pithy stems 35 - 70 cm tall. Lvs reduced to basal sheaths. Inflorescence a cylindrical spikelet 10 - 20 cm long x 3 - 4 mm across, with numerous green to yellowish brown scales 4 - 6 mm long and 0.7 - 2 bristles; Stamen 2 - 3; styles 2 - 3; Nut 2 seeds, shiny brown to gray 1.5 - 2 mm long, obovate.

Habitat: (F.I.M.C.O.B) In Ponape. It is often found as a co-dominant with the club moss, Lycopodium clavatum, in standing water of old cultivated fields.

Distribution: (C) Native to Asia; naturalized in the Caroline Islands.
Monocotyledons - TYLACEAE

Eleocharis acicularis (L.) R. & S.

Vernacular: English "spike rush".

Description: Perennial sedge with erect stems 3 - 20 cm tall. Lvs reduced to basal sheaths; Inflorescence a single cylindrical spikelet 12 - 18 mm long; x 3 mm across with numerous scales 1.5 - 3 mm long; bristles 3 - 4, stamens 2 - 3, styles 3. Nut ovoid, yellow or pale brown, 1.5 - 3 mm long.

Habitat: (FM, C, R,F)

Distribution: (C, H) Also known from North America, Europe, Asia and probably elsewhere in the Pacific.

Eleocharis dulcis (Burm. f.) Trin.

Vernacular: Samos "ulu'ulu", Chamorro "uchaga-lane", English "water chestnut".

Description: Perennial sedge with erect, transversely septate stems 0.5 - 5 m tall, sometimes bearing roundish, subterranean tubers. Lvs reduced to basal sheaths; Inflorescence a solitary cylindrical spikelet to 6 cm long, the numerous scales 4 - 6 mm long; bristles 5 - 6; stamens 3; styles 2 - 3. Nut 2-sided, obovate, shiny brown, 1.5 - 2 mm long.

Habitat: (FM, C, O) Sometimes found as a dominant in freshwater marshes and abandoned cultivated wetlands.

Distribution and Uses: (C, M, S) This sedge is known from Malaysia in the Pacific, the Caroline and Mariana Islands and Samoa. Some forms of this are cultivated for the tuber.

Typha angustata Bory & Chaud.

Acanthus ebracteatus Vahl

Vernacular: Palau "kollit"

Description: Shrub 1 - 2 m tall; Lvs opposite, 10 - 20 cm long x 4 - 6 cm across; Inflorescence a spike 7 - 10 cm long of whitish-violet flowers 2 - 2.5 cm long; Fr a capsule 2 - 2.5 cm long x 0.75 - 1 cm across.

Habitat: (C, O) Found toward the landward edge of mangrove vegetation, along tidal flanks and mangrove channels under marginal tidal influence.

Distribution: (C) Indigenous to Malaysia and Palau.

Monocotyledons - CYPERACEAE

Dicotyledons - ACANTHACEAE
Dicotyledons - AIZOACEAE

Senecio portulacastrum
Syn. Matricaria portulacastrum (L.)
Vernacular: Hawai‘i: 'ōlelo kū‘ū,
English: "sea purslane".
Description: Succulent herbaceous halophytic. Stems prostrate, 0.3 - 1 m long; leaves obovate, glossy; 2 - 4.5 cm long; Fls oblongulate, glossy; 5 - 6 mm long x 3.5 mm wide. Nut ellipsoid, 5 - 6 mm long x 3.5 mm wide. Distribution: (M.H.I) Found throughout the Hawaiian Islands.

Alternanthera sessilis (L.) R. Br.
Vernacular English: "sessile joy weed";
Polynesian: "tēkēhu whena rehahā-ā-ā.
Description: A variable creeping or occasionally floating herb; Lvs sessile or almost so, opposite, 1 - 5 cm long x 0.4 - 1.5 cm across, oblanceolate. Fls in sessile white axillary clusters. Frt sessile, 2 - 3 cm long. Distribution: (C.M.H.S), distributed throughout the Hawaiian Islands.

Cyperus papyrus L.
Vernacular: English: "papyrus".
Description: Perennial sedge 1 - 5 m tall
with roundish to slightly angled stems, 1 - 3 cm thick. Lvs, the basal ones reduced to bladeless sheaths, the involucral leaves
much shorter than infrutescence, with numerous slender branches, linear, 6 - 10 cm long x 1 mm wide. Nut oblong, 3 - 5 angulose. Distribution: (M.C.F) Known from streams and swamps on Kauai, also cultivated as an ornamental.

Cyperus esculentus Linn.
Syn. Cyperus rotundus Linn.
Description: Tufted sedge with erect 3-angled stems 10 - 60 cm tall x 1 - 2 mm diameter. Lvs, the basal ones shorter than the stem, the 3 - 5 involucral leaves to 20 cm and overtopping the infrutescence. Infrutescence a compact, regularly lobed cluster 2 - 5 cm across, usually without long rays, or occasionally with rays 6 - 7 cm, spikelets flattened, linear, 1 - 2.5 cm long x 1.5 - 2 mm wide, bearing 10 - 40 yellowish-brown scales, each 1 mm long x 2 - 5 mm across. Fls 10, stamens 1 - 2. Nut dark brown, about 1 mm long. Distribution: (M.C.F) Sometimes found under occasional influence of brackish water.

Cyperus rotundus Linn.
Syn. Cyperus esculentus Linn.
Description: Tufted sedge with erect 3-angled stems 10 - 60 cm tall x 1 - 2 mm diameter. Lvs, the basal ones shorter than the stem, the 3 - 5 involucral leaves to 20 cm and overtopping the infrutescence. Infrutescence a compact, regularly lobed cluster 2 - 5 cm across, usually without long rays, or occasionally with rays 6 - 7 cm, spikelets flattened, linear, 1 - 2.5 cm long x 1.5 - 2 mm wide, bearing 10 - 40 yellowish-brown scales, each 1 mm long x 2 - 5 mm across. Fls 10, stamens 1 - 2. Nut dark brown, about 1 mm long. Distribution: (M.C.F) Sometimes found under occasional influence of brackish water.

Dicotyledons - AMARANTHACEAE

Alternanthera sessilis (L.) R. Br.
Vernacular English: "sessile joy weed";
Polynesian: "tēkēhu whena rehahā-ā-ā.
Description: A variable creeping or occasionally floating herb; Lvs sessile or almost so, opposite, 1 - 5 cm long x 0.4 - 1.5 cm across, oblanceolate. Fls in sessile white axillary clusters. Frt sessile, 2 - 3 cm long. Distribution: (C.M.H.S), distributed throughout the Hawaiian Islands.

Cyperus papyrus L.
Vernacular: English: "papyrus".
Description: Perennial sedge 1 - 5 m tall
with roundish to slightly angled stems, 1 - 3 cm thick. Lvs, the basal ones reduced to bladeless sheaths, the involucral leaves
much shorter than infrutescence, with numerous slender branches, linear, 6 - 10 cm long x 1 mm wide. Nut oblong, 3 - 5 angulose. Distribution: (M.C.F) Known from streams and swamps on Kauai, also cultivated as an ornamental.

Cyperus esculentus Linn.
Syn. Cyperus rotundus Linn.
Description: Tufted sedge with erect 3-angled stems 10 - 60 cm tall x 1 - 2 mm diameter. Lvs, the basal ones shorter than the stem, the 3 - 5 involucral leaves to 20 cm and overtopping the infrutescence. Infrutescence a compact, regularly lobed cluster 2 - 5 cm across, usually without long rays, or occasionally with rays 6 - 7 cm, spikelets flattened, linear, 1 - 2.5 cm long x 1.5 - 2 mm wide, bearing 10 - 40 yellowish-brown scales, each 1 mm long x 2 - 5 mm across. Fls 10, stamens 1 - 2. Nut dark brown, about 1 mm long. Distribution: (M.C.F) Sometimes found under occasional influence of brackish water.

Cyperus rotundus Linn.
Syn. Cyperus esculentus Linn.
Description: Tufted sedge with erect 3-angled stems 10 - 60 cm tall x 1 - 2 mm diameter. Lvs, the basal ones shorter than the stem, the 3 - 5 involucral leaves to 20 cm and overtopping the infrutescence. Infrutescence a compact, regularly lobed cluster 2 - 5 cm across, usually without long rays, or occasionally with rays 6 - 7 cm, spikelets flattened, linear, 1 - 2.5 cm long x 1.5 - 2 mm wide, bearing 10 - 40 yellowish-brown scales, each 1 mm long x 2 - 5 mm across. Fls 10, stamens 1 - 2. Nut dark brown, about 1 mm long. Distribution: (M.C.F) Sometimes found under occasional influence of brackish water.
Dicotyledons - BARRINGTONIACEAE (LECYTHIDACEAE)

Cyperus elongatus L.

Description: Robust, tufted, perennial sedge with slightly scolopendrom stems 30 - 60 cm tall. 

Leaves, the basal ones as long or longer than the stem, gray-green with cutting edges. Inflorescence compound, umbel-like, with 2 - 12 rays each to 10 cm long. Spikelets cylindrical, 4 - 6 mm long with 2 - 6 scales 2.5 - 3 mm long, the spikelets spreading from the axis and borne in dense spikes obscuring the axis. 

Stem: 2 Nut 3-sided, obovate, 1.5 mm long, brown.

Habitat: [BM.F.M.M] Known from wet coastal areas.

Distribution: (M) Known from Tropical Africa and America, and reported from Guam in the Marianas.

Barringtonia racemosa (L.) Br. and B. samoensis Gray

Vernacular: Chamorro "talega", Kosea "talega", Pisonpe "wehman", Truk "talega", Palau "gorajas", Tinian "talega".

Description: Small to medium-sized trees. 

Leaves succulent, obovate, 15 - 30 cm long, 8 - 10 cm across, margins serrate or entire. 

Flowers with 4 petals 2.5 - 3 cm long, and numerous conspicuous white to pinkish (or in Palau, sometimes magenta) flowers 3 - 4 cm long. 

Fruit: 

Habitat: [BM.F.M.M] Known from wet coastal areas.

Distribution: (M) Known from wet forested areas, swamps, and mangrove vegetation.

Cyperus figulensis L.

Vernacular: Pisonpe "wehman", Truk "wehman", Palau "gorajas", Tinian "gorajas".

Description: Annual or perennial sedge with triangular stems 20 - 100 cm tall. 

Leaves, the basal ones shorter than the stem. 

Inflorescence loose to dense, the several primary rays to 20 cm long, bearing secondary rays and finally cylindrical spikelets 10 - 25 mm long x 1 - 1.5 mm broad, the spikelets spreading yellowish-green with 10 - 25 scales, each 2 - 3.5 mm long; 

Stamens and styles: 3. 

Nut: 1.5 - 2 mm long, grayish brown to black.

Habitat: [F.M.F.M.M] Known from wet coastal areas, swamps, and mangrove vegetation.

Distribution: (M) Known from wet coastal areas, swamps, and mangrove vegetation.

Monocotyledons - CYPERACEAE
**Dicotyledons - BATIDACEAE**

**Belis maritima L.**
**Verneuillet:** Hawaii "Shooliku-kai"; English "saltwort"; "pickle weed".
**Description:** Dioecious, woody-stemmed, spreading, succulent shrub with erect young branches, <1 m long. **Leaves:** spirally succulent, linear to oblong-elliptic. **Flower:** minute, borne in axillary oblong lanceolate to 3 cm long. **Fruit:** fleshy, 1 cm long and consisting of the seed and inflorescence.
**Habitat:** (SM-F) Belis is a colonizer of lowland mudflats and fishponds, often forming a virtually monotypic salt marsh vegetation. It is also found in other areas under tidal influence, as on raised coastal beach rock, and often occurs with Rhuca indica.
**Distribution:** (H) Native to the New World Tropics, introduced to Hawaii. Not naturally occurring throughout the Pacific Islands.

**Cyperus laevigatus L. (SM-F) Cane**
**Verneuillet:** Hawaii "ehu/awa"; "mahakoa".
**Description:** Perennial creeping sedge with roundish stems, 10 - 70 cm tall x 0.3 - 1 cm diameter. **Leaves:** the basal ones, often reduced to sheaths, the blades, when present, 1 - 2 cm long, 1 - 3 per stem. **Inflorescence:** a tight umbel 10 - 60 cm long of 2 - 15 spikelets, each spikelet with 10 - 14 scales, 2 - 2.5 mm long, styles 2, stamens 3, **Nut:** 1 mm long.
**Habitat:** (SM, FM: G) Known from coastal marshes.
**Distribution and Uses:** (H) Known from many tropical areas, but not widely distributed in the Pacific. The fibre, highly prized from the island of Nihau Hawaii, was made from this sedge. Its stems were also used to strain tea, a drink made of Pi'ia or methysticum.
**Cyperus hispani L.**

**Description:** Slender weak-stemmed perennial sedge with 3-ranked stems to 40 cm tall (to 100 cm in ssp. junceoides).

**Lvs:** 5-10 cm long, linear-lanceolate, to 2 cm wide, usually reduced to bladed sheaths 2-10 cm long; pils not deflexed.

**Inflorescence:**礼仪, 3-ribbed, cylindrical, to 10 cm long, 1-2 mm broad, white or yellowish, 0.5 mm diameter.

**Habitat:** (T) SPP. This is a wetland species found as a weed in taro patches, wet fields, and especially on the island of Hawa’i; matures in the forest resulting from disturbance.

**Distribution:** (C) tropical in distribution.

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**Dolichichondron spathaceum (L.) K. Schum.**

**Vernacular:** "yap ru"; Palau "ru"; marnoe.

**Description:** Tree 5-10 m tall. Lvs pinnate with 7-9 leaflets each 6-25 cm long x 3-10 cm across; Figs falling by mid-morning, white, tubular, funnel-shaped, about 20 cm long, pils with 4-5 petals.

**Habitat:** (S) Live in the mouth of the mangrove and other somewhat swampy areas.

**Distribution:** (C) Indispensable only to Yap and Palau in the Carolinian islands and India through Malaysia to New Guinea.

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**Cyperus javanicus** Hoult.

**Vernacular:** "wahitok"; "huakngoung"; "jikakeafak"; "amata"; "manoe"; "Tupat "pupu"; "Pau"; "tukukus"; "Samosa"; "pelekeke"; "mua marialai".

**Hawaiian:** "aikopop"; "wii awea"; "alikue".

**Marquesian:** "Marah Cyperus".

**Description:** Perennial sedge with slightly 3-angled stems 40-100 cm tall. Lvs. 5-10 cm long, linear-lanceolate, to 2 cm wide, usually reduced to bladed sheaths 2-10 cm long; pils not deflexed. Inflorescence cylindrical, to 15 cm long, 1-2 mm broad, white or yellowish, 0.5 mm diameter.

**Habitat:** (S) Often found in coastal marshes exposed to salt or brackish water at the mangrove coastal strand interface, and occasional weed in lowland taro patches.

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**Drymaria cordata (L.) Wild.**

**Vernacular:** "pisip".

**Description:** Low growing herb with slender stems. Lvs opposite, orbicular, 0.5-2 cm diameter. Figs 2-4 mm long with 5 petals and sepalas. Fruits a thrin-wally sticky capsule 4 mm long.

**Habitat:** (S) Live in disturbed areas including cultivated and other natural habitats, and muddy openings in the forest resulting from disturbance.

**Distribution:** (H) This is an American species naturalized in Hawaii.

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**Monocotyledons - CYPERACEAE**

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**Dicotyledons - BIGNONIACEAE**

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**Monocotyledons - CYPERACEAE**

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**Dicotyledons - CAROPHYLLACEAE**

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Lumnitzera littorea (Jack) Voigt
Description: Tree to 25 m tall with slender reddish triangular-shaped pneumatophores covered with pores. Live alternate and clustered at the branch tips, glabrous, glossy, semi- succulent, oblanceolate, 8-12 cm long x 1.5-2 cm across, entire; Fls clustered in terminal spikes, brilliant red, 2.5 cm long; Frs ellipsoid, ribbed, green turning black, 2 cm long, crowned by the persistent calyx.
Habitat: (SS) Found in the middle to landward edge of the mangrove.
Distribution: (C,M) Indigenous from Indo-Malaysia to the Western Pacific.

Cyperus brevifolius (Rottb.) Hassk.
Vernacular: Yap “nikyvyoi”, Hawaii “kolo’oko”, “mana’euhe”, English “killing grass”.
Description: Perennial creeping sedge with stems to 40 cm tall. Live fresh basal leaves short, spreading. Flowers sessile, terminal. Inflorescence a globular head 3-5 mm diameter; involucres, 1-1.5 mm, coarsely dentate. Siliques 3 mm long spaced hing a 1-2 scales, 1 seed and 3 stigmas. Nut 2 sided, yellowish brown, <3 mm long.
Habitat: (FM, R,C,F)
Distribution: (C,M,H) Widely distributed throughout the tropics including most of the Pacific Islands.

Eclipta alba (L.) Hassk.
Vernacular: Chamorro “fimo”, English “false daisy”.
Description: Branching upright or procumbent herb to 50 cm tall. Live 3-8 cm long x 1-2.5 cm across, opposite, searole, elliptic to lanceolate with appressed white hairs. Flower heads white 0.5-1 cm diameter, borne singly or in pairs in the leaf axils on peduncles to 3 cm long; Frs green, turning black.
Habitat: (C,F)
Distribution: (C,M,S,H) Pan-tropical, presumably introduced throughout the Pacific.

Cyperus difformis L.
Description: Annual clumped sedge with 3-angled stems to 60 cm tall. Live fresh basal leaves shorter than stem, the involucres 1-3 mm, linear. Inflorescence consisting of 3-9 primary rays 1-4 cm long, each with either short secondary rays, or directly bearing light clusters of flattened spikelets, the clusters 5-15 mm across with the spikelets 2-8 mm long with 10-32 scales each <1 mm long; stamens 2, 2 stigmas. Nut 3-angled, shiny yellowish or pale brown, <1 mm long.
Habitat: (R, CO) Known from wet lowland areas.
Distribution: (C,M,H) Pan-tropical, naturalized throughout the Pacific.
Cladium leptostachyum (Nees & Mayen) C.H. Wright,互称 "Hawaiian sawgrass"

Description: Large, corymbose, pedunculate, 6-petaled flower. Height: 1.2 m. Flower: Sepals: 6 petaloid, 6 mm long. petals: white, 5 mm long. Fruit: Nut: 1 cm long, brown, smooth. seed: 1 mm long.

Habitat: (F.M.F) This forms dense masses in some freshwater marshy areas.

Distribution: (H) Cladium leptostachyum is considered to be endemic to Hawaii. However, some botanists do not consider the Hawaiian plant distinct from one occurring throughout tropical Asia, Africa, Australia, and North America.

Phyllochaena indica (L.) Less.

Vernacular: English: "Indian marsh fern"; Hawaiian: "idol"; Tagalog: "dupay-bush".

Description: Branchy woody shrub to 2 m tall. Leaves: 2.5 - 6 cm long x 1 - 3 cm wide, alternate, ovate, subulate, toothed, toothed, with glandular hairs. Flowers: Heads: 10 - 15 mm in diameter, grayish-green, borne on long, erect, stiff, pithy, ribbed, and with conspicuous pale hairs.

Habitat: (C.M.F) Margins of coastal marshes, and other brackish areas where it sometimes forms dense thickets. This species often occurs with Baria multiformis in Hawaii.

Distribution: (C.M.H) Native from India to Malaysia, introduced throughout the Pacific near the coast.

Cyperus alternifolius L.

Vernacular: Hawaiian: "alii"; English: "umbrella plant".

Description: Perennial sedge with slightly 3-angled stems. Leaves: 1.5 - 3 m tall, the basal ones reduced to Blackwellia-green 10 - 20 cm long, involucrii leaves numerous, all nearly equal in length; 25 cm long x 1.2 cm across. Inflorescence: umbel-like consisting of many heads, the lowest to 1 cm, and subtended by an involucral leaf. Spikelets flattened, 3 - 9 mm long with 3 - 30 scales each 2 mm long; glumes and stamens: 2; Nut: 3-angled, 0.1 mm long.

Habitat: (C.M.F) Cultivated as an ornamental; it is naturalized in streams, marshes and other wet areas.

Distribution: (C-M.H) Introduced throughout the Pacific.
Isomene aquatica Forsk.

Vernacular: Chinese "long choy"; Chamorro "sahikun". True "geeni". Tagalog "kangkung", "palay "kangkung". English "sweet morning glory".

Description: Creeping or floating glabrous vine without twining stem. Lvs. alternate, arrow to heart-shaped, 4-10 cm long x 1-4.5 cm broad. Fls funnel shaped, 4.5 cm long with 6 mm long sepals. Corolla pale purple with deep purple throat for entirely white and thin with broader leaves. Frt. an ovoid capsule 8-10 mm long.

Habitat and Uses: (R.O.C.) This morning glory grows in and around land patches and roadside drainages. It is also cultivated as greens, especially the white flowered form.

Distribution: (C.M.H.) Indigenous to the Old World Tropics and introduced throughout the Pacific, probably by early oriental laborers.

Isomene pas-cupreus (L.) Sweet & St. 

brasilienis (L.) v. Ostaf.

Vernacular: Hawai‘i "pohuehu‘u"; Pala‘u "ke bea-fiti"; Chamorro "syaq-yadi"; "alabai lasti"; Samoan "tuia moa"; English "beach morning glory".

Description: Glabrous creeping, non-vining vine. Lvs. 6-12 cm long, often folded, livid with deeply notched apex.

Frs funnel shaped, purplish purple with darker throat, 3-5 cm long. Frt. an ovoid capsule 1.5 cm long, bearing woolly seeds.

Habitat: (C.M.F.) This plant is usually restricted to the coastal strand but often found in lowland swamps as well.

Distribution: (C.M.H.) Indigenous throughout the Pacific.

Dicotyledons - CONVOLVULACEAE

Dicotyledons - CONVOLVULACEAE

Monocotyledons - CYPERACEAE

Fimbrylitas

style jointed at base
distinct persistent style base

Eleochoris

Scirpus

flor spikelet with ovary
style continuous with ovary

Cyperus

style continuous with ovary
**INTRODUCTION**

This is a large family of many genera and species which are often major components of wetland vegetation. As it is often necessary to use a hand lens to identify sedges, and as specific terminology is used in most descriptions, the following illustrations are designed to assist the reader in the use of the guide.

Sedges are grass-like plants often with a creeping rhizome. The stem (culm) is usually solid rather than hollow, and often angled. The leaves consist of a closed basal portion called the sheath, and the blade. In sedges the inflorescence is composed of a series of scales, each scale subdividing an individual flower. In most sedges, the flowers are either sexual or unisexual and may be without a perianth, or with a perianth represented by a series of bristles, or a sac-like membrane.

**Nasturtium microphyllum** Sp. nov.

**Vernacular:** English "watercress"; Hawai’i "80 ke ‘oke ‘o”

**Description:** Aquatic perennial herb with prostrate or erect stems rooting at the nodes; Lvs: glabrous, pointed with 3-11 leaflets each 4-30 cm long; Fls: 3-4 mm long with 4 white petals. Fr a slender erect linear capsule.

**Habitat:** (FA:CO) This is the cultivated watercress which has become naturalized in some streams in Hawai’i.

**Distribution:** (H) Native to Europe.

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**Exococha agallocha** L.

**Vernacular:** Truk "lusi”, "roosia”, Yap “bat”; Pala’ u "tas”, "ayas”.

**Description:** Small dioecious tree to 10 m tall with copious acid milky sap. Lvs: alternate, ovate or obovate, 6-11 cm long x 3.5-7 cm across, dark green and glossy above, margins entire or crenate, base with a gland on either side of the petiole, sometimes dehiscing with the old leaves turning red before falling; Fls: "borne in cattails 3.5-10 cm long", borne in racemes 1.5-3.5 cm long. Fr a 3-lobed capsule 6 mm in diameter.

**Habitat:** (SS:S:F) Coastal marshes, mangrove channels and sheltered coasts.

**Distribution:** (C,M) Indigenous from India to Polynesia, known from Truk, Yap and Pala’u in the Caroline Islands, and reported from Guam in the Mariana Islands.
Calophyllum chohobiches Laut.

Vernacular: Palau "chohobiches", "akalea", "kasmorik".

Description: Tree to 25 m tall; Lvs glabrous, opposite, obovate to elliptic, 5 - 10 cm long by 2.5 - 5 cm across, numerous secondary veins arising from midrib parallel to each other and 1 mm apart, new leaves red; Fls 1 cm diam, borne in lax axillary thyrses. Frs ellipsoid 2 cm long, drying on tree then falling.

Habitat: (P.S.O.) Found along rivers at low elevations, in swamp forests, and at the landward edge of the mangrove.

Distribution: (C) Endemic to Palau.

Commelina diffuse Burm. f.

Vernacular: Buna "mau' apo"; Hawai'i "honohong", "honokonawae", "mikolokouy"; Yap "tanu".

Description: Creeping, prostrate, grass-like herb; Lvs obovate, 1.5 cm long by 2 cm across, with parallel venation; Fls fragile, with 3 bluish petals borne in a reflex boot-shaped bract.

Habitat: (P.M. C. R.F.)

Distribution: (C.M.H.S) Pan-tropical, introduced throughout the Pacific.

Burmamnia lefremannii Jank.
Monocotyledons - ARACEAE

**Nolinelleae** 1.
**Vernacular** English: “water lettuce”.

**Description:** Floating aquatic herb with rosette of leaves and abundant dangling dark roots. **Lvs.** light green, with velvety pubescence, obovate, 3 - 12 cm long x 2 - 8 cm across with spongy base to 2 cm thick; **Fls** borne on spongy attached to short leaf-like stalks partially hidden by leaf bases.

**Habitat:** (FAO) This is a wetland plant found in slow moving fresh or somewhat brackish water. It has the potential for being a noxious weed that can form dense mats of vegetation and block canals and waterways. Naturalized in at least Hawaii and Guam. **Distribution and Uses:** (MA) Introduced to the Pacific, presumably as an ornamental. Known from tropical and subtropical Africa and Asia.

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Dicotyledons - HALORAGACEAE

**Microphyllum brasiliense** Canecos.
**Vernacular:** English: “perrol’s feather”.

**Description:** Weak stemmed dioecious aquatic herb growing to 30 cm tall out of water. **Lvs** fleshy, in whorls of 4 - 6, **Fls** white, in axils of submerged leaves. Known from Tropical and subtropical Africa and Asia.

**Habitat:** (FAO) Cultivated and escaped; found in freshwater ponds, streams, taro patches and marshy areas in upland forests.

**Distribution and Uses:** (MA) Native to Chile, probably introduced as an ornamental and now naturalized in Hawaii, especially on the island of Oahu.

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**Burmania ledermannii** Jonk.

**Vernacular:** English: “long stemmed Burmanian”.

**Description:** Small, delicate annual herb to 20 cm tall. **Lvs** leaves mostly recurved to scales, but basal leaves to 2.5 cm long. **Fls** terminal, solitary or clustered, 2-flowered, fading to white, 6 - 13 cm long with 3 prominent wings.

**Habitat:** (C) A wetland plant of the savannas wetlands of Yape and Palau.

**Distribution:** (C) Indigenous to Yape and Palau in the Caroline Islands; also known from Malaysia.

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**Stemonurus amnium** (Kanehira) Sleum.

**Vernacular:** English: “amnium”, “wheelskew”.

**Description:** The 10 - 25 cm tall with looped, knee-like pseudobulbs. **Lvs** alternate, fleshy, epiglottous, ovate to oblong, 9 - 15 cm long x 4 - 6 cm across, **Fls** with reflexed, scent borne in inflorescent umbels. **Frt** ellipsoid, 4.5 cm long subtended by the persistent cuplike calyx.

**Habitat:** (FAO) Found in swamp forests adjacent to mangrove where it is often the dominant understorey tree.

**Distribution:** (C) Indigenous to Palau, Micronesia and New Guinea.

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**Dicotyledons - ICACINACEAE**
**Dicotyledons - LEGUMINOSAE**

*Casiae alata* L.


Description: _Shrub 2-4 m tall, Lvs paniculate, with 8-20 pairs of leaflets each 5-15 cm long, Fls 2 cm long with 5 yellow petals, and borne in showy racemes 40-60 cm long, Frt a dark brown winged pod to 19 cm long x 2.5 cm broad (excluding the wings).

Habitat: (FS, C, F) This species occurs in wet spots of secondary forest vegetation and at the margins of cultivated areas.

Distribution and Uses: (C, M, S, H) Native to America but naturalized on many Pacific Islands. It is used in the treatment of ringworm.

**Cyrtosperma chamisotaei** (Schott) Merr.


Description: Very large plants to 5 m tall with enormous edible fleshy stem and without a developed above ground stem. Lvs 2 to 5 m long borne on spiny petiolate to 4 m long, not peltate; stipules pointed skyward; basal lobes acute, about same length as leaf apex (both measured from petiole attachment); Fls borne in a many-flowered spadix surrounded by a yellowish spathe.

Habitat: (C, G) Apparently can tolerate some exposure to brackish water.

Distribution and Uses: (C, M) Widely cultivated for its corn throughout the Caroline Islands, uncommon in Guam, and rarely cultivated in Polynesia. This, like other members of the family must be very well cooked before being eaten.

**Cymometra ramiflora** L.

_Vernacular:_ Chamorro "gulup", Ponape "kamin", "kahsiai".

Description: _Trees to about 16 m tall, Lvs even pinnate with usually 2 but sometimes 4 leaflets, 5-15 cm long x 3-8 cm broad, pink when young, Fls borne in short racemes to 1 cm long, white, Frt roundish up to 3 cm long, usually wrinkled.

Habitat: (SLS, F, S, P) This plant grows along rivers and in swamp forests at the landward edge of the mangrove associated with Salmithyma radicosa and Heneidae nitotoat. It is also found in low elevation, relatively undisturbed forests.

Distribution: (C, M) Indigenous from Malaysia to the Western Pacific.

**Monocotyledons - ARACEAE**

*Cyrtosperma chamisotaei* (Schott) Merr.
Alocasia macrorrhiza (L.) G. Don
Description: Large erect herb to 3 m tall with well-developed above-ground stems, 1-1.5 m long. Leaves with heart-shaped blades 0.7-1.3 m long and 0.5-1.2 m wide, pointed into a bladelike acuminate tip. Greenish-white flowers are stalked and 10 cm long. The fruits are 2.5 cm long. Habitat: (F/S, C/G) This is an occasional wetland plant from swampy or dry ground. It is often found along streams.
Distribution and Uses: (C/M,S,H) Known throughout the Pacific region and formally cultivated on most Pacific Islands. The above-ground stems are sometimes used as a famine food, but they must be very well cooked.

Colocasia esculenta (L.) Schott
Description: Perennial herb to 1 m tall with wide, coarse and without developed above-ground stems. Leaves to 60 cm long x 40 cm across, heart shaped with rounded bases and tips, usually glossy and petiole, leaf tips pointing downward. Florets borne in many flowered spadix surrounded by a spathe. Habitat: (C/G) Commonly cultivated in muddy patches, but some dryland varieties are also grown.
Distribution and Uses: (C/M,S,H) Widely cultivated. The leaves are sometimes eaten as greens, and the corn is the important staple throughout the Pacific. The corn is often eaten asIMIT1212 in sago, served in pieces, or as an ingredient in stir-fried dishes. Hawaiians will often dry the corn and use it as a communion host at Sunday service. All parts of the plant are used medicinally and must be thoroughly cooked before being eaten to destroy these painful crystals.

Dicotyledons

Delbergia cadenatensis (Dennst.) Prain
Vernacular: Ponape "koygas".
Description: Creaking or occasionally turning woods, shaggy to wavy; Lvs small and pinnate, leaves 0.7-1.3 m long, 1.7-6 cm across. Flowers white to pink, 1.5-6 cm long. Fruits are 2.5-3.5 cm long. Habitat: (S,SS) Found at the landward edge of the mangrove, along rivers and openings in the swamp forest, and in the coastal strand often with Dicrane lobata.
Distribution: (C/M) Indigenous to tropical Asia, Malaysia.

Note: Another species, D. pendula, found in Indonesia, with a leaflet up to 0.9 mm long or occasionally seen in mangroves in Palau.

Dioscorea trifida (L.) Lour.
Description: Woody vine, climbing the ground and surrounding vegetation. Leaves odd-pinnate with 3-7 dark green, shiny, glossy leaves each 4-12 cm long x 2.5-6 cm across with acute apices. Flowers white or pinkish, 8-10 mm long including stalk, borne in axillary racemes 6-15 cm long. Fruit flat, thin, roundish pod up to 5 cm long x 3 cm wide.
Habitat: (S,SS,SS,F) This is found at the mangrove fringe, in the coastal strand, and in lowland swampy forests and sometimes also seen rooted at the landward edge of the mangrove exposed to tidal influence.
Distribution: (C/M) Indigenous from Africa to Indo-Malaysia and the Western Pacific.

Note: The root of this species is used as food in certain areas. It is also used in the preparation of the Palauan dish "bantut", a boat-shaped dough made from this root.
Dicotyledons - LEGUMINOSAE

*Syphilethus polynesiensis*

**Vernacular:** Porcupine "pehri"; Samoa "tiga"; "tiga"; "iluana".

**Description:** Tree 10 - 30 m tall with thorny branches; leaves trifoliate with the leaflet oval to the top leaflet 9 - 16 cm long x 5 - 10 cm broad, silver-gray green on lower surface.

**Flora:** Red 5-6 cm long borne in racemes 20 - 30 cm long on peduncles stalked 1 - 2 cm long, the terminal leaflet 4 - 5.5 cm long x 3.0 - 4.5 cm across. Petal a brown pod 15 - 25 cm long with up to 11 dark brown seeds.

**Habitat:** FS-O Loswal, fresh water, swampy ground often near taro patches.

**Distribution:** Known at least from Porcupine and Puleoe in the Caroline Islands and Samoa, but not apparently from the Mariana Islands or Hawaii.

**Notes:** The pears should not be confused with the common pear, Pyrus communis L. (Europe), which has a similar habitat but produces a spiny, brown fruit and a yellowish-brown or yellowish-green, large, spiny pear-shaped fruit.

*Urochloa stolonifera* (Stapf) Prain & Underw.

**Vernacular:** English "bladder weed".

**Description:** The genus of Bladderwort is distinguished by the presence of bladders, or "organs", on the leaf-like stems and rhizomes which are capable of assimilating and digested small aquatic organisms such as protozoa. The inflorescence usually consists of a simple, unbranched raceme bearing bilaterally symmetrical flowers. The fruit is a capsule that splits open at maturity. Several species have been noted from Micronesia. The following is a key to the common species:

1. Ternate plants to 25 cm tall, growing on mud.
2. Flowers yellow, leaves strap-like
   - U. brittonii
2. Flowers white, leaves inconspicuous
   - U. calycina
1. Aquatic masses with emergent yellow flowers and submerged hair-like leaves
   - U. exsculte

**Habitat:** (FA, FM, R) All the species of this genus are obligate wetland species of freshwater aquatic and marshy habitats including lagoon wetlands, and ruderal habitats on clay soils.

**Distribution:** Known from Malaysia and the Western Caroline Islands and, with the exception of *U. exsculte*, the Mariana Islands. The plants are probably easily dispersed by wetland birds.

*Cyclocereeus intermedia* (Walp.) J. Mab

**Vernacular:** "amari"; Samoa "vao tosniu"; Hawaii: "neke".

**Description:** Fern with creeping rhizome 8 mm diameter covered with brown scales.

**Acrocladichium aureum** L.

**Vernaculars:** Chamorro "langavala"; Truk "sapeko"; Yap "ungangale", "ugenbulang"; Palau "ekiwan"; Samoa "atato"; "ulu atato".

**Description:** Robust fern with scales to 4 cm long on midrib and base of stipe. Fronds 3-10 cm long, 1-5 cm wide, occasionally to 3 m high, the pinnae linear, elliptic to linear, 12-25 cm long × 2.5 cm across. Fertile fronds similar to sterile fronds but with lower surface of upper several pinnae completely covered with golden brown sori.

**Habitat:** (FM-0) This wetland species of fresh or somewhat brackish water is found rooted in coastal marshes, at the margin of mangrove swamps, near streams, and sometimes in large floating masses in freshwater.

**Distribution:** (C.M.S) Pan-tropical in distribution. Indigenous to Samoa, the Marianas Islands and Palau, Yap and Truk in the Caroline Islands, but not naturally occurring in Hawaii.

**U. bifida**

**U. caprifolia**

**Ammania bacillifera** L. and **A. coccinea** Rottb.

**Description:** Erect herbs to 60 cm tall. Lvs opposite, 1-60 cm long, lanceolate or often rounded. Fls minute, less than 2.5 mm. Fig and bony in sessile axillary clusters. **Ammania bacillifera** which has leaves narrowed toward the base, and lacks petals, can be distinguished from **A. coccinea** which has a broad leaf base armor crossing the stem, and minute pink petals.

**Habitat:** (ROI) These two species, along with others in the genus, are obligate wetland species usually of ruderal habitats.

**Distribution:** (C.M.S) *Ammanna bacillifera* is known from Malaysia and at least Palau in the Caroline Islands, with *A. coccinea* reported from the Marianas.

**Dicotyledons** - LENTIBULARIACEAE
Cuscuta carthagenensis (Jacq.) Macbr. 
Vernacular: Hawaiian "pu'ukamilo". English "tar weed". 
Description: Erect perennial slightly woody, herb 20 - 50 cm tall, often with reddish stems. Lvs opposite, 1 - 3 cm long, ovate, hairy, sometimes sticky, Fls 6 - 7 mm long with 6 purplish obovate petals. Frt enclosed by the throrn-tailed calyx 4 mm long. 
Habitat: (F.S.C.R.F.F) Found in mucky, frequently disturbed areas. 
Distribution: (C.M.S.H) Native to tropical America, naturalized and established on many Pacific Islands.

Dicotyledons - LYTHERACEAE

Pemphis acidula J.R. & G. Forst. 
Vernacular: Korean "kauaet", Ponape "rogi", Truk "enji", Chamorro "niga". 
Description: Shrub or small tree to 4 m tall. Lvs opposite, elliptic to obovate, 2 - 3.5 cm long x 0.4 - 1 cm wide, gray-green, pubescent with white silky hairs on leaves and young branches. Fls 1 - 1.5 cm diameter, solitary or paired in leaf axils. petals 5, white. Frt an ovoid capsule 6 - 7 mm long, reddish-brown, splitting about the middle. 
Habitat: (S.S.F) This is often found in the coastal strand and on coraline substrate, but sometimes found growing at the mangrove interface exposed to tidal influence. 
Distribution: (C.M.S.H) Distributed from East Africa to the Pacific, and indigenous throughout the Caroline and Mariana Islands, with a few collections from Samoa (including Swain Islands).

Ferns - PARKERACEAE

Ceratopterus thalictroides (L.) Brongn. 
Vernacular: C. A. Nieto (E.), C. apiculata. 
Description: Weak stems, aquatic fern. Fronds dimorphic, the fertile fronds 30 - 60 cm tall, erect, much dissected, each cylindrical lobe 3 mm across with a continuously thorn-tailed calyx. Stipe 5 - 4 mm long, borne along the axis, sterile fronds shorter, with 4 or 5 ribs borne more or less horizontally. 
Habitat: (F.A. C.F) This fern grows floating, partially submerged, or on the surface of wet mud in taro patches, rice fields, ditches and other still, shallow freshwater locales. 
Distribution and Uses: (C.M.S.H) Found throughout the tropics. The entire plant can be eaten cooked or uncooked as greens, and is sometimes used medicinally.
**Algae - CHARACEAE**

**Chena spp.**
**Description:** Submerged, limp, freshwater, 1 mm diameter with whorled branches arising from nodes, these being repeatedly whorled. The characters separating the species and genera of this family are difficult to observe without magnification.

**Habitat:** (FA:G) Often forms mats of submerged vegetation in bodies of fresh-water, lagoons, patches and ditches.

**Distribution:** (C,M,H) This is a cosmopolitan genus.

**Note:** Another submerged plant with whorled branch-like leaves is Acorus gramineus (Madrepora aquatica) which occurs in the northern part of the tropical forest.

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**Dicotyledons - MALVACEAE**

**Hibiscus bilineatus** L. (SALVIALES: MALVACEAE)

**Vernacular:** Chanso 'maipo', Samos 'kai', Hawai'i 'hau', Kauai 'ho', Ponape 'kau kau', Niihau 'ka la', Kauai 'kalua', Lihue 'ka li', Yo'gi 'kau', Palau 'arame', 'nemal.

**Description:** Small to medium-sized tree with long, narrow, yellowish green leaves. The flower is a showy, bright red, consisting of a single petal with a five-petaled orange flower. The fruit is a capsule 3.5 cm long with spiny thorns in 5 parts which mature.

**Habitat:** (FS:H) This Hibiscus grows in dense thickets on the islands where it can be found along streams, at mangrove margins, in lowland swampy areas and on slopes as well. It is also frequently planted as an ornamental.

**Distribution and Uses:** (C,M,S,H) Indigenous throughout the Pacific region. The fibrous bark is used as cordage and is made into the "grass" skirts of many Pacific Islands. In Ponape, sakau, traditional drink made from Piper methysticum, is

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**Aloza filiculoides:** Lmk.

**Vernacular:** English "water fern", "azolla".

**Description:** Small floating fern with long, narrow leaves and overlapping scale-like leaves often tinged with red, each leaf to 3 mm long.

**Habitat:** (C,F,C) Floating or rooted on very wet mud in lagoons or rice patches or other still freshwater ponds. Members of this genus harbor nitrogen-fixing blue-green algae which contribute to the productivity of some of these wetland crops.

**Distribution and Uses:** (H) Cosmopolitan, and naturalized in Hawai'i. Used as a green alga.

**Note:**دلة: another floating aquatic fern in an aquarium plant that is propagated by runners in the Pacific. Similarly, floating ferns in Hawai'i and similar plants are propagated in the same manner. A small, aquatic fern 1976, squamifera, and a large, aquatic fern 1978, squamifera, are also known. The ferns in the Pacific are known as "Aloza filiculoides."
Dicotyledons - MELIACEAE

Xylocarpus granatum Koen
(Syn. Carapa cooassa Bl.) and
X. moluccensis (L. & C.) Roem.


Description: Xylocarpus granatum is a tree 5-20 m tall with striking smooth white bark, red wood, and elaborated curvilinear buttressed roots (see pg. 13). It even pro- duces with 2-7 elliptic-oblong leaves, each 8-30 cm long x 4-13 cm across, glabrous with rounded to obtuse apex. Fls about 7 mm across, white. Frs 1-3 cm long, joined together by their stalks into a short, small, tubular infructescence a bag 2-7 cm long. Frs 1 globules green to brown capsule 10-15 cm diameter with 5-10 peculiarly angled seeds.

Habitat: (SS) On found at the landward edge of the mangrove, often in dense stands and in estuaries.

Distribution: (CMS) Xylocarpus granatum is known throughout the Indo-Malayan region in the Pacific, including the Caroline and Marianas Islands, and X. moluccensis is known from American Samoa and from one collection from Palau in addition to Malaysia. The wood is red, and used for lumber, and the fruit is sometimes a child’s toy.

Note: 4. moluccensis is distinguished by its squared brown bark, and is included with "tapequot species.

RUDERAL WETLANDS

Representative Species of Ruderal Wetlands

<table>
<thead>
<tr>
<th>Family*</th>
<th>Species</th>
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**Xylocarpus granatum"("C. moluccensis") and "C. granatum" are included with "tapequot species.

Note: 5. moluccensis is distinguished by its squared brown bark, and is included with "tapequot species.
RUDERAL WETLANDS

Species characteristic of ruderal wetlands invade disturbed wetlands or normally drier areas that are periodically flooded. Due to disturbances by man, ruderal wetlands are often temporary in nature. Plinas, living in ruderal wetlands are generally cosmopolitan, often annual, weedy, facultative wetland species that are capable of living in repeatedly disturbed habitats, often by virtue of a short life cycle. A preponderance of weedy herbaceous species in any vegetation is indicative of recent or periodic disturbance. Therefore, areas dominated by a large proportion of ruderal wetland species can be determined to be both wet and disturbed. Ruderal wetland habitats are usually man-made and include roadside ditches and other areas of impeded drainage.

Any area where there is standing freshwater, including ruderal wetlands, private habitat for tadpoles, mosquito larvae, and wildlife.

Typha growing in sitting basin at Kapaa sanitary landfill.

Photo courtesy of Margaret Elrod, Corps of Engineers.

**Nelumbo nucifera** Gaertn.

**Vernacular:** English "lotus", Japanese "yakuu

**Description:** Aquatic herb with roots bearing edible tubers having follow canals. Leaves peltate, orbicular, round at or above the surface of the water, 30-90 cm diameter, and without basal indentation (see *Nymphaea*). Flowers 10-25 cm diameter with numerous white to rose-colored petals, fragrant. (an American species, *N. lutea has yellow flowers). Fruits semi-purpurate; the surface of the water in an oval flat topped structure with many holes - each hole containing an ellipsoid fruit-like fruit 2 cm long.

**Habitat:** (FAO) Found in all ponds and streams.

**Distribution and Uses:** (H) Originally from Asia, cultivated for its edible roots, and sparingly naturalized in Hawaii.

**Nymphaea** spp.

**Vernacular:** Hawaiian "iki-lana-i-kaiwai"; English "water lily"

**Description:** Aquatic herbs rooted in submerged mud. Leaves peltate, orbate, floating with deep basal indentation more than 2/3 the distance to the petiole attachment (see also *Nelumbo*). Flowers red, blue, or white, 8-20 cm diameter with numerous petals, stamens and stigmas. Fruit 2-10 cm across, ripening underwater.

**Habitat:** (FAO) Found in freshwater streams and ponds.

**Distribution and Uses:** (C.M.H.) Several species have often been introduced as ornaments throughout the Pacific and have become sparingly naturalized.
Ludwigia hyssopifolia (G. Don) Exell

Vernacular: Chamorro "tisimo", "charquuan abaiyuan"; Pohnpeian "telukun".

Description: Herb to 1 m tall. Lvs alternately lanceolate, 1.5 - 9 cm long x 0.5 - 3 cm across with entire margins. Fls borne in leaf axils, 1 cm diameter with 4 yellow petals acute to rounded at their tips, but not notched. Ephemeral. Frs a cylindrical capsule to 3 cm long x 2 cm wide, with the 4 persistent sepals at the fruit apex.

Habitat: (P.C.F) Muddy disturbed ground.

Distribution: (C.M,S,H) Pan-tropical.

Ludwigia octovalvis (Jacq.) Raven

Vernacular: Pohnpeian "telukun", "teleula", "tuluk", "tuluk", "tulunj", "telunj", "tulupi", "tabl", "tabl".

Description: Semi-woody herb to 2 m tall. Lvs mostly alternate, elliptical to narrowly lanceolate, 3 - 15 cm long x 0.5 - 2.8 cm across with entire margins. Fls borne in leaf axils, 2.5 - 3 cm diameter, with a ephemeral, yellow calyx. Frs a cylindrical ribbed capsule to 4 cm long x 4 mm wide with the 3 persistent sepals persistent at the fruit apex.

Habitat: (F.M.R.C.F) This species is associated with taro patches and wet nutrient environments. It is sometimes dominant in recently abandoned taro patches.

Distribution: (C.M.S.H) This species is pan-tropical in distribution and naturalized throughout the Pacific.

Taro cultivation of a lowland freshwater marsh behind the village of Aunu'u, Samoa.

Aerial view of lowland cultivation in Yap illustrating a Cyrtosperma patch. Note Protegrimes, a weed which invades recently abandoned patches, and Mitracis trifolius, the gray, medium sized bushes on the periphery of cultivation toward the center of the picture that eventually colonizes wet lowland areas.
## CULTIVATED WETLANDS

### Representative Species of Cultivated Wetlands

**Includes common weeds and cultivated ornamentals**

<table>
<thead>
<tr>
<th>Family</th>
<th>Habitat</th>
<th>Species</th>
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<th>American Samoa</th>
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<td>x</td>
</tr>
<tr>
<td>AR</td>
<td>c</td>
<td>Colocasia esculenta 1-6 x x x</td>
<td>x</td>
<td>x</td>
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<td>x</td>
</tr>
<tr>
<td>AR</td>
<td>c</td>
<td>Cyperus chamissonis 1-5 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CL</td>
<td>w</td>
<td>Commelina diffusa 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CY</td>
<td>w</td>
<td>Cyperus bucephalus 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CY</td>
<td>w</td>
<td>C. difformis 1-6 x x</td>
<td>x</td>
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</tr>
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<td>w</td>
<td>C. fluitans 1-6 x x</td>
<td>x</td>
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<td>x</td>
</tr>
<tr>
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<td>w</td>
<td>C. odoratus 1-6 x x</td>
<td>x</td>
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</tr>
<tr>
<td>CY</td>
<td>w</td>
<td>C. polysantha 1-6 x x</td>
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<td>Eleocharis acicularis</td>
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<td>w</td>
<td>E. dulcis 1-6 x x</td>
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<td>E. graminea 1-6 x x</td>
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<td>w</td>
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<td>w</td>
<td>F. globulosa 1-6 x x</td>
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<td>w</td>
<td>F. umbraticola 1-6 x x</td>
<td>x</td>
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</tr>
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<td>w</td>
<td>RhyynchosporaLogo confusa 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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</tr>
<tr>
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<td>w</td>
<td>Scirpus juncoides 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GR</td>
<td>w</td>
<td>Echinochloa colina 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ER</td>
<td>c</td>
<td>E. carinata 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GR</td>
<td>c</td>
<td>Cynodon dactylon</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
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<td>w</td>
<td>Psammophyton compositum 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GR</td>
<td>w</td>
<td>P. obtusata 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GR</td>
<td>w</td>
<td>P. nigricans 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GR</td>
<td>w</td>
<td>Scleropogon indica 1-6 x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LM</td>
<td>w</td>
<td>Lemoletta spp</td>
<td>1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>AM</td>
<td>w</td>
<td>Alenupeptis sessilis 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CP</td>
<td>w</td>
<td>Echinochloa colina 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CN</td>
<td>w</td>
<td>Ipomoea aquatica</td>
<td>1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>CC</td>
<td>w</td>
<td>Nasturtium microphyllum 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LG</td>
<td>a</td>
<td>Cattleya alata</td>
<td>1-6 x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LY</td>
<td>w</td>
<td>Cyperus carinthiopolis</td>
<td>1-6 x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>NY</td>
<td>w</td>
<td>Nymphaea lotus 1-6 x x</td>
<td>x</td>
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<td>w</td>
<td>Ludwigia pygmaea</td>
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<td>x</td>
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<td>ON</td>
<td>w</td>
<td>L. octoflora</td>
<td>1-6 x x</td>
<td>x</td>
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<td>ON</td>
<td>w</td>
<td>L. palustris</td>
<td>1-6 x x</td>
<td>x</td>
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</tr>
<tr>
<td>PL</td>
<td>w</td>
<td>Polygonum spp. 1-6 x x</td>
<td>x</td>
<td>x</td>
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</tr>
<tr>
<td>SC</td>
<td>w</td>
<td>Limnocharis amaratica</td>
<td>1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>SC</td>
<td>w</td>
<td>L. fragilis 1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>UM</td>
<td>w</td>
<td>Hydrocotyle verticillata</td>
<td>1-6 x x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

**Dicotyledons - ONAGRACEAE**

Ludwigia palustris (L.) El

**Vernacular:** English, "water purslane"

**Description:** Perennial creeping herb with rhizomatous stem, rooting at the nodes and ascending to 10 cm tall. Flowers opposite, 3 cm long, oval, filaments and styles in the leaf axils. About 2 mm long, petals absent. At full flowering, forms extensive mats.

**Habitat:** (FA, FS, RC, OR) Muddy disturbed ground, including disturbed areas and ditches.

**Distribution:** (H) Native to Europe and naturalized in Hawaii.

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**Dicotyledons - POLYGONACEAE**

**Polygono**mum spp. (also known as "blackberry")

**Vernacular:** Chamorro "mamaaka", Truk "nuppong", Pijapu "pangaman"; Hawai'i "pālolo", English "smartweed", "kniweed".

**Description:** Low herbs to 1 m tall. Flowers usually racemose 5 - 17 cm long x 0.5 - 3 cm wide, often with a ciliolate (fringed) margin, alternate with a distinctive membranous sheath 1 - 2.5 mm long surrounding the stem above and below a leaf attachment of the petiole. Flowers 3 - 4 mm long, white or pink in loose or congested clusters of spikes 5 - 30 cm long. Fruit 2 - 3 angled, about 1 mm long.

**Habitat:** (FS, RC, OR) Many species of Polygonum are obligate wetland plants of muddy disturbed pieces in forests, or wet cultivated areas.

**Distribution:** (C, K, H) Polygonum minus var. procera is known from the Carolines and Mariana Islands. Polygonum glabrum (Syn. P. densiflorum) which is a perennial with prostrate and erect stems. P. hypericoides is an annual with erect stems, and several other species are known from Hawaii. The taxonomy of this widespread genus is somewhat confused.
Dicotyledons - RHizophorACEAE

Bruguiera gymnorhiza (L.) Link.

Vernacular: Chamorro "mangie mach", "mangie lata", Kpok CHECK "sang", "sang"; Pohnpeian "tong", "tong", "tong"; Tagalog "daga", "tong"; Bacobo "tong"; Samoan "togo"; English "oriental mangrove".

Description: Mangrove tree to 25 m with smooth brown bark. Prop roots flat, leafy, to 1.5 m long; with red stipules sheathing the new leaves; Fls. 5 - 4 cm broad, obovate in leaf axil. Calyx with 10 - 14 mm, glossy tubes, red, or rarely white, as long as flower petals 10 - 14. Fruit 1 - 1.5 cm, globose, apex slightly notched, 13 - 2 cm broad before falling.

Habitat: (SS.O) Mangrove forests, one of the tallest and commonest trees of the middle to landward edge of the mangrove.

Distribution and Uses: (I.C.M.S.H) Indigenous from Indo-Malaysia to the Pacific, introduced and naturalized in Hawaii. The wood is used for timber.

Cerios tagai (Perry) J.C.B. Rob.

Vernacular: Palauan "taytay".

Description: Small tree to 15 m tall, with well-developed prop roots. Lvs opposite, obovate or elliptic, blade 5 - 10 cm long, 3 - 6 cm broad, margins entire, rolled under, apex slightly notched. Fls yellowish-green, 5 parted, 2.7 - 1.0 cm long; purple in 4 - 10 flowered clusters, hypogynous to 15 - 35 cm long before falling.

Habitat: (SS.O) Found in the middle portion of the mangrove and along channels through the mangrove. It is always rooted in mud and associated with other mangrove species.

Distribution: (C) It occurs naturally from Africa to Melanesia, indigenous to Palau and possibly Yap.

People of the Pacific have traditionally depended on aviod crops as their staple and rice is an important staple in much of the world. Wetland conditions are required for rice cultivation. In the Western Pacific, rice is cultivated in basins, ditches, or on small scale. Rice cultivation is a major part of the economy in many countries. In the Pacific, rice is often grown in combination with other crops such as bananas, sweet potatoes, and other vegetables. Rice is also a staple food in many Pacific countries, and is often eaten boiled, steamed, or in a variety of dishes. Rice is a symbol of wealth and status in many cultures, and is often associated with prosperity and good fortune. In some Pacific cultures, rice is used in ceremonial and religious rituals. Rice is also important in the economy, as it is a major export for many Pacific countries. Rice is often grown in combination with other crops such as bananas, sweet potatoes, and other vegetables. Rice is also a staple food in many Pacific countries, and is often eaten boiled, steamed, or in a variety of dishes. Rice is a symbol of wealth and status in many cultures, and is often associated with prosperity and good fortune. In some Pacific cultures, rice is used in ceremonial and religious rituals. Rice is also important in the economy, as it is a major export for many Pacific countries.
Dicotyledons - RHIZOPHORACEAE

Rhizophora apiculata Bl.

Vernacular: Chamorro: "matagå"; Kusin: "sakapik"; Ponape: "anap"; "swihu"; "skapah"; Pethu: "agap".

Description: Mangroves tree to 35 m tall with straight to arching prop roots. Lvs. elliptic to ovate, leathery, elliptic 8 - 16 cm long x 3 - 7 cm across, dark green and shiny above; dull and dotted below, spikes scute with stiff point, margins not rolled. fls. paired or solitary on short thick pedicels to 1.5 cm long, shorter than the pedicle, petals and sepals 4; the petals falling shortly after opening of flowers. Hypocotyl cylindrical, growing to 50 cm long x 12 cm broad before falling.

Habitat: (S.S.) This species is often one of the most abundant components of the mangrove forest.

Distribution: (C.M.) This species is known from Sri Lanka and southeast Asia to the western Pacific.
Dictyledons - RHIZOPHORACEAE

Rhizophora mangle L. 

Description: Mangrove tree to 25 m tall with straight to arching prop roots. Leaves as in R. apiculata but with blunt, slightly notched apex. Fruits borne in clusters of 2-3, the infrutescence longer than the pedicels, petals and sepals 4. Hypocotyl to 50 cm long before falling.

Habitat: (SS,O) Readily colonizes estuaries and sheltered bays in Hawaii.

Distribution: (SI,H) Indigenous to the American tropics and Samoa; naturalized in Hawaii.

Rhizophora microcarpa Linn. 

Description: Mangrove tree 20 m tall with numerous arching prop roots. Leaves as in R. mangle but lighter green above, and with margins often rolled under. Fruits in 3 to 10. Lvs reshaped, the infrutescence shorter than the petioles, petals and sepals 4. The petals white, fringed, and falling shortly after opening of flower.

Habitat: (S,S,O) This is one of the most seaward mangroves in the Caroline Islands.


Note: A species of Rhizophora cut to a height of 2 m may be used as a shelterbelt or windbreak. It is useful for coastal erosion control.

FRESHWATER SWAMP VEGETATION

Representative Species of Freshwater Swamp Vegetation (including species from disturbed spots in forests, and along streams in forests)

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Caroline Islands</th>
<th>Mariana Islands</th>
<th>American Samoa</th>
<th>Hawaiian Islands</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>c Alocasia macrorhiza</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CY</td>
<td>d Cyperus hargan</td>
<td>1-40 (27)</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CY f</td>
<td>d Scapiophyllum pendens</td>
<td>1-8</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CY f,m</td>
<td>d Scirpus juncoides</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GR</td>
<td>d Paspalum conjugatum</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GR d</td>
<td>d Saccocolea indica</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>JN</td>
<td>d Junco angustifolius</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>PN</td>
<td>m Pandanus sp</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>BR s,m</td>
<td>d Bambusa raksana</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CR</td>
<td>d Drymilla cordata</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CC</td>
<td>m Hydrocotyle paniculata</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GT</td>
<td>m Callitrichophyllum obovatum</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>IC</td>
<td>m Helminthostachys ampuco</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LG s d</td>
<td>m Cattleya alata</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LG s,m</td>
<td>m Gymnema ramiflorum</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LG f</td>
<td>m Dendrocalamus</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LG f m</td>
<td>m Erythrina fiscus</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
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</tr>
<tr>
<td>LY</td>
<td>m Cyphus carthaginensis</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>MA</td>
<td>m Hibiscus fulvus</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ON</td>
<td>m Ludwigia palustris</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>PL</td>
<td>m Polygonum spp</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>SM f</td>
<td>m Samardia indica</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>ST f</td>
<td>m Heliandra littoralis</td>
<td>1-5</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>UM</td>
<td>m Hydrocotyle verticillata</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

*AR = Alocasia; BR = Bambusa; CC = Callitrichophyllum; CY = Cyperus; GR = Gastrochilus; GT = Gymnema ramiflorum; IC = Ilicium; TK = Toona; LG = Ludwigia; MA = Malvaceae; ON = Oenothera; PL = Polygonum spp.; SM = Samardia; ST = Stemonaceae; UM = Utricularia; AR = Alocasia; BR = Bambusa; CC = Callitrichophyllum; CY = Cyperus; GR = Gastrochilus; GT = Gymnema ramiflorum; IC = Ilicium; TK = Toona; LG = Ludwigia; MA = Malvaceae; ON = Oenothera; PL = Polygonum spp.; SM = Samardia; ST = Stemonaceae; UM = Utricularia.

**Habitat:** (SS,O) This is one of the most seaward mangroves in the Caroline Islands.

**Distribution:** (C,M) Indigenous to the Old World Tropics from Africa to Malaysia. Melanesia and Micronesia.

Note: Some species of Rhizophora cut to a height of 2 m may be used as a shelterbelt or windbreak. It is useful for coastal erosion control.
FRESHWATER SWAMP VEGETATION

Freshwater vegetation of the lowlands is characterized by predominately woody species growing on permanently or periodically inundated or waterlogged ground. These swamps occur in depressions or other pockets of water, and the vegetation may have been quite extensive in the lowlands in the past. However, lowerland vegetation has been severely altered in many areas where agriculture and farming has occurred. This certainly applies to areas that may have at one time been swamp or mangrove. The swamp environment is suitable for growth of the swamp forest. The present vegetation of these areas is generally a cultivation or secondary growth. Characterized by species that recognize an area after the original vegetation has been removed. The secondary vegetation may persist for a long period before primary forest species become significant components of the vegetation again.

Secondary growth freshwater swamp vegetation occurs in most Pacific Island groups, and is characterized especially by Hibiscus tiliaceus. Where disturbance has taken relatively recent in freshwater swamps of the Caroline and Mariana Islands, the red Rhizophora mangle is also common (see photograph illustrating succession, page 23). Hibiscus tiliaceus is not exclusively a component of secondary vegetation and probably occurred in wet swamp areas prior to man's alterations of the landscape. It is the sole representative of a native swamp forest species in both the Mariana islands and Hawaii, and forms dense stands in swampy areas on the islands. In Fiji, however, a Hibiscus tiliaceus, but another species, Krypyllus fischeri, is also found. All Pacific Islands several components of the primary swamp forests persist although this vegetation has certainly been as disturbed where. Swamp forests dominated by components of the primary forests are found to some degree on all the high Caroline Islands, being least extensive in the Truk group.

Each of the high Caroline Islands have distinct swamp forest communities often with different dominant canopy and subcanopy species. These swamp forests are most confined to flat, peaty soils behind the mangrove. Like mangrove species, certain swamp forest plants have root systems adapted for growth under wetland conditions—with loopy pneumatophores or prop roots occurring in some species. The canopy is closed and often high, to 20 m or more, and because the lower forest is dark, it often does not support dense vegetation. At few edges, ferns and seedlings are found in the understory. Several freshwater swamp forest species are found in humid forests near the lower edge of the mangrove. Additionally, there is a distinct flora associated with streams that run through the swamp forests, as indicated in the following tables. Hocquart (1952, 1971) presents detailed discussions of this vegetation in the New Caledonia, Solomon Islands. He stresses the need for preservation which is important due to the widespread disturbances in these areas. Swamp forests dominated by components of the primary forests are found, only those that are found on several islands, or those that consistently include the mangrove are included. Also included in the table are several woody herbaceous species from many areas in upland forests of the Hawaiian Islands. These swamp areas are often the result of disturbance by feral animals or man rather than natural occurrences. The swamps are colored and characterized by woody, geophytes herbaceous species tolerant of the wetland conditions, rather than a woody flora. Only a few of these species are listed and should be considered strictly a representative sample. It is noted that the mangrove and Sphagnum swamps of the Hawaiian Islands have been totally excluded as have montane swampy areas of the other island groups.

Dicotyledons - RUBIACEAE

Scrophulariaceae

Vernacular: Yahe, "Velaivu"; gua; Paun "kah; guna.

Description: Shrubs or small tree to 5 m tall.

Lvs: opposite, broadly ovate, 4-8 cm long; 2-3 cm broad, glossy, shiny, with entire margins. The high portion between the pedicles. Fts: in ax. 1-2 D12, including the petals, tube-like, lobule and sessile 4, born in many flowered clusters. Fr: 5-11 mm long, cylindrical, greenish with the persistent calyx at the fruit apex.

Habitat: (SS0) Found along mangrove channels in the north to leeward edge of mangrove. At the mangrove-palauki island interfaces. Also often found growing with Lorimeria illotica.

Distribution: (C) Known from Yap to New Caledonia. Restricted to Yahe and Paun in the Caroline Islands.
**Bacopa monnieri** (L.) Pennel

**Vernacular:** English “water hyssop”.

**Description:** Creeping herb to only 5 cm high but with long stems rooting at the nodes. **Lvs:** 1-2 cm long x 5 mm wide, obovate, sessile, slightly crenate. **Fls:** auxiliary, 1 cm long with 5 white to pale lilac petals (calyx tubes, **Frts:** about 5 mm long and enclosed by the calyx.

**Habitat:** (S.M.F.) From coastal marshes to wet silts exposed to brackish water.

**Distribution:** (M.H.) Indigenous to some Pacific islands.

---

**Limnophila aromatica** (Lmk.) Merr.

**Vernacular:** Palau “yami”.

**Description:** Erect semi-aquatic herb emergent to 30 cm high. **Lvs:** opposite or whorled in 3’s, dotted, long to stellate, 1-4 cm long x 4-8 mm wide, shtalk. **Fls:** 10-15 mm long, long pedicellate, white. **Frts:** at base of a short, broad, ovate, 4 mm long. **Habitat:** (F.A.C.O.) Found growing in standing water, or very loose mud in cultivated or abandoned taro patches.

**Distribution:** (C) Known from Malaysia, and at least Palau in the Carolihe Islands.
## Dicotyledons - SCROPHULARIACEAE

### Limonaphila ragnans (Forst.) Seem.
_Syn._ Antirrhinum barbatulum

**Vernacular:** Chamorro “gope samoanen”; Palau “uikeliek”; Samoan “tamale vali”.

**Descriptions:** Cw. weak, somewhat aromatic; hair to 3.5 cm long; Lvs opposite, dentate, 1-2 cm long by 0.4-0.6 mm wide with serrate margins; Fls 6-8 mm long, white with faint purple veins, borne solitary and sessile in the leaf axils; Fr. a globose capsule 2.5 mm across.

**Habitat:** (C, RO) Found rooted in mud of lower haboans and taro patches.

**Distribution:** (C, M, S) Indigenous from Australia and Melanesia to some of the Pacific Islands.

### Limonaphila indica (L.) Druce

**Vernacular:** Chamorro “greje”.

**Descriptions:** Herb to 25 cm tall; Lvs 1-2.5 cm long, opposite or whorled; the lower ones many times divided, the upper ones 3 lobed or entire; Fls purplish, 9 mm long on distant stalks to 8 mm; Fr an ellipsoid capsule. The entire plant smells of turpentine.

**Habitat:** (FA, OC) Found in freshwater habitats, sometimes partially submerged.

**Distribution:** (C, M) Known from Malaysia to some of the Pacific Islands.
Dicotyledons - SIMAROUBACEAE


Vernacular: Palau “ekosam”

Description: Small tree to 20 m tall. Lvs alternately, flat to pinnate, 12 - 30 cm long x 4 - 12 cm broad, with distinctive glands at leaf base and scattered spiny-rose on leaf surfaces and other plant parts. Fld, purple, and red to purple-violet, to 1 cm in length petals and sepals 4. Flowers borne in umbels of up to 10 to 15 flowers, long. Frt 1 - 3 cm long, 1 - 3 cm long x 1 - 3 cm long, 1 - 3 cm long x 1 - 3 cm long, 1 - 3 cm long x 1 - 3 cm long. Fruits 1 - 3 cm long, 1 - 3 cm long x 1 - 3 cm long, 1 - 3 cm long x 1 - 3 cm long, 1 - 3 cm long x 1 - 3 cm long. Habit: Found in swamp forests in Palau, and to some extent; along muddy banks of channels through the upper part of the mangrove.

Distribution: (C) Indigenous only to Palau in the Caroline Islands. It is also known from Madagascar to Malaysia.

FRESHWATER MARSH VEGETATION

Sedges, grasses, and similar plants are the conspicuous components of freshwater marsh vegetation. Throughout the Pacific islands freshwater marsh vegetation can be found in both the oswands and uplands. Lowland freshwater marsh vegetation may be just as rich of similar vegetation under aquatic influence, with some species found in both. Probably most, if not all, new water marsh vegetation may have been cultivated in the past. It is possible that some present marshes were at one time swampy forests that had been cleared for the purpose of cultivation, subsequently abandoned, and now converted to woody species. In the Caroline and Marshall Islands these marshes are often dominated by dense Phragmites patches. In some instances, where the marsh vegetation is firmly rooted in saturated soil the marsh probably represents a successful stage toward vegetation dominated by woody species.

In other instances where there is a central open body of water, the substratum may be deep, with the vegetation surrounding the central pond not rooted but floating and forming a denser mass of sedges, ferns, mangroves, or other vegetation only a few centimeters above the water levels. These masses of floating vegetation (Gudd) may shift location from time to time, as can be seen by comparing aerial photographs taken during different years of anlés such as Kawauso Marsh, Dahu and Lake Nabor, Palau. Filled in creeks, such as Kaua Creek, Oahu, and Aua’s Eräler. Samoa, represent this sort of vegetation.

On most Pacific islands, upland marsh vegetation is often similar in species composition to that of the lowlands. However, in large areas in Yap and Palau in the Caroline Islands, and similar pockets of vegetation on Guam, there are savannah wetlands that have a distinctive species composition. These areas have probably resulted from massive disturbances that naturally occur in these areas, such as fire and flooding, and possibly are the result of a mixed species of the ‘versatile’ afforestation or soil characteristics. Even within the savannah wetlands however, are pockets of marsh vegetation not unlike those of lowlying coastal areas. Montane bogs, which occur in Hawaiin generally above the elevation of 4000 feet, have not been considered here. Discussion of that vegetation can be found in Carlsquist (1976). On the island of Hawaii between 2000 and 6000 feet elevation there are marshy areas surrounded by forest which are vegetated by rushes and sedges. These areas are often associated with a declining ohia forest and probably represent a transitional type correlated with soil changes which take place as elevation increases. Since this is a very small area, and organic material is accumulated.

Both freshwater and squaw-marshes are important waterbird habitat.

Sonneratia alba J. E. Smith


Description: Mangrove tree to 50 m tall and occasionally to 15 m in diameter, with spike-like conical pneumatophores 20 - 60 cm high emerging from the mud (see front cover). Lvs, opposite, entire, leafy, obovate to oblanceolate, 6 - 12 cm long x 5 - 8 cm across, often with a retched apex. Fld 5 - 7 - 85 cm long with white petals and numerous white stamens, the stamens falling early in the day and exposing the 6 - lobed greenish calyx. FRT 3 cm long x 4 cm broad.

Habitat: (SS-D) This species grows on mud or sand and is found in the seaward, middle and landward mangrove zones. S. alba is one of the largest trees in a well-developed mangrove swamp and is often festooned with epiphytes, more so than Rhizophora sp. or Bruguiera sp.

Distribution: (C) This species is known from Indo-Malaysia to the Western Pacific.

Note: The white as opposed to reddish-pink, and white aro a ro, a race that has been historically shipped to the Micronesian plants.
FRESHWATER AQUATIC VEGETATION

Freshwater aquatic vegetation is characterized by submerged, partially submerged, and emergent species. The submerged species, such as those in the genus Elodea, grow well in nutrient-rich, still water and are common in lakes and slow-moving streams. The partially submerged species, like Potamogeton, grow in habitats with moving water, often in streams or rivers. The emergent species, such as spatter-dock (Nuphar lutea) and pickerel weed (Pontederia cordata), are native to freshwater ponds and wetlands and can be found in areas with shallow water and rich soil.

**Water lilies in Waialua Canal, Hilo**

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**Representative Species of Freshwater Aquatic Vegetation**

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Carolinian Islands</th>
<th>Mariana Islands</th>
<th>American Samoa</th>
<th>Hawaiian Islands</th>
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<tr>
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<td>Chara spp.</td>
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<td>Phragmites australis</td>
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</tbody>
</table>

**Dicotyledons - SONNERATIACEAE**

**Sonneratia alba** J.E. Smith

- Habitat: Tidal marshes of low to medium salinity
- Description: Tree to 15 m tall, with white flowers and edible fruits
- Distribution: Southern Asia to the Pacific

---

**Sonneratia laden with epiphytes including the brownish, water-strider species.**

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**Dicotyledons - STERCULIACEAE**

**Hemiheliotropium Dryand.**

- Habitat: Sandy, well-drained soil
- Description: Small to medium-sized shrub with showy flowers
- Distribution: Tropical America and the West Indies

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**Heritiera littoralis** Dryand.**

- Habitat: Estuaries and coastal areas
- Description: Tall tree with large leaves
- Distribution: Southeast Asia to Australia and the western Pacific

---

**Vernacular Camacho"ula; Koae" turn; Porana "margaretse; Truk "zuak"; Tapi "yuri," "yung; Palaus "skabobo"; English "looking-glass tree".**

- Habitat: Tropical and subtropical regions
- Description: Tall, slender tree with glossy leaves
- Distribution: Southeast Asia to Australia and the western Pacific

---

**Description:** A tree to 15 m tall with grey, buttressed trunk; Lvs. alternate, oval to elliptic, 6 - 30 cm long x 3 - 12 cm broad; the lower surface silvery white, and the upper surface often covered with lichens and bryophytes; Fls. unisexual, 4 - 6 mm long, borne in axillary spikes; Frs. keeled, hard, woody fruit 5 - 7 cm long x 3 - 5 cm broad, greyish-brown, single or in close clusters of up to 5.**

- Habitat: (SS,FS) Found at the landward edge of the mangrove, along channels or groves, and occasionally at the mangrove-coastline strand fringe and in lowland forests.
- Distribution: (CM) Indigenous from Southern Asia to the Pacific.
Dicotyledons - UMBELLIFERAEB

Hydrocotyle verticillata L.
Vernacular: Hawaii "pohepohe", English "marsh pennywort".
Description: Creeping herbs to 12 cm high; Lvs oblanceolate, 1 - 5 cm diameter on stalks to 12 cm long; Fls minute borne in a spike shorter than the leaves; Fr 3 - 4 mm long flattened.
Habitat: (FS, FA, R, C, O) From freshwater muddy places.
Distribution: (H) Native to Europe and naturalized in Hawaii.

Avicennia marina (Forsk.) VIem.
Description: Trees to 12 m tall; Lvs opposite, elliptic, the blade 7 - 10 cm long x 2.5 - 4 cm across, olive-green above and white below; Fls yellow-green; Fl exserted 0.5 - 1 cm from Lvs; Sepals 5, white; Achenes 2, white; Frs a floating capsule.
Habitat: (SS, O) Avicennia is found in the middle to landward sections of the mangrove.
Distribution: (C, M) Indigenous from Malaysia to some of the Pacific Islands including Guam, Palau and possibly Yap.

SALTWATER SWAMP VEGETATION

Mangrove stand, Kosrae
Xylocarpus roots, Santau River, Pohnpei
Lukop, Pohnpei
<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Caroline Islands</th>
<th>Mariana Islands</th>
<th>American Samoa</th>
<th>Hawaiian Islands</th>
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</tbody>
</table>

*AVICENNIAEAE (AVICENNAEAE)*

**Avicennia marina**

The mangrove vegetation with grey green, Avicennia, and other species is bounded by higher land vegetated with coconut, Palau.

**Clerodendron inermis** (L.) Gaertn.


**Description**: Strabo or woody climber. Climbing to 7 - 8 m tall. Lvs opposite in pairs to 6 cm long and 5 cm wide. The blade 4 - 13 cm long and 1.5 - 5 cm broad. Flowers white. Corolla 3.5 - 5 cm long (not including stamens) with 5 petals, the 4 red stamens exerted 1.5 - 3 cm beyond corolla. Fruit black, obvoid, to 1.4 cm long.

**Habitat**: (G&M) This species grows at the edge of the mangrove and Palmate dioscoreum marshes, at lagoonal margins, in the coastal strand, and occasionally in lowland secondary vegetation.

**Distribution**: (CM) Indigenous to Indonesia, Malaysia, Australia, and the Western Pacific.
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SALTWATER SWAMP VEGETATION

Saltwater swamps are vegetated by woody species under brackish or saltwater influence. In the Pacific Islands these swamps are generally dominated by members of the mangrove family Rhizophoraceae, and therefore can be referred to as mangrove or saltmarsh swamps.

Mangrove swamps generally occur on silly or sometimes coralline substratum in sheltered bays or on tidal coastal areas protected from exposure to wave action by land or other barriers. Mangrove swamps are frequently found in areas subject to periodic inundation and suspended salt settles and accumulates around the mangroves. Because of this, mangroves are important in protecting coasts from storm and wave damage. They are also economically important, in some Pacific Islands in lumber and firewood and provide habitat for marine organisms such as fish, mollusks, crabs (including Scylla serrata), the mangrove or Samoan crab) and in Pacific islands Coelodenus porosus the estuarine crocodile and the New Guinea crocodile, Crocodylus nova guineae. A low number and diversity of birds also frequent mangrove vegetation of Pacific Islands.

Mangroves are woody species with morphological and physiological adaptations for survival in periodic or continuous exposure to saltwater through many species, especially those occurring at the landward edge of the mangrove, can grow in freshwater. These adaptations often include elaborate and specialized root formations that not only support growth but are also important in protecting coasts from wave damage and sedimentation. Mangrove root systems vary from prop roots in the genera Rhizophora, thick-knobby pneumatophores (breathing roots) in Bruguiera, slender knobby pneumatophores (breathing roots) in Avicennia, and long, fleshy, anchoring roots in Laguncularia racemosa, the estuarine mangrove.

Another adaptation to the saltwater environment is the fruits of certain mangrove species that germinate while still attached to the parent tree. This allows the young plants to develop sufficiently to improve its chances for successful establishment in the otherwise hostile environment of flowing saltwater. In these species, the fruit is dispersal tool for the young plant to grow to 0.5 m before finally falling to the mud or water below. Should the young plant fall at low tide, it is embedded in the mud and begins to grow, otherwise it may drift in the saltwater for some time before finally lodging in mud, or in some cases, mudslides, where growth can resume. Another mangrove adaptation is the thick leathery character of the leaves of most species. The leaves often have a thick waxy cuticle that protects the leaf from exposure to saltwater.

Mangrove vegetation occurs naturally in Samoa, the Mariana and Caroline Islands. Though no species are native to Hawaii, they are naturalized there and are becoming increasingly widespread. The mangroves of the Caroline Islands are more diverse and extensive than those in the other areas. In the Caroline Islands there is often a distinct stratification of species with certain species occurring most seaward usually Rhizophora mangle, but sometimes Sonneratia. Species in the midtidal zone include Bruguiera gymnorhiza, and Avicennia marina. In the backtidal zone, the brackish species are R. mangle, B. gymnorhiza, and A. marina. In the Caroline Islands mangrove trees usually form a closed canopy at 15-25 m tall and are often laden with epiphytes. However, in some areas, the vegetation of the middle of an extensive mangrove consists of dwarfed Rhizophora apiculata that forms an open thicket 2-4 m tall. This generally occurs where much salinity has occurred and water circulation is reduced. These two factors lead to reduced nutrient cycling and smothering. Other species that occur further inland and in estuarine situations include Cumnorhiza, Xylocarpus, Nipa and Avicennia mixed with Bruguiera. Still other species, as indicated in this table, occur where rivers enter the mangrove, at the margin of the mangrove and freshwater swamps, or at the mangrove-coastal stand interface.

The distribution of species in the mangrove swamps of the Mariana Islands is similar to that of the Carolines, although in the Marianas, mangrove forest generally have a lower canopy and fewer species. Only 2 mangrove tree species, Rhizophora mangle and Bruguiera gymnorrhiza are commonly present in American Samoa with Rhizophora being the most seaward, and Bruguiera preferring the inner mangrove and estuarine habitats.

The same distribution is found in Hawaii. However, Bruguiera is far more restricted in distribution than Rhizophora which readily colonizes suitable coastal areas.

Following is a list of representative weftland species found in mangrove vegetation. Euphyllae which are found in abundant in an extensive mangrove have been omitted as they are usually not restricted to mangrove vegetation, and cannot be considered desirable or facultative wetland species.
SALTWATER MARSH VEGETATION

Saltwater marsh vegetation is characterized by predominantly herbaceous vegetation, often with many sods and grasses, growing in areas under the influence of saltwater or on islands groups. Since these saltwater marshes occur near the coast, they are often referred to as coastal marshes. These marshes are often important wildlife habitats for both resident and migratory species.

Coastal marshes occur on salt, sand, or tidal flats, and several types can be considered. The low coastal marsh, generally less than 25 cm high, is dominated by grasses, such as Spartina, Distichlis (especially in Hawaii). Sporobolus virginicus, with shallow-rooted species (Cyperus javanicus, C. palaestinum, Eleocharis sp., S. elegans, S. palustris) and others, a few herbaceous species such as Scirpus acutus, Carex morrowii, S. palustris, and the yellow flowering S. elegans. Vigna marina. This marsh type occurs throughout the Pacific in the California Islands. This vegetation sometimes occurs where marshes have been cleared.

Another coastal marsh is the Alkali marsh, dominated by the Eriophorum vaginatum. This marsh type is often found in the California marshes. Another type of coastal marsh is the salt sedge, which is characterized by salt marsh vegetation found in brackish estuarine conditions. This type of marsh occurs in the Maritimes (there dominated by Scirpus maritimus) and various species of Taxus and S. Balsas. Anemone is characteristic of this marsh type, which is similar to freshwater marsh vegetation in appearance as well as to some extent, species composition. In many saltwater marshes there is a transition to freshwater marsh vegetation along a decreasing salinity gradient, with several freshwatem marsh species tolerant of slightly brackish conditions found in both situations.

Representative Species of Saltwater Marsh Vegetation

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<th>Family*</th>
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<th>Hawaiian Islands</th>
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These wetlands are usually continuously flooded by saltwater with the vegetation characterized by a few strictly marine flowering plants, collectively referred to as seagrasses and many other species. The definitions of wetlands and of wetland habitats would exclude these submerged marine communities. This wetland type is included here because of its importance as a highly productive and diverse habitat affected by disturbances in adjacent areas. Furthermore, since communities of strictly freshwater epatic flowering plants are considered wetlands for most definitions, there is little justification for excluding comparable marine communities.

Seagrass beds are found in shallow water, generally less than 7 m in depth. Light availability restricts their growth in deeper water. Beds of aquatic flowering plants support a diverse marine fauna including numerous species of economically important fish, shellfish, marine turtles (including the hawksbill, Eretmochelys imbricata, and the green turtle, Chelonia mydas), and in Palau, the endangered Dugong dugon sago turtle. The algae associated with seagrasses contribute to the productivity of these communities.

Seagrass beds are extensive and diverse areas in Micronesia, occurring under a shallower flat between the main islands and the seaward edge of their fringing or barrier reefs. They are not as abundant in Hawaii and Samoa. Seagrass communities are currently the object of several ecological research projects, and further collections from the Pacific will certainly add to present knowledge on the distribution of various species. Following is a table of seagrasses known from the Pacific. Sufficient information is not available at present to include the algal components of the various areas or to discuss the diatom communities (but see USGS reports on Hawaii) for identification of many of the more conspicuous seagrasses which occur in the Pacific.

Representative Species of Saltwater Aquatic Vegetation

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<tr>
<th>Family*</th>
<th>Species</th>
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* Only the most abundant species of each family are listed. ** These species generally occur in sheltered, brackish waters.
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**SCHEMATIC OF WETLAND TYPES**
Outline of Wetland Vegetation Types in the Caroline & Mariana Islands, Hawaii & American Samoa

VEGETATION TYPES UNDER SALTWATER INFLUENCES

SA - Saltwater Aquatic - Vegetation consisting of permanently submerged seagrass beds and communities of macro and micro algae. This vegetation type is extensive and diverse throughout the Pacific.

SM - Saltwater Marsh (coastal marsh) - Vegetation characterized by predominantly herbaceous species (mostly sedges and grasses) or low woody species under tidal or estuarine influence. These wetland communities are found in each of the island groups.

SS - Saltwater Swamp (mangrove forest) - Vegetation dominated by woody species under tidal or estuarine influence. These communities are extensive and diverse in the Caroline Islands, where they occur along the coasts of most of the major islands. In the Mariana Islands and American Samoa they are more localized and less diverse. In Hawaii they are colonizers of suitable, protected coastal areas.

VEGETATION TYPES UNDER FRESHWATER INFLUENCES

FA - Freshwater Aquatic - Permanently flooded by freshwater, the vegetation consists of submerged, partially submerged or floating species without well-developed structural support. This wetland type is found in slow-moving streams and ponds in the Carolines, Marianas, and Hawaiian Islands, and is apparently of limited distribution in American Samoa.

FM - Freshwater Marsh - Vegetation characterized by emergent herbaceous species, especially sedges and grasses, growing under freshwater influence. This vegetation type occurs in each of the island groups considered and such areas have often been cultivated in the past. Montane bogs occurring in the uplands of Niue and at 2000 feet elevation have not been included.

FS - Freshwater Swamp - Vegetation dominated by predominantly woody species growing on soils more or less permanently saturated. These communities have often been disturbed in the past with natural vegetation of such areas persisting to some degree in some of the Caroline Islands, but usually represented by secondary vegetation dominated by ubiquitous Rhusus in American Samoa, Hawaii and the Mariana Islands.

C - Cultivated Wetlands - Vegetation of cultivated crops requiring wetland conditions such as taro or rice, and the associated weedy species. Taro and other aroid crops are cultivated throughout the Pacific, mostly as subsistence agriculture in family or community patches except in Hawaii where taro cultivation is more commercialized. Rice is presently grown commercially on Ponape and Kauai.

R - Ruderal Wetlands - Disturbed areas such as ditches, wet roadsides and bomb craters, vegetated primarily by obligate and facultative weedy wetland species. These communities are found in all the island groups considered.
PLANT GROUP DESCRIPTION: Algae are generally submerged and have no vascular system (vena in the "leaves"). Though widely represented in wetlands only one is included in the guide. Ferns can be readily recognized by the layman and are characterized by having spores on the undersides of some of their fronds, rather than flowers, as their reproductive structures. Monocotyledons are flowering plants which can be recognized by having usually parallel venation in their leaves, and flowering parts in multiples of three. Dicotyledons on the other hand can be recognized by usually netted venation in their leaves and with flower parts in multiples of four or five.

PLANT NAMES: Both scientific and common names of the plants are used in the guide. The scientific name is a Latin binomial (genus and species) followed by the name of the botanist who described the plant. Synonymous scientific names occur when two or more names have been accidentally applied to the same plant, or when there is disagreement among botanists as to whether a group of plants should be considered as one or two species. The synonyms listed in this guide are only those that have appeared in readily available literature to which the user of the guide may have access.

nutrients from its support as would a parasite

* erect - upright

* estuary - the area of tidal mixing with river waters

* arctic - intentionally or accidentally intro- duced into an area from somewhere else by man’s activities

* facultative wetland species - a plant found in wetland conditions, but not wholly dependent upon those conditions for survival and reproduction

* family - a grouping of related genera, the family name usually ends with the suffix "aceae"

* fertile - bearing reproductive material such as pollen, spores or fruit

* froonds - the leaves of ferns, palms and some other plants are often referred to as fronds

* genus (pl. genera) - a grouping of related species, the first of two words in a plant name, e.g. Colocasia is the genus of taro. Colocasia esculenta

* germinating - a young plant

* germinate - to begin to grow from seed

* glabrous - without hairs, smooth

* glaucous - with whitish film often caused by wax on leaf and fruit surfaces

* globose - 3-dimensional globe shaped

* grass - a member of the grass family,这些人是雨林生态系统的支柱

* halophyte - a plant able to grow in salty environments

* hypocotyl - part of the elongating stem of a germinating plant

* Hawaiian Islands - The northernmost island group of Polynesia forming an Archipelago with eight main islands (Hawai, Maui, Molokai, Kahoolawe, Oahu, Lanai, Maui and Niihau) and a myriad chain of islands including Midway.

* indigenous - native to a particular area and also found elsewhere

* inflorescence - the arrangement of a group of flowers

* interface - the boundary between two zones

* involucral - a structure associated with, but below an inflorescence, as involucral leaves below the inflorescence

* key - a numbered outline used to identify species by the process of elimination; in the PANDANACEAE one of the segments of the fruit

* lanceolate - much longer than broad, with the broadest part near the base

* leaf - an often green flat structure found below a bud on a stem and generally consisting of a petiole (stalk) and a blade

* leaflet - one part of a compound leaf

* legume - a member of the pea family, the LEGUMINOSAE

* linear - a long narrow shape

* lobes - rounded projections on a leaf or fruit

* mangrove - a member of the mangrove family, the RHizophORACEAE, which occurs in saltwater-influenced swamp vegetation dominated by members of the RHizophORACEAE; other species occurring in such vegetation

* Mariana Islands - The archipelago of islands north of the Caroline Islands including Guam, Tinian, Rota, Saipan and several smaller islands to the north.

* marsh - a wetland vegetation type dominated by herbaceous rather than woody species

* Micronesia - one of the three major divisions of the Pacific comprising the small islands north of the equator, east of the Philippines and west of Polynesia.

* midrib - the central nerve in a leaf

* monotypic - with only one species

* native - occurring in an area without the aid of man

* naturalized - introduced to an area, but growing without the aid of man

* node - the joint where a leaf is attached

* nut - a dry hard, one-seeded fruit

* oblong-lanceolate - much longer than broad with the apical portion wider than the base

* obligate wetland species - a plant requiring wetland conditions for its survival, establishment and reproduction
GLOSSARY

- **oblong** - longer than broad with almost parallel sides
- **obovate** - the shape of a hen’s egg in outline, with the narrower end toward the base (2-dimensional)
- **obovoid** - ovoid in outline (3-dimensional), larger above
- **obtuse** - pointed with the angle greater than 90°
- **opposite** - two leaves borne on either side of a branch at a single node
- **orbicular** - circular, (2-dimensional)
- **ovary** - the part of a flower that matures to a fruit and bears seeds
- **ovate** - the shape of a hen’s egg in outline, with the large end toward the base (2-dimensional)
- **ovoid** - ovoid in outline (3-dimensional), larger below
- **panicule** - a compound, branched inflorescence
- **pentanchic** - occurring throughout the tropics
- **petal** - an accumulation of petallike decomposed organic material sometimes of considerable thickness
- **pedicellate** - a flower attached to the stem or inflorescence axis by a stalk, as opposed to sessile
- **pedunculate** - the stalk of an inflorescence
- **pellate** - a leaf or other structure with the stem attached to the lower surface rather than at the margin as leaves of a water lily or an umbrella
- **perennnial** - a plant that lives longer than one year
- **perianth** - collectively the sepals and petals of flower; the term is often used when sepals and petals are indistinguishable or highly modified
- **petiole** - the stalk of a leaf
- **pinna (pl. pinnae)** - one division of a pinnate leaf or frond
- **pinnate leaf** - a compound leaf bearing leaves along a single axis
- **pneumatophores** - "breathing roots" (see discussion of mangroves)

Polyneasia - Islands of the Pacific falling within the triangle having Hawai‘i, New Zealand and Easter Island at its corners (excluding some such as Fiji)
- **prop roots** - still-like roots of some ARACACEAE and PANDANACEAE
- **prostrate** - lying on the ground
- **pubescence** - hairiness
- **raceme** - an unbranched inflorescence with the flowers borne on short stalks
- **ray** - one of the branches of a compound inflorescence
- **rhizome** - a horizontal underground stem which bears shoots and leaves as well as roots
- **rosette** - a radiating cluster of leaves in a dish
- **ruderal** - growing in disturbed places
- **savanna** - a grassland with scattered trees
- **scales** - wide, flat hairs, or, in grasses and weeds the flat, often straw-colored structures of the inflorescence
- **seed** - a member of the seed family, the CYPERACEAE
- **sepal** - the individual segments of the calyx
- **sheath** - in grasses and sedges that part of the leaf surrounding the stem
- **soil** - the cluster of reproductive material in forms, the dusty round or linear structures on the underside of a fern frond
- **spadix** - a spike on a succulent axis, in the ARACACEAE the inflorescence consists of the spadix surrounded by a sheathing bract, the spadix

HOW TO USE THIS GUIDE

Eight broadly defined wetland types recognized by the layman are described in the guide. A table for each wetland type provides a list of typical wetland plants found in that wetland type, and the distribution of the plants within the island groups covered by the guide. The plants are organized in the tables as they occur in the text. Plant species are listed alphabetically within genera, genera within families and families within the broad groups of algae, ferns, monocotyledons and dicotyledons. The individual plant description and illustration can then be consulted for each wetland type. A glossary of botanical terms is included to assist the reader in using the guide. For some groups of plants, a key (numbered outline) is provided to aid in identifying the species.

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<td>FS - Freshwater Aquatic</td>
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<td>FS - Freshwater Swamp</td>
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<td>R - Ruderal Wetland</td>
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**GLOSSARY**

- **spathe** - the bract borne below, and often enclosing the spadix of the ARACEAE, on a similar structure in other families
- **species** - a naturally occurring population of individuals which are reproducively isolated from similar species, in a plant name it is the second word, but a plant species is always referred to by its binomial combination - the genus and species together as *Colocasia esculenta*
- **spikelet** - in grasses and sedges a spikelet is the basic unit of an inflorescence, consisting of a group of overlapping scales; each scale represents a flower in most sedges, while in grasses a flower usually is contained within two scales, with usually two scales borne at the base of a spikelet, not representing flowers
- **spinosum** - bearing spines, sharp points on a plant
- **spore** - the reproductive structures of ferns
- **stamen** - the male part of the flower which includes the pollen bearing anther and the staminal, or filament
- **stigma** - the sticky part of the flower
- **stipe** - the stem of a fern frond
- **stipe** - a scale-like leaf-like appendage at the base of the petiole (stalk) of the leaf of some plants
- **stenolitoratus** - with a creeping horizontal stem (as a strawberry)
- **stenosiphon** - attached with very short stalk, as a flower with short pedicel or a leaf with a short petiole
- **stoloniferous** - with a creeping horizontal stem (as a strawberry)

**HABITAT CODE**

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<td>American Samoa</td>
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**LIST OF ABBREVIATIONS**

- **cm** - centimeter - approximately 0.39 inches
- **mm** - millimeter - approximately 0.04 inches
- **Fe** - Female
- **M** - Male
- **O** - Other
- **Le** - Leaves
- **S** - Species
- **ssp** - Subspecies
- **var** - Variety
- **type** - Type
INTRODUCTION

This guide was prepared to assist in the identification of wetlands and important wetland plants in the Pacific Ocean region for the US Army Corps of Engineers regulatory activities. As currently defined by US Army Corps of Engineers regulations (33 CFR 323.2 (c)), wetlands are "those areas inundated or saturated by ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and other similar areas."

Wetlands and wetland plants from the Hawaiian Islands, American Samoa, Guam and the Northern Mariana Islands and the high Caroline Islands are described in this guide. While not all wetland plants found in these island groups are included, the most common, indicative species are represented. This guide should be applicable to other island groups in the Central and Western Pacific Ocean region, although only wetlands and wetland plants from specific island groups were considered in the preparation of the guide.

The primary source materials and photographs used in preparing the guide were wetland surveys prepared for the US Army Corps of Engineers by Whistler (1976), Elliott and Hall (1977), Moore et al (1977), and Stemmermann and Proby (1978). In selecting representative wetland plant species for inclusion, it was necessary to exclude species with limited distribution and species more frequently associated with non-wetland vegetation. Furthermore, wetland and wetland plant delimitation is difficult and somewhat arbitrary on Pacific Islands with high average rainfall. The user of this guide may encounter plants in the field that are not addressed in this guide, since only the most common, indicative wetland plant species are included.

Wetlands serve many functions. They can serve as nursery grounds for marine organisms, including many commercially important species, and as recreational areas. Wetland crops, such as rice and taro, support much of the world's population. Some wetlands function in sewage treatment, flood control, groundwater recharge, wildlife habitat, pollution control and nutrient cycling, and others provide shore protection against storm erosion and damage. Certain mangrove vegetation have been considered agents in land construction.

Acknowledgements

The preparation of the guide was performed under US Army Corps of Engineers Contract No. DACW84-70-C-0021. P00002, with Science Applications, Inc. "The Departments of Botany at the Bernice Pauahi Bishop Museum and the University of Hawaii generously provided research materials used in compiling the guide. Dr. Charles Lamoureux graciously helped to set up the design of the guide. Dr. Arthur Whistler helped to review the draft and kindly provided me with a photograph of Erythrina indica. Dr. James Marigo, Corps of Engineers, was patient and encouraged the work to completion. Michael Lee, Roy Naratang, James Odd, James Duro, Lynn R. Martin and Margaret Elliott, Corps of Engineers, were instrumental in preparing the guide for publication. Lynn was particularly instrumental in completing the last few botanical illustrations. A special thanks is extended to Mr. Elizabeth Day for typifying the original manuscript, and to Mr. Hugo delives of Nick Keats Design, for helping to organize and lay out the guide.

Photo Credits

Except as noted, the photographs used in this guide were taken by Lyn Stemmermann, Margaret Elliott, and Dr. Arthur Whistler under contract to the Corps of Engineers.