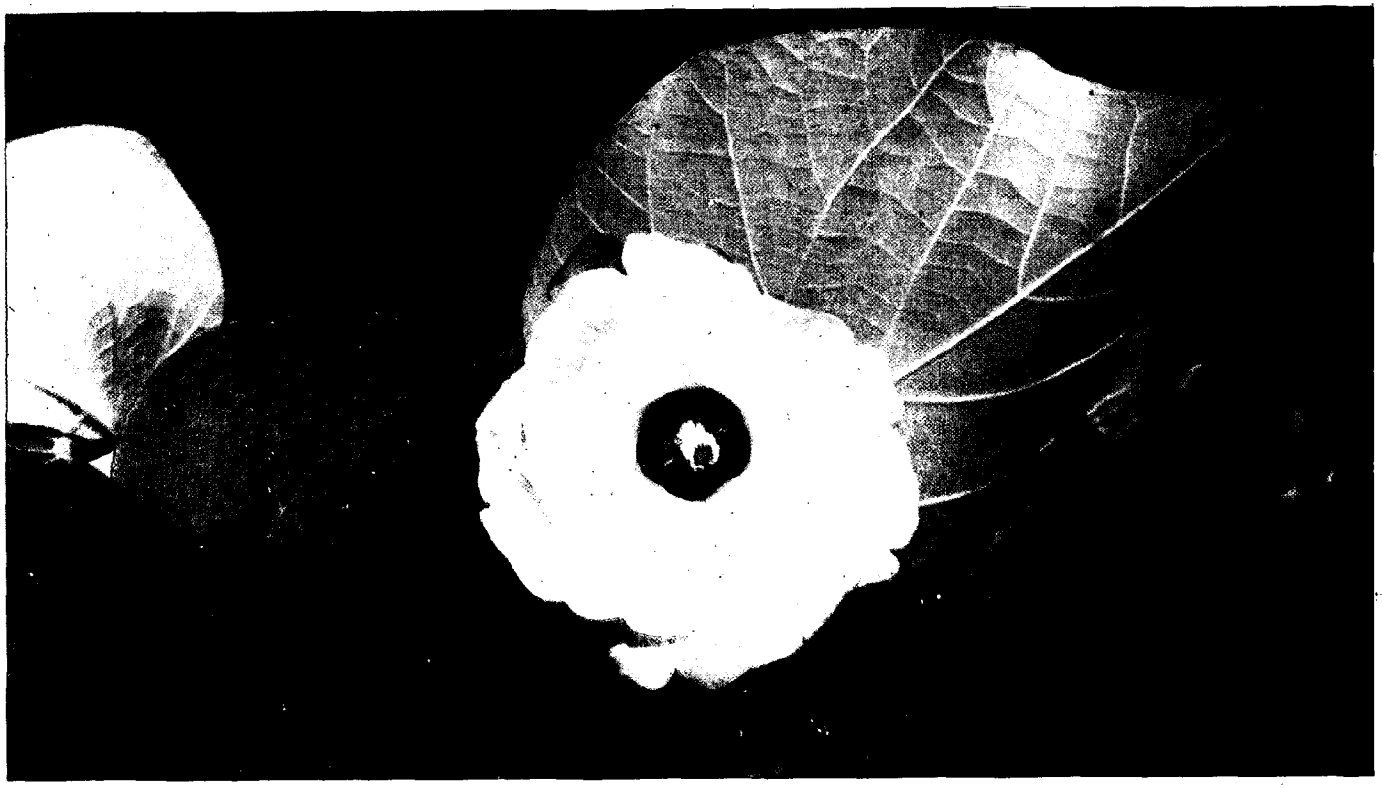
Laueleele susu (vaia) o Amerika Samoa

O se faamatalaga pu'upu'u i pala ma taufusi o Aunu'u ma Tutuila

American Samoa's wetlands

A concise reference to the swamps and marshes of Tutuila and Aunu'u



Lomiga a le
Malo o Amerika Samoa

A publication of the
Government of American Samoa

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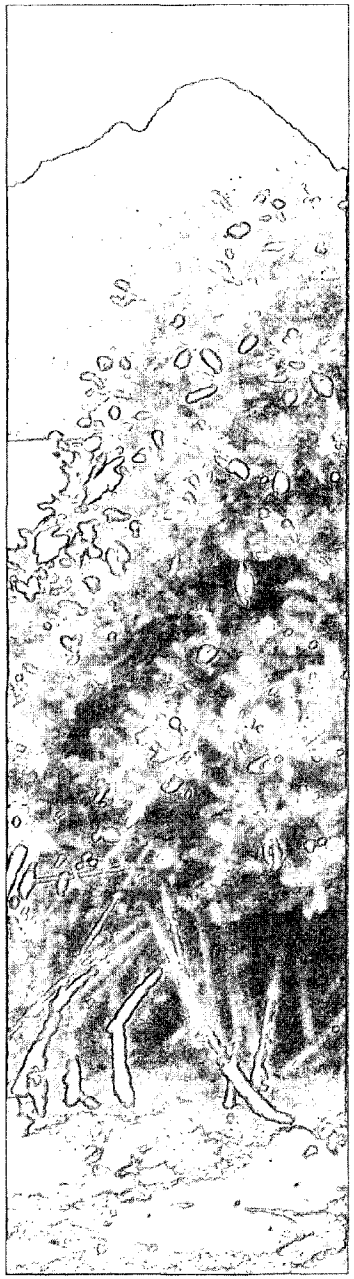

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Ua faasaina ona toe lomia pe faaaogaina lenei tusi po o se vaega o lenei tusi e ala ile kopiina i se masini fai kopi, po o le faaaogaina o nisi masini e faamaumau ai upu po'o faaupuga o lenei tusi, e aunoa ma se faatagana tusitusia a le lomitusi.

Lomia i Amerika Samoa

Lomiga muamua, 1992

Faafetai

Sa faatupeina lenei tusi i se vaega tupe sa mauaina e le polokalama o le Va'aiga o le Gataifale ma Laufanua, mai le ofisa o le National Oceanic and Atmospheric Administration/Office of Ocean and Coastal Resource Management e pei ona aiaia e tulafono mo le puipuia o le gataifale lea sa faatulafonoina i le 1972; faatasi ai ma se vaega tupe mai le Ofisa o le Puipuia o le Si'osi'omiaga i Amerika Samoa sa mauaina e le polokalama mai le Ofisa o le Puipuia o le Si'osi'omiaga a le Feterale.

O lenei galuega sa **tu'ufaatasia** e le Ofisa o Atina'e ma le Manuia Lautele, ma e fia momoli atu le faamalo ma le faafetai a lenei ofisa i tagata ma faalapotopotoga nei sa fesoasoani mai i le faataunu'uina o lenei galuega:

Lelei Peau *Manager, American Samoa Coastal Management Program*
Richard Volk *Environmental Planner*

O lenei galuega sa faaliliuina i le gagana Samoa e le:
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O le a le mea e faapitoa ai laueleele susu (vaia)?

O le laueleele vaia pe maua ai le vai, (pei o pala ma faataufusi) e lauolaola ai laau o le teropika e tamaoaiga i meaola esecse ma e tele lona taua ma le aoga. A'o alualu i luma le malamalama e uiga i nei nofoaga, ua faapena ona alia'i mai ai nei nofoaga ma ni o latou sao taua i le lauusiusi lelei o le motu, atoa ai ma le soifua solo lelei o tagata soifua uma o loo nonofo ma ola ai. O nei nofoaga o laau ma meaola ma mea o loo si'omia ai, e faaeteete gata tele ma e faigofie ona aafia i galuega po o gaoioiga e fesoota'i ma so o se nofoaga o lo o maua ai le suavai. O lo latou tulaga i meaola (laau ma manu) ma le tino mai e tulaga ese ma e matele ina le mafai ona toe suia pe a faaleagaina. Ua atili ai ona manino mai le taua o le puipuia o nei ala manuia faale-natura e anoanoa'i lo latou aoga.

O nofoaga vaia nei e aofia ai togatogo e tau atu i le sami, o faataufusi ma pala e lata i uta, ma vaitafe. E taua nei nofoaga e fofoa ma tuufua ma nonofo ai i'a, ula, manu felelei, manu vaefa ma isi meaola atoa ma laau. E fesoasoani foi nei nofoaga e taofiofi tafeaga, i taimi o lologa, e auala mai ai foi le suavai taumafa ma maua ai avanoa mo mea toto ma faatoaga.

O le toatele o tagata Amerika Samoa o lo o nonofo i luga, faataamilo po o tafatafa o nei nofoaga e iai le vai. O se tasi o tulaga e tula'i mai i lenei feumia'iga vavalalata o le lamatia tele lea o le ola lelei o nei nofoaga faaeteete-gata e mafua mai i galuega a le tagata soifua.

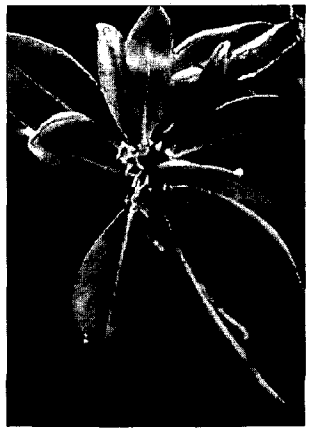
I le 30 tausaga ua mavae e tusa ma le kuata o nei nofoaga ua faaleagaina, ma o nisi togatogo tusa o le afa ua faatama'ia. A o faatupula'ia le faitau aofa'i o tagata soifua, o le a faapena foi le a'afia o nei nofoaga. A tatou mulimuli ai pea i le ala o

What is so special about wetlands?

American Samoa's wetlands are areas of lush, tropical vegetation, rich with life, and offering a wide range of valuable functions. As more is known about them, wetlands are emerging as important contributors to the island's well-being and, consequently, the well-being of everyone who lives here. They are fragile ecosystems easily affected by other activities in associated watersheds. Their biological and physical features are unique and largely irreplaceable. The importance of protecting these immensely valuable natural resources is becoming increasingly clear.

Wetlands include coastal mangrove swamps, inland freshwater marshes and swamps, and streams. They are productive and important habitats for fish and shellfish, birds, animals, and plants. They help to control flood waters, provide a source of drinking water, and offer opportunities for agricultural production.

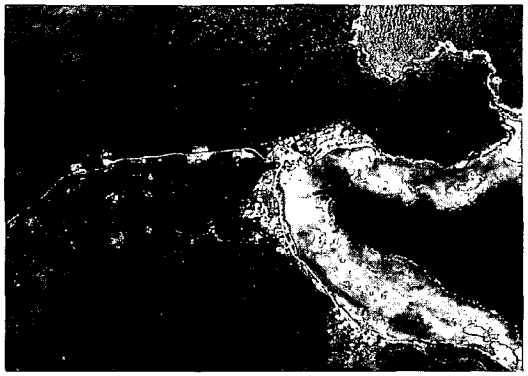
Many of American Samoa's people live on, around, and near wetlands. One consequence of this close interaction is the serious threat to the health of these sensitive areas caused by human activity. Within the last 30 years, at least a quarter of the wetlands has been destroyed, and some mangrove swamps have been reduced by half. As the population continues to increase, so will the pressures on wetlands. If we follow the path we are on, our wetlands will disappear. At worst, they will be filled in for development. At best, they will continue to be polluted by trash or runoff from piggeries and other upland development. If future generations of American Samoans are to benefit from the richness of this natural resource, wetlands need protection and careful management from now on.



O togomumu (Rhizophora mangle) *e mafai ona ola i laueleele samia latou te faia galuega aoga ma taua mo laueleele susu o Amerika Samoa.*

The salt-tolerant red mangrove (Rhizophora mangle) *plays an important role in the wetlands of American Samoa.*

lo o tatou ui ai nei o le a le pine ona mou atu o tatou laueleele faataufusi ma pala. O le itu sili ona le manuia o le tanu o nei nofoaga mo atina'e. Ae sili atu le faaauauina o le faaleagaina i otaota po o leaga i le tafe mai o pa pua'a ma isi atina'e i uta. Ae a iai se faamoemoe e manuia tupulaga o le lumana'i o Amerika Samoa ile tamaoaiga o nei alamanuia faale-natura o lona uiga e mana'omia e nei nofoaga (pala ma faataufusi) le puipuiga ma le vaaia lelei e amata atu nei.



O a laueleele susu (vaia)?

O le faaupuga laueleele susu pe vaia, o laueleele ia e iai le suavai, a e le faigofie lona faapupulaga pe le maua tonu sona uiga sa'o i le faauigaina e le Malo Tele po o le faigamalo a le teritori. Po o lona uiga ea o se laueleele e ufitia i le vai pe na'o le palapala? Pe susu ea i aso uma, pe susu mai lea taimi ma lea taimi? Po'o le mea faato'ata'u o le laueleele, o se laueleele vaia pe a faasusuina i le vai e tafe mai ni mea sa eli? O le tali o nei fesili, ua faamatala mai e le tulafono a le Malo Tele ni elemene patino tuufaatasi, ona maua lea o le laueleele vaia.

O elemene la nei :

O la'au e ola ai

E avea se nofoaga ma laueleele vaia pe a ola ai ni laau e ola lelei ai i le tulaga susu. I se isi faaupuga e tatau i le nofoaga faapea ona ola lelei ai laau e fiafia i le vai.

Palapala

O le eleele i nofoaga nei e masani ona itiiti se okesene e maua ai aua foi e tele taimi e ufitia ai i le suavai. O nei ituaiga o palapala e taua o palapala susu (vaia). O eleele nei e malosi le lanu e pei e pa'auli.

Vaia

O laueleele susu (vaia) e masani ona maua i nofoaga maualalalo e to'a ai ma faaputu ai le suavai pe lata foi i se auvai e tatau ona lofia i le suavai i taimi uma, pe mai lea taimi ma lea taimi pe ulufia foi i le vai mai lalo o le laueleele. A faapea e faatafea'ese le vai mai nei nofoaga ona faatama'ia loa lea.

What are wetlands?

Wetlands are "wet lands," as you would expect. But for federal and territorial governments, a precise definition of "wet lands" is not so easy. Is a wetland covered by water or just muddy? Is it wet every day, or every now and then? Does it become a wetland when it is flooded with irrigation runoff? To answer these questions, federal law has defined three specific elements which, together, make up a wetland.

These elements are:

Vegetation

To be a wetland, an area must contain plants that survive well in wet soil conditions. In other words, it should support water-loving, or hydrophytic, plants.

Soils

The soils in a wetland typically contain very little oxygen because they are frequently covered by water. These soils are called "hydric soils." Hydric soils are usually dark with bright blotches.

Hydrology

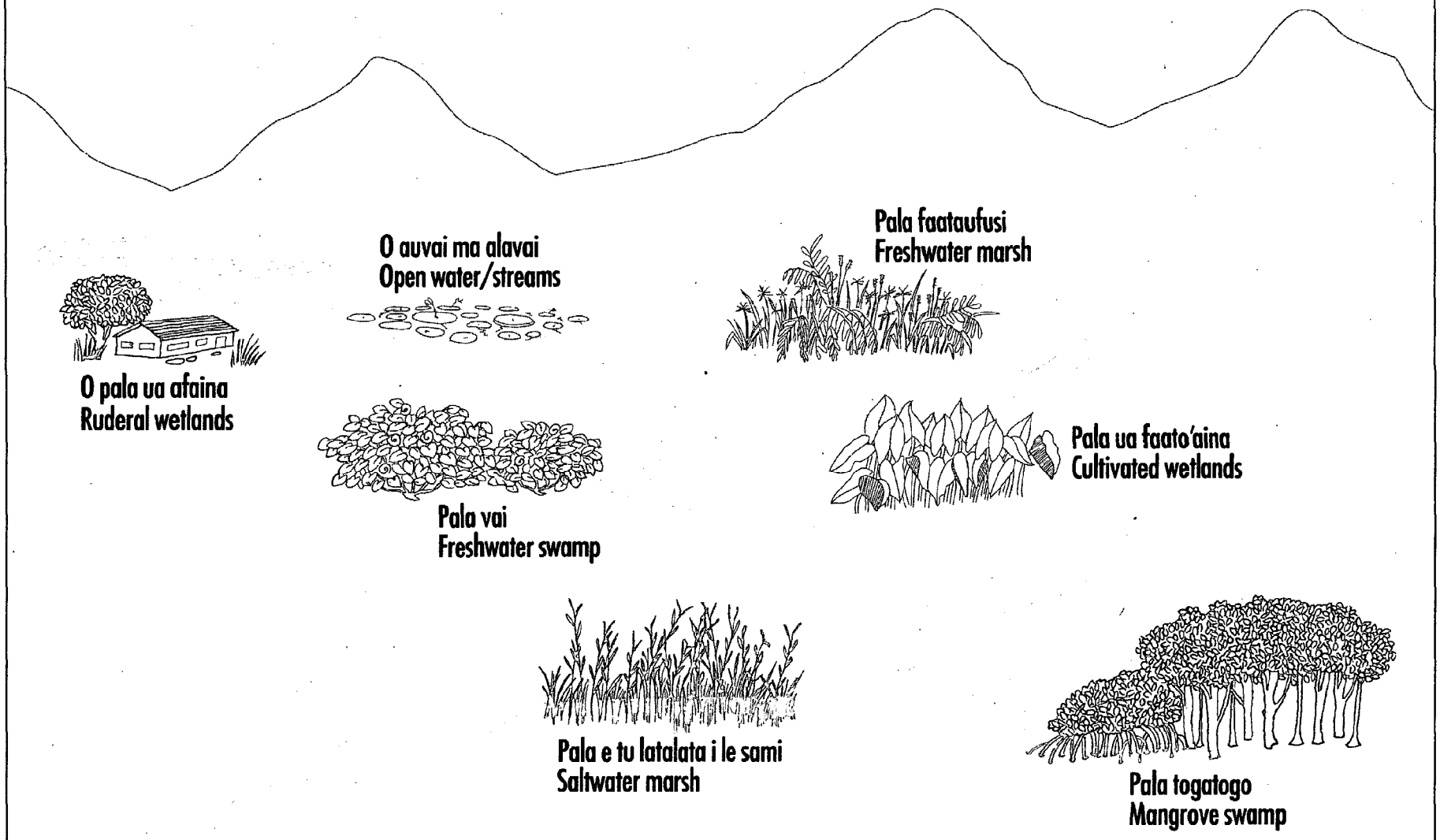
Wetlands typically are located in low-lying areas where water collects or are next to stream where they can be flooded. A wetland must be flooded with water, permanently or occasionally, or at least saturated by groundwater. If a wetland was drained, it would be destroyed.

O le faapupulaga lenei o laueleele vaia a le Malo o Amerika Samoa :
"O nei nofoaga e lofia atoa i le vai ma luga o le eleele po o le vai mai lalo i se vaitaimi e talafeagai e lagolagoina ai, ma o tulaga masani o laau e ola lava latou i le eleele nei e lilofia i le suavai. O laueleele susu (vaia) la nei e aofia ai faataufusi, pala, togatogo, auvai ma nofoaga faapena."

The government of American Samoa defines a wetland as:
"Those areas that are inundated or saturated by surface or groundwater 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, mangroves, streams, and similar areas."

Ata o loo faaalia mai ai ituaiga laueleele eseese o loo maua i totonu o Amerika Samoa

Schematic showing the different wetland types in American Samoa



O ituaiga o laueleele susu (vaia)

E maua i Amerika Samoa ituaiga laueleele susu (vaia) eseese e a'afia ai pala togatogo, pala vai, pala tu latalata i le sami, pala faataufusi, pala ua faato'aina, pala ua afaina. O le tele o auvai ma vaitafe e mafai ona aofia ai i le faapupulaga o laueleele susu. O nei nofoaga o lo o faamatalaina i parakarafa ia o lo o soso'o ai.

Pala togatogo

O togatogo (po o pala) e mafai ona ola a'e i vai sami i tafatafa ane o gataifale i faga po o le mulivai o ni auvai i le mea e fetaui ai le sami ma le vai. I nei pala o lo o tutupu ai laau, e maua ai le laau o le togo (taga'i i le itulau 13) ma le sa'ato. E mafai foi ona vaaia ai le laau maua gata o le le'ile'i.

O laueleele susu e aupito sili ona maua gofie i Tutuila ma Aunu'u. E mafai ona maua pala togatogo i :

- Nu'uuli (Pala Lagoon)
- Alofau
- Aoa
- Masefau
- Le Pala i Aunu'u
- Leone (Pala)
- Aua (ua tele ina faaleagaina lenei pala)
- Vatia
- Taufusi i le A'oga i Aunu'u

O le pala togatogo i Nu'uuli e aupito sili ona tele, ma o le laueleele vaia aupito tele foi lea i Tutuila ma Aunu'u . E tusa e 123 eka lona tele, amata mai i le itu i saute o Mulinu'u (Coconut Point), seia oo i le fale pamu vai i le Paka Liona i Tafuna.

O le pala togatogo i le Pala Vai i Aunu'u e ese mai ai lava

Wetland types

American Samoa supports several kinds of wetlands including mangrove swamps, freshwater swamps, saltwater marshes, freshwater marshes, cultivated wetlands, and ruderal or disturbed wetlands. Many streams and open water bodies can be included within the definition of wetlands. Each wetland type is described below.

Mangrove swamps

Mangrove swamps (the pala) are salt-tolerant wetlands found in such coastal areas as sheltered bays or near the mouth of a stream where fresh water and salt water mix. In these forest swamps you will find oriental and red mangroves (see page 13) and swamp fern. You may even see the rare puzzlenut tree.

Mangrove swamps are the most common type of wetland on Tutuila and Aunu'u. Examples of mangrove swamps can be found at:

- Nu'uuli (Pala Lagoon)
- Alofau
- Aoa
- Masefau
- Pala Lake, Aunu'u
- Leone (the pala)
- Aua (this mangrove swamp is mostly destroyed)
- Vatia
- School Swamp, Aunu'u

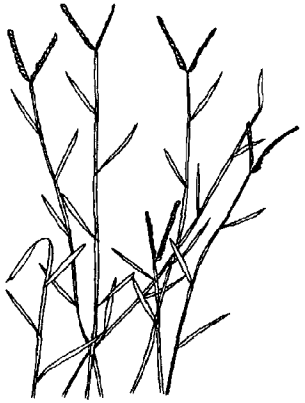
The Nu'uuli pala is the largest mangrove swamp and the biggest wetland on the islands of Tutuila and Aunu'u. Covering about 123 acres, it extends from the southern end of Coconut Point around the lagoon to the pumping station at Lions Park in Tafuna.

O le sa'ato (Acrostichum aurem), *o se la'au lea e masani ona maua i laueleele susu o Amerika Samoa. E masani ona maua i faasi'usi'uga o pala ma mulivai, e iai taimi e masani ai ona va'aia o loo ola faaopeaopea i totonu o ogavai.*

The swamp fern (Acrostichum aurem) *is a familiar resident of American Samoa's wetlands. Found in coastal marshes, at the edge of mangrove swamps and river mouths, it sometimes grows as a floating mass in fresh water.*

A'a o le ifi (Inocarpus fagifer).

Roots of Tahitian chestnut (Inocarpus fagifer).



O vao ma vao selesele e iai le vao lima, o nisi nei la'au e ola lauusiusi i ni vaega faigata o pala tu latalata i le sami.

Grasses and sedges such as Paspalum *tolerate extreme conditions in the saltwater marsh.*

ona e le o'o i le sami. O le togatogo i le Pala i Aunu'u e ese ona e le papa'i i le sami. Ae maua ai lava le suasami, e masalomia o lea suasami e ui mai i lalo o le eleele.

Pala vai

O pala vai e tele ona tutupu ai laau o le fau, ifi, falaga, ma le teuila. O lo o maua tele i totonu i laueleele e le o lelei le alagavai aga'i i le sami e latalata i le itu aga'i i le laueleele o pala togatogo. O pala vai e maua gofie i Amerika Samoa ae le tele, o lo o iai i :

- Malaeloa
- Leone (ua tele i le faato'aina)
- Pala Vai i Aunu'u (se mea itiiti o lenei vai)

O le pala vai i Malaeloa e ese mai lava ma taua ona o lona tele ma lona tulaga lelei. E le'i faaaogaina lava lenei laueleele vaia, e tusa e 72 eka o lo o maua mai i auvai e tele o lo o tafe faatasi iai mai mauga. Ua fautuaina ia avea ma ogaeleele faapitoa ia puipuia ma tausia lona tulaga na sau a'i.

Pala e tu latalata i le sami

O pala e tu latalata i le sami e maua i taufaasi'usi'uga o togatogo i nofoaga ua faaleagaina po ua motusia mai le sami, o i, e te maua ai ituaiga o vao faapitoa.

O pala e latalata i le sami o ituaiga ia o pala e seasea ona maua i Amerika Samoa. Pau lava le faata'ita'iga o lea ituaiga pala o loo maua i:

- Mulinu'u (Coconut Point), i le taufaasi'usi'uga

Pala faataufusi

O pala faataufusi e ola ai vao, ma laau pei o laugasese, ae e le o maua ai ni laau tetele poo laau malo pei ona maua i pala vai. O ituaiga o laau e masani ona maua i nei nofoaga e aofia ai sagasaga, fuesaina, selesele, sa'ato, utuutu, ma le vao malo. O faataufusi nei e maua i nofoaga papa'u e to'a ai le vai pe tafetafe lemu i mulivai e latalata i le oneone poo autafamauga, poo tofe, e maua ai vaitafe e tele. O ma'umaga foi ua lafoa'ia e masani ona tafia aga'i i pala vai.

The mangrove swamp at Pala Lake (Aunu'u) is unusual because it does not directly touch the sea. Salt water probably comes from underground.

Freshwater swamps

Freshwater swamps are dominated by beach hibiscus, Tahitian chestnut, *Barringtonia samoensis*, and red ginger. They are found inland on poorly-drained lowlands or near the landward edge of mangrove swamps. Freshwater swamps are uncommon in American Samoa, but there are a few:

- Malaeloa
- Leone (mostly cultivated)
- Pala Lake, Aunu'u (a small portion of the lake)

The freshwater swamp in Malaeloa is unique and important because of its size and pristine condition. This relatively undisturbed 72-acre wetland is fed by streams draining into it from the hills above. It has been recommended as a Special Management Area to protect and maintain its pristine condition.

Saltwater marshes

Saltwater marshes occur along the edges of mangrove areas that have been disturbed or cut off from the sea. Here you will see grasses and sedges such as knottgrass.

Saltwater marshes are the rarest type of wetlands in American Samoa. The only example is:

- Coconut Point (on the end of the point)

Freshwater marshes

Freshwater marshes support grasses and ferns rather than the woody shrubs and trees found in freshwater swamps. Characteristic plants include Job's tears, mile-a-minute vine, marsh cyperus, swamp fern, water chestnut, and willow primrose. Freshwater marshes are found in shallow, slow-moving, or standing water, at the mouths of streams blocked by sand bars, and near the steep slopes of mountains, where streams are more plentiful. Abandoned taro

O pala faataufusi e maua i nuu nei:

- Masefau
- Vatia
- Pala Faimulivai e maua i le omoa'i o le mauga i Aunu'u
- Tula
- Aoa
- Nu'uuli (tafatafa o le South Pacific Traders, e itiiti ae lauusiusi)
- Alao

O le faataufusi aupito tele i Amerika Samoa o Faimulivai. O lea faataufusi e aofia ai se laueleele pe a ma le 40 eka ma o lo o iai i ona tulaga pei ona iai i la tausaga ua mavae. O lenei nofoaga ua fautuaina ia avea ma se nofoaga e vaaia faapitoa e mana'omia ai se puipuiga faapitoa. O lo o maua i lenei faataufusi le toloa efuefu, e masani ona vaaia i lenei tuloto.

Pala ua faato'aina

O pala ua faato'aina e masani ona faaaogaina e toto ai le talo, ua le nao talo, ae mafai foi ona maua ai i nei nofoaga selesele ma isi laau. E ui lava o nei pala o loo faato'aina e i lalo pea o le faaupuga o laueleele susu lona uiga e pulea i tulaga mana'omia o le puipuiga o pala ma faataufusi.

O faataufusi poo pala nei ua faato'aina e masani ona tuaoi ma isi laueleele susu. E mafai ona vaaia i nu'u o loo ta'ua i lalo:

- Nu'uuli
- Masefau
- Vatia
- Alao
- Tula
- Leone
- Ma'umaga i taufusi i Aunu'u

O ma'umaga nei o lo o totoina i taufusi i Aunu'u o faata'ita'iga aupito sili ia o pala ua faato'aina. O le talo e maua mai nei taufusi e tulaga ese aua foi e latou te maua le suavai mai vaitafe o tumutumu o mauga ma lalo foi o le

fields also may revert to marshland. Freshwater marshes are found in:

- Masefau
- Vatia
- Faimulivai Marsh, in the crater on Aunu'u
- Tula
- Aoa
- Nu'uuli (by South Pacific Trader's; small, but lush)
- Alao

The largest freshwater marsh in American Samoa is Faimulivai Marsh. The marsh, which covers about 40 acres, is in pristine condition. The site has been recommended as a Special Management Area, which would afford it special protection. The rare Australian gray duck has been seen on this lake.

Cultivated wetlands

Cultivated wetlands are naturally occurring wetlands used for growing taro. Besides taro, these areas may contain marsh cyperus, swamp morning glory, and Mexican seedbox. Even though these wetlands are under cultivation, they are considered wetlands and so fall under the requirements governing wetlands protection.

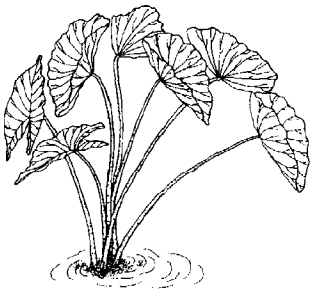
Cultivated wetlands often border other wetland types. They can be seen in the following villages:

- Nu'uuli
- Masefau
- Vatia
- Alao
- Tula
- Leone
- Taro fields, Aunu'u

The taro fields on Aunu'u are the best example of cultivated wetlands. These taro fields are unusual because they receive freshwater runoff from the crater slope and from underground, rather than from streams. This wetland has been used for taro cultivation for several centuries.

Pala faataufusi.

Freshwater marsh.



Talo (Colocasia esculenta).

Taro (Colocasia esculenta).

O pala ua afaina.

Ruderal (disturbed) wetland.

Faimulivai i Aunu'u.

Crater Lake, Aunu'u.

eleele, a e le sau sa'o mai vaitafe. Ua tele seneturi o faaaogaina lenei taufusi e toto ai ma'umaga.

O pala ua afaina

O le faaupuga "pala ua afaina" e faamatalaina ai nofoaga pei o autu, o vai, poo togatogo ua faaleagaina. I nei nofoaga e mafai ona e vaaia ai laau pei o le avapui.

E maua ia pala (faaleagaina) i nuu nei:

- Nu'uuli (laueleele e iai mauga laiti, i le va o le South Pacific Traders ma le pamu i le Paka Liona)
- Aoa
- Tula
- Taufusi i le aoga i Aunu'u

O auvai ma alavai

O ia auvai ma alavai e i ai vai tetele, vaivai, ma vai tu matafaga e ta'ua o laueleele susu tusa lava pe le o iloga uma ai elemene e tolu (laau e ola ai, laueleele, ma le vaia) ua uma ona faamatalaina i luga. E ta'ua ia o laueleele susu ona o ituaiga laau o lo o ola ai.

O le Polokalama o le Va'aiga o le Gataifale ma Laufanua o se vaega lea o le Ofisa o Atina'e ma le Manuia Lautele, e mafai ona fesoasoani atu i nisi faamatalaga e tusa ai o ni auvai po'o alavai o ni laueleele susu.

Ruderal wetlands

The term "ruderal wetland" describes disturbed areas such as ditches, ponds, or disturbed mangrove swamps. In ruderal wetlands you may see Mexican seedbox, ferns, and wild ginger.

There are ruderal (disturbed) wetlands in the following villages:

- Nu'uuli (the hummocky, or hilly, area between South Pacific Traders and the Pumping Station at Lions Park)
- Aoa
- Tula
- School Swamp on Aunu'u
- Leone

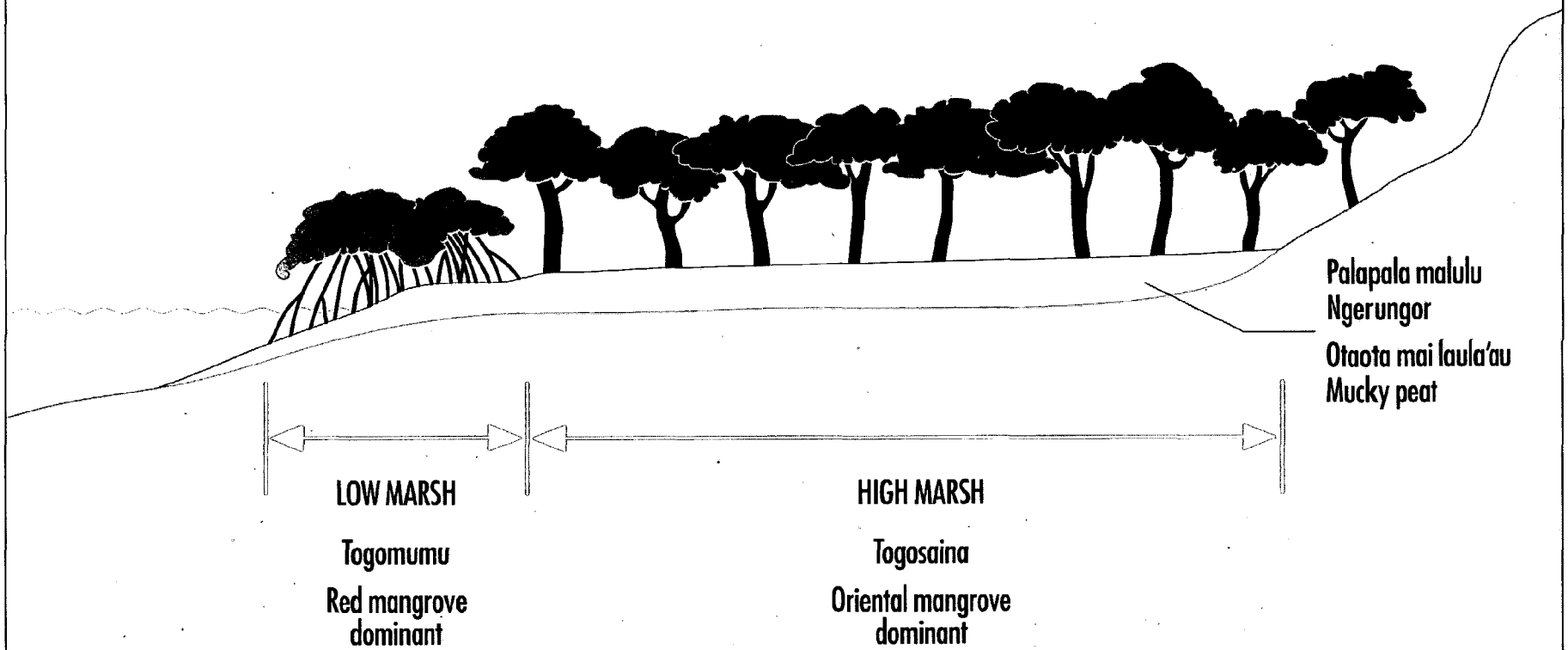
Streams and open water bodies

Such streams and open water bodies as large ponds, intermittent stream channels, and coastal waters are considered wetlands even though they do not display the three basic elements (vegetation, soils, and hydrology) discussed above. They are considered wetlands because they contain typical wetland vegetation.

The American Samoa Coastal Management Program, which is part of the Economic Development Planning Office (EDPO/ASCMP), can help you with more information to decide whether a particular area of a stream or open water body is a wetland.

Faasoasoaina o togomumu ma togosaina i totonu o se pala togatogo

Distribution of red and oriental mangroves in the mangrove swamp



Laau masani o laueleele susu

O le la'au matagofie o le le'ile'i (Xylocarpus moluccensis), *e vaevaeina lona fatu e pei o se paso. Sa masani ona faaaogaina i isi taimi e fai ma mea ta'alo a tamaiti.*

The fruit of the striking puzzlenut tree (Xylocarpus moluccensis) *contains a large segmented seed that fits together like a puzzle and is sometimes used as a child's toy.*

E lua ituaiga laau e ola i laueleele susu, o laau vai poo laau e fiafia i le vai ma laau e mafai ona ola lua, i le laueleele matutu poo i vai foi. Laau vai, o laau ia e fiafia moni lava i le vai e na'o laueleele susu e ola ai, o laau fanua e mafai ona ola i laueleele susu faapea foi laueleele matutu.

I le itulau i tua atu o le itulau o loo soso'o nei, o loo iai se lisi o ituaiga laau e maua i laueleele susu o Amerika Samoa (itulau 16). O lo o iai igoa Samoa o nei laau faapea foi ma igoa faa-Peretania i le gagana faa-saienisi ma le gagana masani.

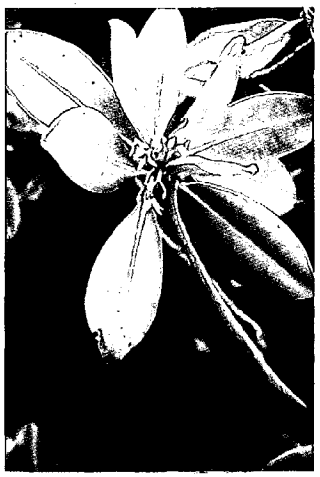
Typical wetland plants

There are two types of wetland plants, obligate or "water-loving" and facultative. Obligate or true "water-loving" plants only grow in wetlands. Facultative species tend to grow in wetlands but will grow in drier habitats, too.

On page 16 is a representative list of plant species found in American Samoa's wetlands. The Samoan names are given as well as the scientific and common English names.

Itu tauagavale: Fau (Hibiscus tiliaceus).
Luga: Talo (Colocasia esculenta).
Itu taumatau i luga: Sa'ato (Acrostichum aureum).

Left: Beach hibiscus (Hibiscus tiliaceus).
Above: Taro (Colocasia esculenta).
Above right: Swamp fern (Acrostichum aureum).



Itu tauagavale i luga: O le togomumu (Rhizophora mangle) *e ola latalata i faasi'usi'uga o pala togatogo e i tala ane o le sami, ma e seasea lava ona tupu tele ifo i lo le 10 futu. O ona a'a e avea ma nofoaga mo le tele o meaola.*
Itu taumatau i luga: Ata o le togomumu.
Itu tauagavale i lalo: O le togosaina (Bruguiera gymnorhiza), *e mafai ona o'o lona tupu i le 60 futu, ma e aupito sili ona tele lona fuainumera i totonu o pala togatogo.*
Itu taumatau i lalo: Ata o le togosaina.

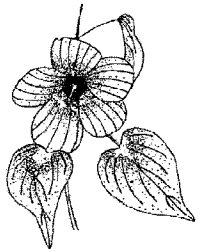
Top left: Red mangrove (Rhizophora mangle) *grows close to the seaward edge of the mangrove swamp and is rarely taller that 10 feet. Its stilt-like roots provide habitat for many animals.*
Top right: Detail of red mangrove.
Bottom left: Oriental mangrove (Bruguiera gymnorhiza) *can grow to 60 feet and is the dominant tree in mangrove swamps.*
Bottom right: Detail of oriental mangrove.

Itu taumatau: Gatae (Erythrina fusca).
Tala atu o le itu taumatau: Sagasaga (Coix lacryma-jobi).

Right: Gatae (Erythrina fusca).
Far right: Job's tears (Coix lacryma-jobi).

Itu tauagavale: Fue moa. (Ipomoea aquatica).
Luga: Falaga (Barringtonia samoensis).

Left: Swamp morning glory (Ipomoea aquatica).
Above: Falaga (Barringtonia samoensis).



Lisi o laau eseese e maua i laueleele susu o Amerika Samoa

A representative list of American Samoa's wetland plants

Igoa faasamoa Samoan name	Igoa faaperetania English name	Igoa faasaienisi Scientific name	Tulaga Status*
Sa'ato	Swamp fern	*Acrostichum aureum*	OBL
Lopa	—	*Adenanthera pavonina*	NL
Teuila	Red ginger	*Alpinia purpurata*	NL
—	—	*Alteranthera sessilis*	FAC
Laugapapa	Bird's nest fern	*Asplenium nidus*	NL
Falaga	—	*Barringtonia samoensis*	FACW
—	—	*Blechum brownei*	FAC
—	Paragrass	*Brachiaria mutica*	FACW
Togosaina	Oriental mangrove	*Bruguiera gymnorrhiza*	OBL
Moso'oi	Ilangilang	*Cananga odorata*	NL
Fanamanu	Indian shot	*Canna indica*	FACU
La'au fai lafa	Candlebush	*Cassia alata*	FAC
—	—	*Christella harveyi*	NL
Niu	Coconut	*Cocos nucifera*	FACU
Sagasaga	Job's tears	*Coix lacryma-jobi*	FACW
Talo	Taro	*Colocasia esculenta*	OBL
Mau'u toga	Spreading dayflower	*Commelina deffusa*	FAC
—	Tar weed	*Cuphea carthagenensis*	FAC
Vao tuaniu	Marsh fern	*Cyclosorus interruptus*	NL
—	Umbrella plant	*Cyperus alternifolius*	FACW
Selesele	Marsh cyperus	*Cyperus javanicus*	FACW
'Anume	Samoan ebony	*Diospyros elliptica*	NL
—	—	*Diplazium proliferum*	NL
'Utu'utu	Water chestnut	*Eleocharis dulcis*	NL
—	Tropical cupgrass	*Eriochloa procera*	FAC
Gatae palagi	—	*Erythrina fusca*	OBL
Mati	Wild fig	*Ficus tinctoria*	FAC
—	—	*Fimbristylis autumnalis*	NL
—	—	*Fimbristylis dichotoma*	FAC
Fau	Beach hibiscus	*Hibiscus tiliaceus*	FACW
Fue selela	Wax flower	*Hoya australis*	NL
Ifi	Tahitian chestnut	*Inocarpus fagifer*	FACU
—	Swamp morning-glory	*Ipomoea aquatica*	OBL
Fue moa	Beach morning-glory	*Ipomoea pes-caprae*	FAC
Tamole vai	—	*Limnophila fragrans*	OBL
—	—	*Ludwigia hyssopifolia*	FACW
—	—	*Ludwigia octovalvis*	OBL
Mago	Mango	*Mangifera indica*	FACU
Selesele	—	*Mariscus javanicus*	NL
Fue saina	Mile-a-minute vine	*Mikana micrantha*	NL
Vao fefe	Sensitive plant	*Mimosa pudica*	FACU
Nonu	Indian mulberry	*Morinda citrifolia*	NL
Fa'i	Banana	*Musa paradisiaca*	FACU
'Atone	Samoan nutmeg	*Myristica fatua*	NL
Vao lima	T-grass/sour paspalum	*Paspalum conjgatum*	FAC
—	Rice grass	*Paspalum orbiculare*	FAC
—	Seashore paspalum	*Paspalum vaginatum*	FACW
Pasio vao	Wild passionflower	*Passiflora foetida*	FACU
Matalafi	—	*Psychotria insularum*	NL
A'a	Kudzu	*Pueraria lobata*	NL
Togomumu	Red mangrove	*Rhizophora mangle*	OBL
Tavai	—	*Rhus taitensis*	NL
Selesele	—	*Rhynchospora corymbosa*	OBL
La'au failafa	Candelabra plant	*Senna alata*	NL
—	—	*Struchium sparganophorum*	FACW
Masoa	Polynesian arrowroot	*Tacca leonropetaloides*	NL
Fue sina	Beachpea	*Vigna marina*	FACU
Le'i le'i	Puzzlenut tree	*Xylocarpus moluccensis*	OBL
'Avapui	Wild ginger	*Zingiber zerumbet*	FACU

* O le tulaga e mafai ai ona iloa laau e maua i laueleele susu (pala) poo laueleele matutu. Ua mafai ona iloa ia tulaga i laau o loo ola i le pala pe a faatusatusaina i laau i nofoaga e ese mai i laueleele susu. O faailoga e iloa ai nei tulaga ua faamatalaina atu i lalo:

* The status is a regional indicator of whether a plant is found in wetlands or uplands. It is based on the estimated probability of a species occurring in a wetland versus a non wetland habitat. The indicator status codes are as follows:

OBL	La'au e faamoemoe i laueleele susu (>99%); maua i laueleele susu Obligate (estimated probablility >99%); always found in wetlands
FACW	La'au e fesoasoani i laueleele susu (67% i le 99%); maua i laueleele susu Facultative wetland (estimated probability 67% to 99%)
FAC	La'au fesoasoani e maua i laueleele susu ma laueleele matutu (pea ma le 34% i le 66%) Facultative (estimated probability 34% to 66%): found in both wetlands and uplands
FACU	La'au fesoasoani i laueleele matutu (mai le 1% i le 33%) Facultative upland (estimated probability 1% to 33%)
UPL	La'au e faamoemoe i laueleele matutu (<1%); maua i laueleele matutu Obligate upland (estimated probability < 1%); always found in uplands
NL	Le lisiina No listing

O 'tulafono masani' e iloa ai ia laueleele susu

Mo se malamalamaga atili e faatatau i laueleele poo se laueleele susu, fesili i le Ofisa o Atina'e ma le Manuia Lautele/Polokalama o le Va'aiga o le Gataifale ma Laufanua mo se faamaoniaina aemaise lava pe afai o le a fausia ai se fale, eliina, pe tanuina. O mea nei e tatau ona fai, e avea ma ta'iala :

- Vaia. Pe masani ona susu ma vaia lenei laueleele?
- Laueleele. Pe lanu malosi ma eleelea lea laueleele?
- O laau e ola ai. Vaai uma i laau o lo o ola ise vaega e 6-futu le lapotopoto. Afai o ola ai ni laau e lua pe tolu o laau o lo o ta'ua i le itulau 16 o lenei tusitusiga (e le na'o laau vai) i lenei faa-lapotopotoga, e le taumate o se laueleele susu. Tusa fo'i pe tasi se laau e maua i lena vaimea, e le iloa lava po o se laueleele susu.

  Faamatalaga: A maua ai ni laau vai, o lona uiga o le laueleele susu.

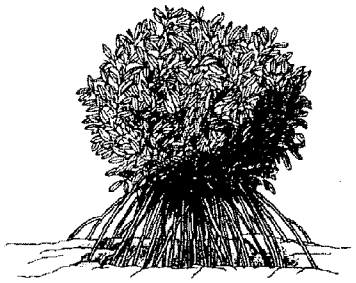
A 'rule of thumb' for determining if an area is a wetland

If you are wondering whether an area is a wetland, ask EDPO/ASCMP for positive confirmation, especially if you are planning any construction, digging, or filling. The following exercise, however, can serve as a rough guide:

- Hydrology. Is the area regularly wet or muddy?
- Soils. Is the soil dark and mucky?
- Vegetation. Look at all of the vegetation growing in a 6-foot circle. If two or three of the plants mentioned in the list on page 16 of this guide (not just obligates) are in the circle, the site is probably a wetland. Even if only one of the plants mentioned is found in the area, however, it may still be a wetland.

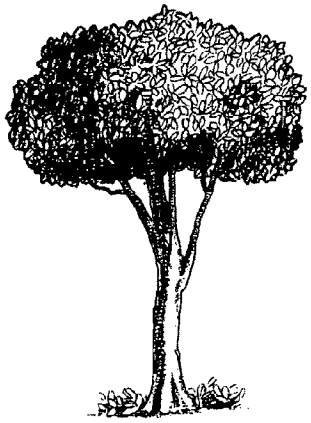
  Note: If you find obligate plants, the area is a wetland.

O le tulaga ese o togatogo i Amerika Samoa



Togomumu.

Red mangrove.



Togosaina.

Oriental mangrove.

Ua na'o Samoa lava se tasi o atunuu, i se fuainumera itiiti o atunuu i le lalolagi e ola faatasi ai le togatogo saina ma le togatogo mumu. O le togatogo mumu *(Rhizophora mangle)* e tupu i atunuu vevela e i le itu sisifo o le 0 tikeri le maualuga. Maua i Aferika i sisifo, Brazil i sasa'e, atunuu o le Keripea, Amerika Tutotonu, ma le sitete o Florida, ona oso mai ai lea o le ola o nei laau e pasia le Sami o le Pasefika i Samoa, Fiti ma Niu Sila.

O le togatogo saina *(Bruguiera gymnorrhiza)* e tupu tele i le itu sasa'e o le 0 tikeri le maualuga. E masani ona maua lenei togatogo i Aferika i sasa'e, i le itu saute o le gataifale o Initia, Melesia, Ausetalia sisifo ma matu, Maikolonisia, Fiti ma faaauau mai i Samoa. Pau lava isi atunu'u e maua uma ai nei laau e lua o ola faatasi o Niu Sila, Niu Kaletonia, Fiti ma isi atunu'u o le Pasefika.

E ui i le tele o pala ma taufusi i Amerika Samoa o lo o tutupu ai laau e maua foi i isi vainu'u o le Iunaite Sitete, o togatogo i laueleele susu, aemaise ia e lagolagoina le tutupu o laau tetele, e pei o lea e iai i Nu'uuli, e le aumaua. O le mea lea e ala ai ona tele le naunau mai o Ofisa ole Malo Tele i togatogo i laueleele vaia. E taua ma e tulaga ese ma e tatau ona puipuia.

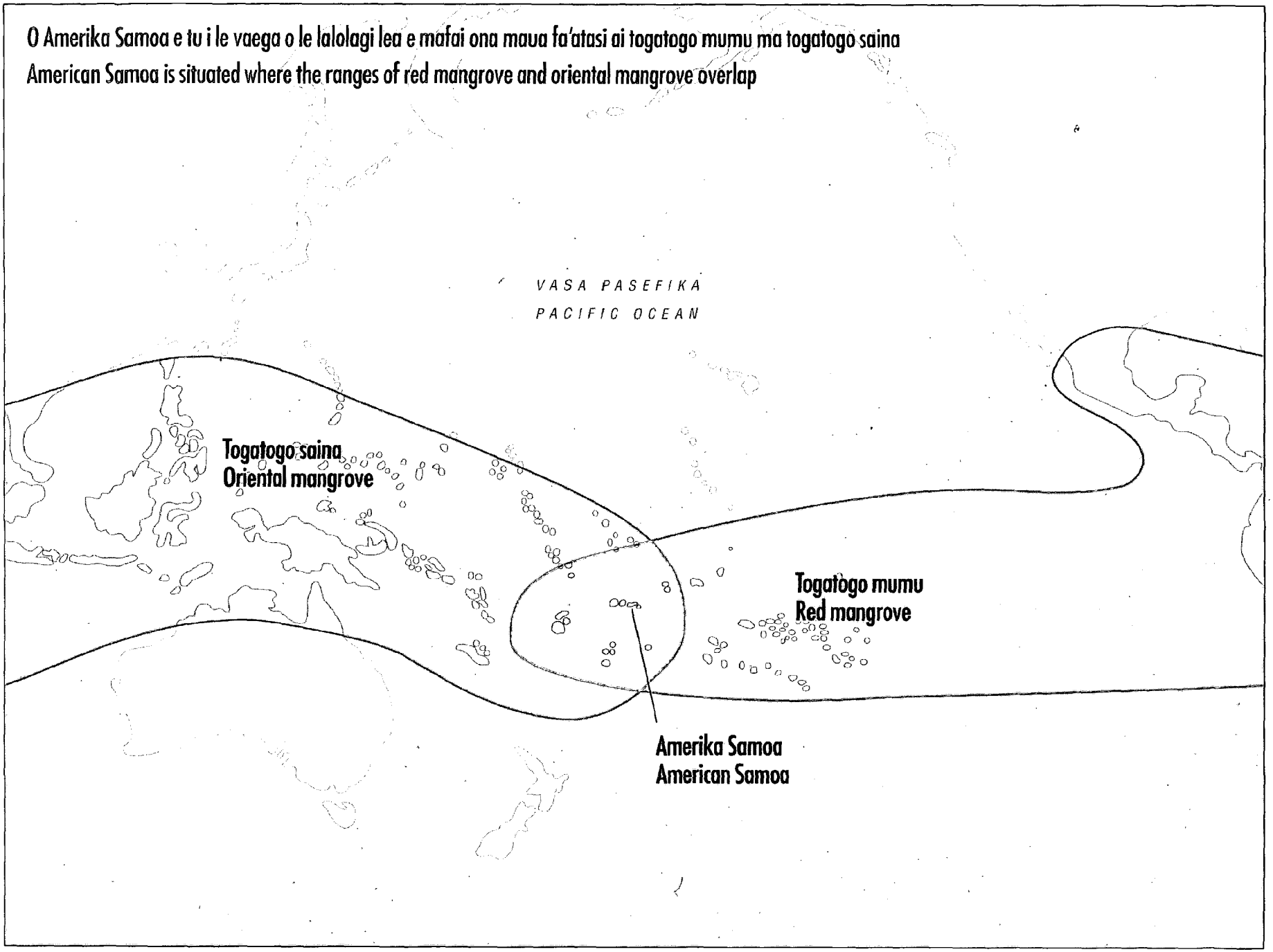
The unique character of American Samoa's wetlands

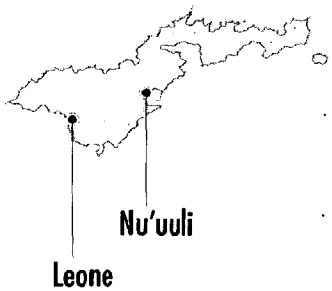
The Samoan island group is one of the only places in the world where both the oriental mangrove and the red mangrove grow together. The red mangrove (*Rhizophora mangle*) grows in tropical areas to the west of 0 degrees longitude. Found in West Africa, eastern Brazil, the Caribbean, Central America, and Florida, the distribution of the species then leaps across the Pacific Ocean to Samoa, Fiji, and New Zealand.

The oriental mangrove (*Bruguiera gymnorrhiza*), on the other hand, grows mostly to the east of the 0 degrees longitude mark. Typically, this mangrove is found in East Africa, the southern Indian coast, Malaysia, western and northern Australia, Micronesia, Fiji and continues on to Samoa. The only other places where both species are found together are New Zealand, New Caledonia, Fiji, and some other Polynesian islands.

While most of the marshes and swamps of American Samoa contain plants found commonly in other parts of the U.S., the mangrove wetlands, especially those which support mature forests, such as those in Nu'uuli, are uncommon. This is part of the reason why American Samoa's mangrove wetlands receive so much attention from federal government agencies. They are unique and should be protected.

O Amerika Samoa e tu i le vaega o le lalolagi lea e mafai ona maua fa'atasi ai togatogo mumu ma togatogo saina
American Samoa is situated where the ranges of red mangrove and oriental mangrove overlap





A faaauau pea le afaina o togatogo o Amerika Samoa, e i'u ina afaina ai nofoaga o loo maua ai le toloa efuefu.

With continued development affecting American Samoa's wetlands, the habitat of the Australian gray duck is threatened.

O laueleele susu aupito taua i Tutuila ma Aunu'u

O pala i Nu'uuli ma Leone ua iloga o ni laueleele vaia aupito taua ia e tatau ona puipuia ma faaleleia mo tupulaga o i luma. Ua ta'ua ia pala o "Nofoaga Vaaia Faapitoa" i lalo o le tulafono faatulagaina o le Vaaia o le Gataifale o le 1990. O loo mana'omia ai ofisa o le Malo faapea tagatanuu ia latou vaaia nei laueleele susu ma laueleele o i autafa o ia laueleele susu, ina ia puipuia mai atina'e e ono afaina ai.

O pala i Nu'uuli ma Leone e taua tele ona o mafua'aga nei:

- E iai laau togatogo ua tauolaola, o loo tutupu faatasi ai togatogo saina ma togatogo mumu.
- O nei pala o loo iai ituaiga laueleele susu eseese. O le pala i Nu'uuli o loo iai le togatogo tele lava, o se pala sami latalata ane i Mulinu'u (Coconut Point), ma se pala vai itiiti e i tua o le South Pacific Traders. O le Pala i Leone o loo iai togatogo ma taufusi vai.
- O nei pala e lua e taua ona e iai ofaga o i'a ma meaola ta'aloa.
- O le pala i Nu'uuli e nofo ai le toloa efuefu, e faapea ua le toe aumau ai iinei.
- O le pala i Nu'uuli e fai ai tafaoga, o fagotaga, ta'elega, ma ti'etiega va'a.
- O le pala i Leone ua iloga mai anamua i le faaaogaina lea e maua ai mea taumafa a le nuu o Leone i aso anamua.
- O le puipuiina o le pala i Leone ia mama le suavai ma le ola lelei o amu i le aau i le Fagaloa o lea nuu e tatau ona matua faaeteete i ai.

E lua foi isi nofoaga faapea i Tutuila ma Aunu'u e taua tele ma e tatau lava ona puipuia faapitoa ona o lo la tulaga ese ma le aoga. O ia nofoaga o le faataufusi lea i Malaeloa, ma Faimulivai, o se faataufusi e i luga o le mauga i le omoa'i i Aunu'u .

Tutuila and Aunu'u's most important wetland sites

The Nu'uuli and Leone palas are recognized as important wetland areas needing protection and maintenance for generations to come. They have been designated "Special Management Areas" under the Coastal Management Act of 1990. This requires government officials and the public to ensure that these wetlands and surrounding "buffer" areas are protected from harmful development.

The Nu'uuli and Leone palas are important wetland areas for the following reasons:

- They contain well-developed mangrove forests in which both oriental and red mangroves are present.
- Both palas include a variety of wetland types. The Nu'uuli pala contains a large mangrove swamp area, a saltwater marsh area near Coconut Point, and a small freshwater marsh area behind South Pacific Traders. The Leone pala contains mangroves and a freshwater swamp area.
- Both palas are important fish and wildlife habitat areas. The Nu'uuli pala provides habitat for the rare Australian gray duck which, until recently, had been believed to be extinct locally.
- The Nu'uuli pala covers about 123 acres, making it the largest wetland in the Territory.
- The Nu'uuli pala provides such recreational activities as fishing, swimming, and boating.
- The Leone pala holds historical significance since it served as a primary food source for the residents of the prehistoric village of Leone.
- Protection of the Leone pala will protect water quality and the health of a diverse coral reef in Leone Bay.

O le pala lea i Malaeloa e taua tele ona o itu nei:

- O le laueleele susu lea, e lona lua i le laueleele susu aupito tele i totonu o le teritori, e tusa ma le 72 eka.
- Pau lava lea o le faataufusi vaimagalo i Tutuila ma Aunu'u.
- O lo o i ai se laau e maua gata e ta'ua o le gatae o lo o maua ai i lea taufusi. O le taimi mulimuli lava na iloa ai lea laau o le tausaga e 1929 i le nu'u o Leone.

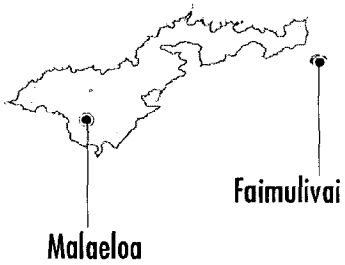
E taua le faataufusi lea i Faimulivai ona taluai:

- O le nofoaga aupito tele lea o lea ituaiga e maua ai le vaimagalo ma e ola ai laau e le o faalavelaveina foi i totonu o le Teritori.
- E taua tele le faataufusi lenei ona e maua ai i'a ma le tele o isi meaola taaloa e pei o le toloa efuefu sa iloa ai i se taimi.
- O se nofoaga e le'i tagofia ma e matagofie tele.

Two other wetland areas on Tutuila and Aunu'u are also important and should be afforded special protection because of their uniqueness. These two sites are the freshwater swamp in Malaeloa and Faimulivai Marsh, a freshwater marsh located in the Crater on Aunu'u.

Malaeloa's freshwater swamp is an important wetland site because:

- It is the second largest wetland in the Territory (72 acres).
- It is the only pristine freshwater swamp on Tutuila and Aunu'u.
- A very rare plant, gatae (*Erythrina fusca*), has been identified within the swamp. The last known collection of this plant was in Leone in 1929.



Faimulivai marsh is an important wetland site because:

- It is the largest, least disturbed, true herbaceous freshwater marsh in the Territory.
- The marsh offers excellent fish and wildlife habitat and the rare Australian gray duck has also been sighted there.
- It is pristine and is very beautiful.

Pala faataufusi i Faimulivai, Aunu'u.

Faimulivai Marsh, Aunu'u.

O le taua o nei nofoaga faataufusi

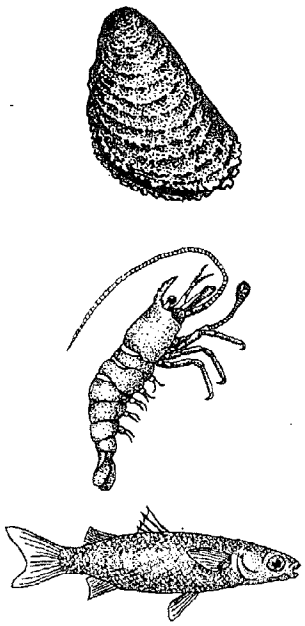
O faamanuiaga e maua mai nei nofoaga pei o taufusi ma pala e tele lo latou sao i le soifuaga o tagata Samoa i auala e tele.

I'a, figota, ma meaola tu'ufua

O le tele o ituaiga i'a eseese ma ula e ola i se vaega o lo latou olaga i totonu o togatogo, o alavai, ma isi nofoaga e maua ai le vai i Amerika Samoa. E i le va o le 10 ma le 40 pasene o i'a taua o le sami ma vai o lo o faalagolago tele i togatogo ma pala mo vaega uma po o se vaega o lo latou atina'eina o lo latou ola. O le tele o i'a ma ula e faalagolago sa'o lava i mea'ai mai togatogo ma pala. O malauli ma pusi ma tuna e ola i mano'o ma apofu ia e ola i togatogo ma pala. O pa'a ma ulavai ma tama'i i'a e aai i limu e pipi'i i a'a o togo. E faapena foi fuafua ma apofu e faalagolago foi i togatogo mo a latou mea'ai ma e maua ai foi e tama'i i'a le puipuiga mai isi fili ma i'a lapopo'a i le felavasa'i o a'a o togo. I le vaitaimi timu, o mea'ai nei e tafi mai le pala i le aloalo, po o pala ma aau e maua ai mea'ai mo 'ina po o tuitui, o ulavai ma isi ituaiga o figota. O nei mea'ai e maua mai i lala pala o togo ua pa'uu i totonu o le pala (taga'i itulau 24).

O le toatele o tagata Samoa e tausasami i i'a ma figota nei e maua i le pala, ma aau amu, po o vaitafe foi. O figota pei o pa'a ma tugane e aumai sa'o lava mai le pala. Taluai la e faalagolago tele i'a o le gataifale ma figota i meaai nei e maua mai le pala ma togatogo ma faataufusi o lea e taua tele ai le faatumauina pea o nei nofoaga ina ia mautinoa ai le maua pea e figota po o i'a o a latou mea'ai.

O le tele foi o meaola taaloa e latou te faaaogaina pala ma nofoaga nei e aai ma tuufua ai. O manulele ia pei o le iao, tiotala ma isi figota e momoe i lala o togo i faataufusi e saili ai mea'ai po o se mea foi e tau ina malolo i ai. O le toloa efuefu, po o le pato faaefuefu mai Ausetalia e seasea maua.



O i'a ma figota ia e maua ai alaga manuia mo le tele o tagata Samoa e mana'omia foi e i latou togatogo manuia ma le lelei.

Fish and shellfish, which provide food and income for many Samoans, benefit from healthly wetlands.

Wetland values

The benefits provided by wetlands, or "wetland values," contribute to the overall quality of life for Samoans in many ways.

Fish, shellfish, and wildlife habitat

A variety of fish and shellfish live at least part of their lives amongst the mangroves, freshwater streams, and other open water bodies of American Samoa. Between 10 and 40 percent of the important inshore and coastal fishes depend on mangrove swamp ecosystems for all or part of their development and livelihood (see list opposite). Many fish and shellfish depend directly or indirectly on food from the mangrove wetlands. Jacks, groupers, snake eels, and freshwater eels feed on the mud skippers and gobies that live in the mangroves. Mangrove crabs, shrimp, and small fish feed on the algae growing on the roots of the mangroves. Mullet and gobies also rely on mangroves for food and the young, small fish find protection from predators among the tangle of mangrove roots. During the rainy season, nutrients washed from the pala into the lagoons, mud flats, and coral reef flats provide food for sea urchins, goat fish, lobster, cowries, and other species. These nutrients are manufactured by the decomposed leaves, twigs, and branches that fall from the mangroves (see page 24).

Many Samoan families eat fish caught in the pala, from amongst the coral reefs, or from streams. Crabs, clams, and other shellfish are harvested directly from the pala. Because inshore and coastal fish and shellfish rely, in part, on nutrients from the mangroves and other wetlands, it is important that these habitats be preserved to support the food chain.

Several species of wildlife use wetland habitats for feeding or nesting. Such birds as the honey-eater, white-collared kingfisher and starling perch amongst the branches of

Ae ua iloa e masani ona tuufua i le vai o le taufusi lea o Faimulivai i Aunu'u . Ae le gata foi i lea sa iloa i se taimi e le o mamao atu i le Pala lea e i Nu'uuli. O isi foi meaola pei o ia e nonofo i le vai, o meaola fetolofi ma manu toto mafanafana e masani foi ona asiasi ane i nofoaga nei.

mangrove and freshwater swamps searching for food or just resting. The Australian gray duck is a rare species of waterfowl known to nest in the freshwater Faimulivai marsh on Aunu'u Island. Also, it has been sighted recently in Pala lagoon. Amphibians, reptiles, and mammals are also frequent visitors to the wetlands.

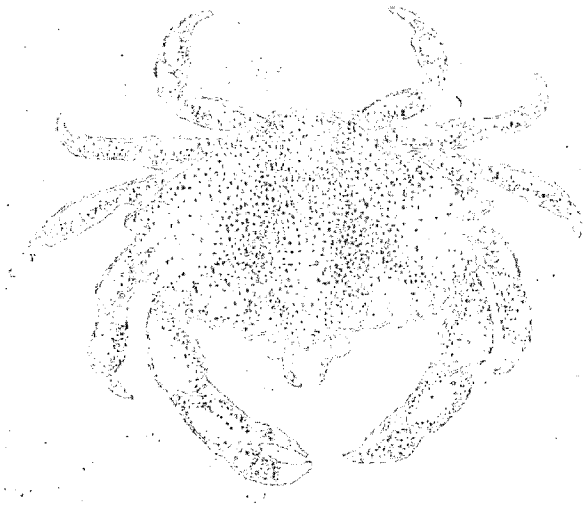
Lisi o i'a, figota, ma meaola ia e faalagolago i laueleele susu mo mea'ai ma nofoaga

A representative list of fish, shellfish, and wildlife that depend, directly or indirectly, on wetlands for food and habitat

Igoa faasamoa Samoan name	Igoa faaperetania English name
I'a	**Fish**
Fo	Cardinalfish
Malauli, Lupo, Lupota	Jack
Aua, Fuafua	Mullet
Sali	Silverside
Mumu	Ponyfish
'Anae'afa	Yellowtailed mullet
Lai	Leatherskin jack
Sapatu	Barracuda
Sesele	Perch
Apofu	Goby
Aroa	Catfish
Figota	**Shellfish**
Ulavai	Mantis shrimp
Pa'a limaga	Mangrove crab
Tifa	Oyster
Faisua, Tugane	Clams
Mano'o	Mud skippers
Ula	Lobster

Manu fetolofi	Amphibians and reptiles
Lage	Marine toad
Mo'o	Polynesian gecko
Mo'o	Mourning gecko
Pili	Azure-tailed skink
Pili uli	Black skink
Pili	Samoan skink
Manu felelei	**Birds**
Toloa efuefu	Australian gray duck
Ve'a	Banded rail
Manualii	Purple swamp hen
Tuli	Wandering tattler
'Aleva	Long-tailed cuckoo
Lulu	Barn owl
Pe'ape'a	White-rumped swiftlet
Iao	Wattled honey-eater
Ti'otala	White-collared kingfisher
Segasegamau'u	Cardinal honey-eater
Miti vao	Polynesian starling
Fuia	Samoan starling

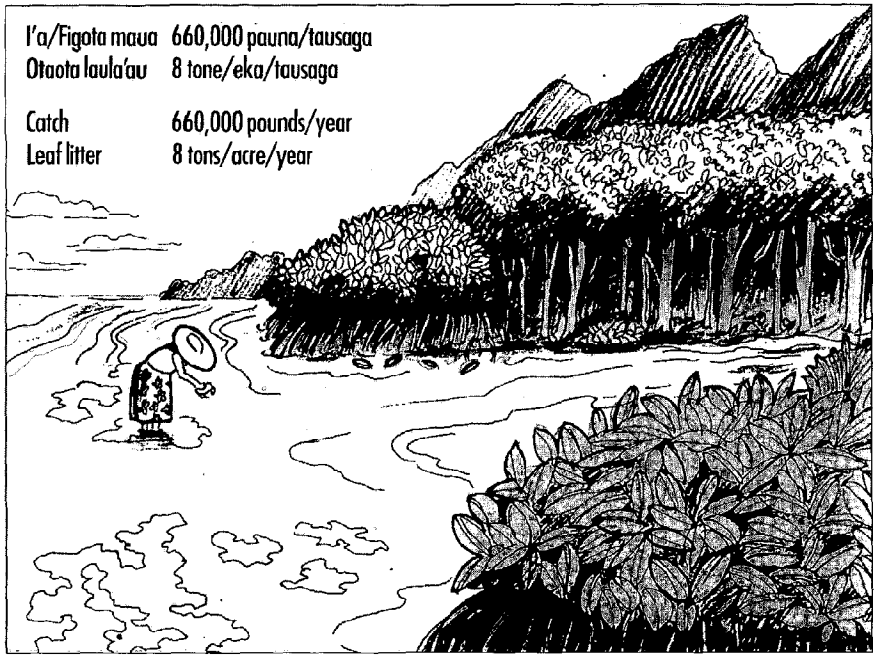
Manu toto mafanafana	Mammals
'Isumu	Polynesian rat
'Isumu	Roof rat
Pe'a	Sheath-tailed bat

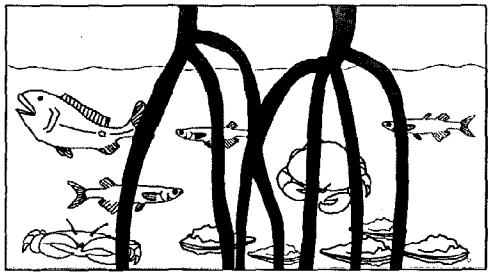


I totonu o se togatogo, o laulaau ma isi mea e pala e pa'uu ifo i le fola o le togatogo. O vaitafe ma auvai latou te aveina nei mea ma o latou nutirieni i tai i le sami ma a'ai ai loa i'a, pa'a, tugane, ma ulavai o loo nonofo i le aloalo ma le a'au. O i'a ma figota, e fagotaina e tagata o Amerika Samoa mo a latou mea'ai poo mea taumafa.

In the mangrove ecosystem, leaves and other debris fall from the trees onto the floor of the mangrove forest and into the water. Streams carry this debris and its nutrients into the sea, feeding the fish, crabs, oysters, and shrimp which live and feed around the mangrove roots and in the shallow waters of the reef. The fish and shellfish are caught, collected, and eaten by American Samoa's people.

I totonu o se togatogo
The mangrove ecosystem

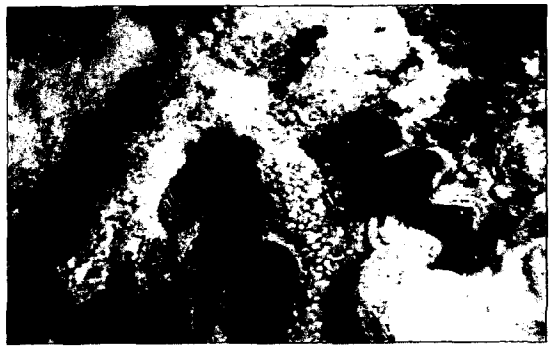




Luga: A'a o togo ma meaola o loo nonofo ai.
Itu tauagavale: Leone Pala.

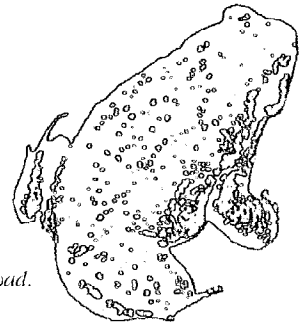
Above: Mangrove roots and some of the animals who live among them.
Left: Leone Pala.

O nisi o ituaiga o meaola e maua i totonu ma autafa o laueleele susu o Amerika Samoa
A few of the species found in and around American Samoa's wetlands



Luga: Faisua, malauli.

Above: Clams, jack.



Lage.

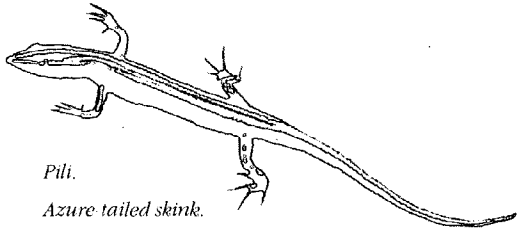
Marine toad.

Iao.

Wattled honey-eater.

Segasegamau'u.

Cardinal honeye-eater.

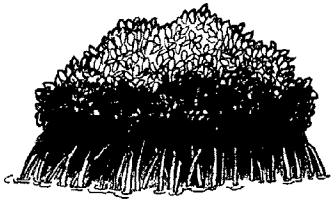


Pili.

Azure tailed skink.

Itu taugavale: Mo'o.
Luga: Ti'otala.

Left: Polynesian gecko.
Above: White-collared kingfisher.



O togatogo latou te puipuia Amerika Samoa mai lologa ma afa.

Mangroves help protect American Samoa by minimizing storm damage and controlling floods.

Puipuiga mai lologa ma faaleagaina i afa

E faaitiitia e laueleele vaia le afaina mai lologa i le ulufia lea o vaitafe mai lologa. Mai laueleele susu eseese, o togatogo e aupito sili ona aoga i tafe o vai ma puipuia mai le malosi o afa ona o ia laau latou te taofia vai e tele, e sili atu i lo laueleele mutia. O le lelei o le laueleele susu e iloga lea i lona tele. I Tutuila ma Aunu'u, e le tetele ni pala togatogo o iai ma e le lava se puipuiga mai lologa ma afa. Afai e faateteleina ia laueleele susu, e tele le aoga ma le puipuiga mai lologa ma faaleagaina i afa.

E taua tele le puipuia o Amerika Samoa ma isi motu o le Pasefika mai lologa o le a tutupu mai ona o le fesuia'iga o le tau, e pei ona valoia e le toatele o saienisi. Afai e si'isi'i le maualuga o le sami i tausaga e 50 o i luma, o le a afaina ai le gataifale o atumotu pei o Amerika Samoa.

Pueina o le palapala ma le taofia o le faaotaota

O togatogo o le gataifale latou te pu'eina palapala lelei ma mea'ai e fafagaina ai i'a ma figota o lo o faamoemoe lo latou ola i le pala. Ana leai togatogo i le gataifale latou te pu'eina palapala lelei ia e mafai ona faatafeaina i le aau. O le faatama'iaina o i'a o le aau ma figota o le a faaitiitia ai le tele o i'a mo fagotaga.

O laueleele susu latou te ulufia le otaota e iai vailaau faalelei eleele, pauta tamea, ma feau a tagata (se'i tulou). O le ulufia o nei otaota ua puipuiina ai e laueleele susu le vai taumafa ma nofoaga o i'a ma meaola ta'aloa.

Flood control and storm damage prevention

Wetlands reduce flood damage by absorbing and then slowly releasing floodwaters. Of all wetland types, mangroves provide the most effective flood control and storm damage prevention because forested areas hold more water than grassy, marshy areas. How effective a mangrove wetland will be depends on how big it is. On Tutuila and Aunu'u, the mangrove swamps are not very large and offer only moderate or low protection from storm damage. If the mangrove wetlands are enlarged, the flood control and storm damage prevention benefits will increase accordingly.

The flood control protection provided by wetlands is important as American Samoa and other Pacific Islands plan for the flooding that may result from global climate change, as has been predicted by many scientists. If the global sea level rises even a few centimeters a year over the next 50 years, low-lying coastal areas of such islands as American Samoa could be affected.

Sediment trapping and pollution abatement

Coastal mangroves trap sediments and nutrients that feed and provide habitat for a number of fish and shellfish living in or dependent on the pala. Coastal wetlands also trap sediments that would otherwise wash onto offshore reefs, causing them to die off. The subsequent loss of reef fish and shellfish would reduce stocks for local fishing.

Wetlands trap and dissolve pollutants such as fertilizers, detergents, and fecal matter. By dissolving these pollutants, wetlands protect the island's drinking water as well as fish and wildlife habitat areas.

Tafaoga ma a'oa'oga

O le laueleele susu e le iai se otaota ma se tanu, e matagofie mo fagotaga, ti'eti'ega va'a, ta'elega ma savaliga faanatura. Na'o le pala i Nu'uuli ua mafai ai nei mea i lenei vaitaimi, ae o le a mafai foi e isi pala o le atunuu ona maua nei tulaga lelei.

O vasega o a'oa'oga e masani ona asiasi i laueleele susu ina ia a'oa'oina ai e tusa ma le si'omaga. O Tutuila ma Aunu'u e maua ai ituaiga laueleele susu, e iai laau ma mea ola faapitoa.

O le pu'eina ma le toe faaaluina o vai i lalo o le laueleele

O laueleele vaia e pu'eina le vai lelei ma teuina, o nei vai lelei e toe faaalu lemu i vai o loo i lalo o le laueleele. O laueleele susu latou te toe faatumuina vai i lalo o le laueleele. I nisi gataifale, o laueleele susu latou te taofia le vai sami i le oo atu i vai lelei i lalo o le laueleele. O le talivai i Tafuna o le talivai autu lea i Tutuila, o togatogo i le Pala Taufusi e faagaoioina le taliina o le vai.

Aoga faaneionapo i su'esu'ega o mea mai anamua ma lona faaaogaina

I aso anamua, o nuu aupito tetele o Leone ma Pago Pago, e tuaoi ai laueleele susu. Na iloa lelei e tagata Samoa anamua le taua o laueleele vaia mo le olaola o i'a ma figota faapea fafie mo le saunia o mea taumafa ma isi fuafuaga. O vali mo laei taua ma ni mea faapepe i'a na maua mai lea i le togatogo. O vai taumafa foi na mafai lava ona aumai sa'o mai auvai ma auvai i tafatafa o punavai e faamamaina ai to'i faigaluega.

O le mea masani, o laueleele susu e masani ona faaaoga e toto ai talo, o vao vai ma kome na faaaoga e fai ai ato ma isi mea.

Recreation and education

Wetlands, free of trash and fill, invite fishing, boating, swimming, and nature hikes. At present, Nu'uuli pala is the only wetland with these recreational opportunities, but other wetlands would make equally attractive recreation sites.

School groups often visit wetlands to learn about the island's local ecosystem. Both Tutuila and Aunu'u offer a variety of wetland types, each with its own characteristic plants and animals.

Groundwater recharge and discharge

Freshwater wetlands collect and store fresh water, which gradually seeps into underground water collection areas. In this way, the wetlands are said to recharge groundwater resources. In some coastal areas, wetlands prevent salt water from entering underground water supplies. The Tafuna Plain is Tutuila's main collection and storage area for underground water supplies. The mangroves in Pala Lagoon facilitate the collection of water.

Archaeological and historical uses

Historically, American Samoa's two largest villages, Leone and Pago Pago, bordered mangrove wetlands. Early Samoans recognized that healthy mangrove swamps were important breeding grounds for fish and shellfish as well as a source of wood for cooking and other uses. Dyes for ceremonial outfits and poison for killing fish were produced by mangroves. Drinking water could be taken straight from streams and streams near prehistoric quarries were used to clean adzes (ax-like cutting tools).

Traditionally, freshwater wetlands have been used for taro cultivation and freshwater grasses and reeds were used for making baskets and other items.

E mafai ona e iloa atili ia laueleele susu o Amerika Samoa pe a e asiasi atu iai.

The best way to learn about American Samoa's wetlands is to experience them first hand.

E fesoasoani laueleele susu i le faamatagofieina o Amerika Samoa.

Wetlands add to American Samoa's scenic beauty.

O le taua o laueleele susu mo le tamaoaiga

O le a le aoga o le laueleele vaia? E le o maua tonu se tau tupe ae o le laueleele vaia lelei e aoga mo le tamaoaiga atina'e. O laueleele susu e pei o se inisiua poo se tupe i le faletupe, e mafai ona maua mai ai le tupe ae le mafai ona silia le tupe to mai i tua. E lua ona aoga. Muamua, o le le faaaogaina lea o tupe e suia ai laueleele susu i se isi mea, ma lona lua, tuu pea ia iai se aoga mo le lumana'i.

E iai foi le taua i le soifua maloloina. O le ola lelei o se laueleele vaia, e tele lona aoga i le tamaoaiga ma le va fealoa'i. E le'i faaaogaina lava laueleele susu mo ni galuega i Amerika Samoa. O galuega ma mea e maua ai e tele. O nisi o mea e maua mai ai o i'a maunu mo fagotaga, i'a teropika mo tane i'a teu fale e mafai ona faatauina atu i le Iunaite Setete, o laau ta mo turisi, o laau vai fofo mo le atunuu faapea mo atunuu i fafo. O ni pisinisi laiti, mo nuu ta'itasi, ma mea e faatau atu mai mea e maua mai i laueleele lelei, e faaleleia ai le tamaoaiga o tagatanuu, ma vaaia lelei ai le siomaga. I le itulau o loo soso'o, e maua ai se faapupulaga o nei avanoa e maua mai laueleele susu.

O laueleele susu o le a le tau faaalu ai ni tupe e tele mo le puipuiina o le atunuu mai lologa, galulolo (tsunami) ma afa. O laueleele susu e matagofie ma lanulau'ava, laau o lo o ola ai. A faaitiitia laueleele susu, ua faapena foi ona mou atu se tasi vaega matagofie o Amerika Samoa, i le va'aiga a tagata fai mai ma tagatanu'u o lo tatou motu.

Aoga masani o laueleele susu

E masani i tausaga e tele ua tuana'i ona soona faaaoga o laueleele susu ae le lava se faailogaina. E ui ina ua iloga le aoga o laueleele susu, ae tele ona le fiafia iai i o latou manogi ma faapea o mea e lafo iai le otaota. I aso ua tuana'i, e le'i tele se taimi na nonofo ai nisi i laueleele susu. Sa faigata ona maua vai lelei ma o tulaga o faato'aga ma le taina o laau sa le lelei i se taimi umi. E ui ina tele mea sa

Economic importance of wetlands

Just how much is a wetland worth? The actual dollar amount is difficult to calculate but healthy wetlands have significant economic benefits. Wetlands are like an insurance policy or money in the bank because you can cash in the funds, but you are not able to overdraw. The community saves twice. First, by not spending money to convert wetlands into something else and, second, leaving open the option to realize future opportunities.

Healthy wetlands also pay healthy dividends. The healthier a wetland, the greater the potential to produce economic and social value. Wetlands have not yet been tapped as a market opportunity in American Samoa. The types of jobs and products available from American Samoa's wetlands, however, are many. Some of these include harvesting bait fish for local fishermen or tropical aquarium fish for sale in the U.S., wood carvings for the tourist market, and medicinal plants for local and overseas markets. Small business opportunities, village cooperative options, and export possibilities based on these products could improve economic self-sufficiency for villagers and, at the same time, enable sustainable management of the environment. On the facing page is a sample list of market opportunities related to wetlands.

Wetlands save millions of dollars that otherwise would have to be spent on substitute control measures for flood, tsunami, and hurricane protection. Wetlands are beautiful, scenic areas of lush, tropical vegetation. American Samoa's visual appeal, for both residents and tourists, would be diminished without them.

Historic uses of wetlands

Wetlands historically have been over-used and undervalued. Although the benefits of wetlands are acknowledged, they have too often been viewed as smelly mudflats

faaleagaina o laueleele susu, ae na vave ona toe tutupu a'e ona o le lelei o ala e tutupu ai. O ona po nei, e ese ai. O otaota e faigata ona faaumatia, o le faato'ateleina o tagata, faapea tauvaga mo fanua ua tele ai le faaleagaina o laueleele susu.

O aoga o laueleele vaia i Amerika Samoa mo le lumana'i

E mafai ona maua mai ni mea taua e fau mai i se laueleele vaia lelei. O mea e iai fafie mo le saunia o mea taumafa, faamafanafanaina mai le malulu, ma le tunuina o i'a; o mea faigaluega mo faiga faiva; ma talo (mai pala vai). O le sua mai le laau o le togo e aoga mo upega ma faaaoga i vai fofo. E maua ai mea'ai, le sua o le meli mai pi, ma mea faalelei eleele. E tele mea faafiafia e mafai ona fai ai e pei o fagotaga, ti'eti'ega vaa, tafaoga, matamata i manu felelei, ma a'oa'oga mo le natura.

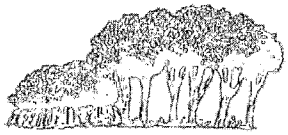
useful only for dumping trash. In the past, wetlands settlers didn't stay long. Fresh water was hard to collect and logging and agricultural activities were unsuccessful over any length of time. While the damage was considerable, overused and abandoned wetlands recovered quickly as their rich organic processes went to work. Today, it is a different story. Non-biodegradable waste products, increased human population, and competition for land puts more pressure on wetlands and the implications of disturbance are more serious.

Future opportunities for wetlands in American Samoa

Both direct and indirect products can be harvested from healthy, carefully managed wetlands. Direct products include firewood or charcoal for cooking, heating, and smoking fish; poles for fish traps and fishing floats; and taro (from freshwater marshes). The tannins found naturally in the bark of mangrove trees can be used to preserve fish nets and leather and as an ingredient in medicines. Indirect products derived from wetlands include food (from fish, shellfish, birds, and mammals), honey and wax (from bees), and fertilizer (from finfish). Many recreational opportunities can continue to be promoted, including boating, fishing, picnicking, bird watching, and nature education.

O le fuafuaina lelei o le faaaogaina o laueleele susu, e maua ai ni manuia o atina'e o Amerika Samoa, e le gata i le taimi nei, ae i le lumana'i foi.

The wise management of such wetlands resources as mangroves has immediate and future economic benefits for American Samoa.



Lisi o faata'ita'iga o ni alaga manuia e mafai ona maua mai i laueleele susu

Sample list of wetlands market opportunities

	Alaga manuia mo le taimi nei	Short term opportunity	Alaga manuia mo le lumana'i	Long term opportunity
Atina'e tau faigafaiva/ mea taumafa **Aquaculture/food production**	Fagotaga I'a teropika mo tane i'a teu fale I'a fai maunu/pa'a	Fisheries Tropical aquarium fish Bait fish/crabs	Figota fai atigi'e aina Tupa ma 'u'a Figota e tai lua itu Ulavai	Edible molluscs Mud crabs Oysters Shrimps/prawns
Atina'e tau la'au **Forestry**	Galuega faafailelega togo	Mangrove nursery	Mea e taina i la'au Mea e faia i ogala'au ma pa'ula'au Malala Apulupulu	Wood carvings Wood/bark products Charcoal Sap (waterproofing)
Laau masani **Vegetation**	Meli/ga'o Mea'ai tetele a meaola (e pei o popo) Laau fai vai/vali Ga'o mai la'au	Honey/wax Fodder Medicinal plants/dyes Vegetable oils	Vaimili Fasimoli Mea e gaosia e lima	Alcohol/ethanol Soda ash/soap Synthetics

Mea e faaleagaina ai laueleele susu o Amerika Samoa

O fagavao, faalelei eleele ma le lafoia o mea leaga i totonu o pala ma taufusi ua afaina ai laueleele susu ia e faamoemoe ai isi meaola.

Pollution from pesticides and fertilizers and the dumping of wastes threaten the delicate wetland ecosystem on which many animals depend.

I le 30 tausaga ua tuana'i, e silia ma le kuata o laueleele susu i Amerika Samoa ua faaleagaina. Mai le 600 eka i le 1961, na'o le 463 eka, (77%) o lo o totoe ile 1992. Mo laueleele susu ta'itasi i Nu'uuli, Leone, Tula, Alofau, ma Aoa, o le tulaga ua faaleagaina ai nei laueleele susu ua vave tele ma maoa'e. E i le va o le 30 i le 60 pasene o nei laueleele ua faaleagaina i le 30 tausaga ua te'a. Ua faaleagaina le tele o nei laueleele susu ona o le atina'e. Afai e faaauau pea lava le faaleagaina o lo o iai nei, e oo atu i le 100 tausaga o i luma o le a matua'i leai lava se laueleele susu e totoe. O Nu'uuli e pito tele ai le faaleagaina, (61 eka); a'o Tula ma Leone o lo la faaleagaina ua matua faaitiitia (tusa ma le afa o ia eka o totoe talu mai le 1961). A'o laueleele susu i Aunu'u, e le o tele ai ni atina'e o faia, e le o tele foi se faaleagaina. Ole mafua'aga o le tele o laueleele susu ua faaleagaina i Amerika Samoa ona ua tele atina'e ma mea fai. Ua faaaogaina ma tanuina le tele o laueleele susu mo fale o aiga, sai o pua'a, ma fale pisinisi.

O isi mea e ono afaina ai laueleele susu e iai:

- O le lafoina ai o otaota, e faaleaga ai laau o loo iai
- Tatipiina o togo mo fafie
- Lafoina lea o leaga o meatuaolo poo tagata iai
- Faaotaotaina o vai mai lalo o mauga
- Faamamaina lea o laau o laueleele susu mo faatoaga e faaaoga ai vailaau ma le totoina ai o isi laau pei o laau ile eleele matutu.

E le gata i le faalavelave i le ola lelei o laueleele susu, o le tele o nei mea e ono afaina ai le soifua o tagata. O le faama'i ate fefete na pipisi i le nuu o Nu'uuli i le vaitaimi o le 1980 ona o tugage faaleagaina mai paipa mo le otaota ua ta'i aga'i i le pala. Na pipisi le cholera (faama'i faigata e tupu ai le manava tata, faa'asuatigofie, ma le manava tiga; a le togafitia vave e i'u lava ina maliu ai se ua maua ai) i Truk i le 1984 na tupu mai i se togatogo ua faaleagaina. O lenei mea na

Threats to American Samoa's wetlands

In the last 30 years, over a quarter of American Samoa's total wetland acreage has been lost. From a total of 600 acres in 1961, only 463 acres (77%) are left in 1992. For individual wetlands, such as those in Nu'uuli, Leone, Tula, Alofau, and Aoa, the rate of loss has been much higher. Between 30 and 60 percent of each site's total acreage has been lost in the last 30 years. These wetlands have historically been reduced in size or damaged by encroaching development. If the average rate of loss continues for these wetlands, they will disappear completely within the next 100 years. The greatest loss of wetland acreage (61 acres) has occurred at Nu'uuli pala, while Tula and Leone have suffered the greatest percentage decrease (over half of the wetland acreage existing in 1961). By contrast, the wetlands of Aunu'u, where there is less development pressure, have not decreased.

The primary cause of the loss of American Samoa's wetlands is development. Wetlands are cleared and filled for village homes, piggeries, and commercial buildings.

Other threats to the wetlands include:

- Dumping of trash, ash, and other debris which smothers vegetation
- Cutting mangroves for fire wood
- Dumping or piping piggery wastes and human sewage into the wetlands
- Polluting up-stream water
- Clearing wetland vegetation to plant crops, using pesticides, and filling wetlands to plant dryland crops.

Besides interfering with the continued productivity and survival of wetlands, some of these threats pose health hazards to residents. A hepatitis outbreak in Nu'uuli in the

faaleagaina o laueleele susu, ae na vave ona toe tutupu a'e ona o le lelei o ala e tutupu ai. O ona po nei, e ese ai. O otaota e faigata ona faaumatia, o le faato'ateleina o tagata, faapea tauvaga mo fanua ua tele ai le faaleagaina o laueleele susu.

O aoga o laueleele vaia i Amerika Samoa mo le lumana'i

E mafai ona maua mai ni mea taua e fau mai i se laueleele vaia lelei. O mea e iai fafie mo le saunia o mea taumafa, faamafanafanaina mai le malulu, ma le tunuina o i'a; o mea faigaluega mo faiga faiva; ma talo (mai pala vai). O le sua mai le laau o le togo e aoga mo upega ma faaaoga i vai fofo. E maua ai mea'ai, le sua o le meli mai pi, ma mea faalelei eleele. E tele mea faafiafia e mafai ona fai ai e pei o fagotaga, ti'eti'ega vaa, tafaoga, matamata i manu felelei, ma a'oa'oga mo le natura.

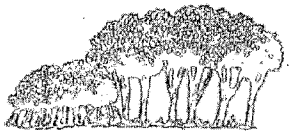
useful only for dumping trash. In the past, wetlands settlers didn't stay long. Fresh water was hard to collect and logging and agricultural activities were unsuccessful over any length of time. While the damage was considerable, overused and abandoned wetlands recovered quickly as their rich organic processes went to work. Today, it is a different story. Non-biodegradable waste products, increased human population, and competition for land puts more pressure on wetlands and the implications of disturbance are more serious.

Future opportunities for wetlands in American Samoa

Both direct and indirect products can be harvested from healthy, carefully managed wetlands. Direct products include firewood or charcoal for cooking, heating, and smoking fish; poles for fish traps and fishing floats; and taro (from freshwater marshes). The tannins found naturally in the bark of mangrove trees can be used to preserve fish nets and leather and as an ingredient in medicines. Indirect products derived from wetlands include food (from fish, shellfish, birds, and mammals), honey and wax (from bees), and fertilizer (from finfish). Many recreational opportunities can continue to be promoted, including boating, fishing, picnicking, bird watching, and nature education.

O le fuafuaina lelei o le faaaogaina o laueleele susu, e maua ai ni manuia o atina'e o Amerika Samoa, e le gata i le taimi nei, ae i le lumana'i foi.

The wise management of such wetlands resources as mangroves has immediate and future economic benefits for American Samoa.



Lisi o faata'ita'iga o ni alaga manuia e mafai ona maua mai i laueleele susu

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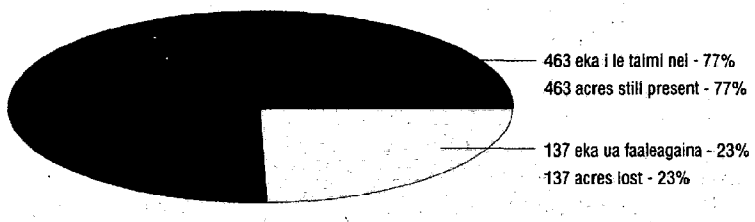
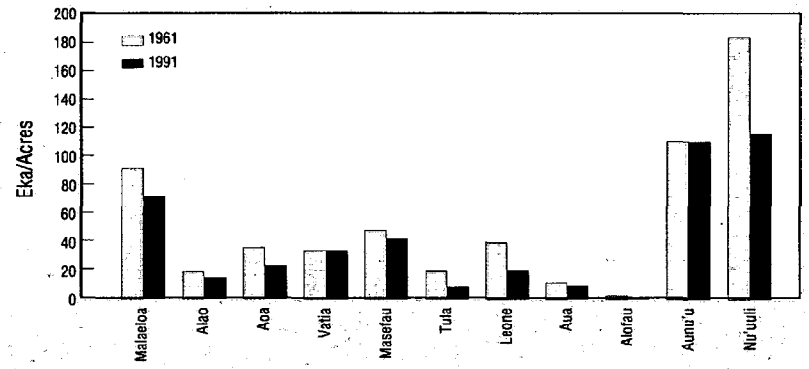
maliliu ai nisi, faaitiitia ai turisi, ma faaitiitia ai le tupe maua i le falei'a.

1980s was caused by clams contaminated with sewage piped into the pala. An outbreak of cholera on Truk in 1984 was traced to a polluted mangrove swamp. This incident resulted in loss of life, a decline in tourism, and a drop in fisheries income.

Faaititia o laueleele susu i Amerika Samoa mai le 1961 e oo i le 1991
Wetland losses in American Samoa from 1961 to 1991



Tu'uaofa'iga o fanua laueleele susu
Total wetland area



Fanua laueleele susu
Wetland area

Aisea e tatau ai ona puipuia laueleele vaia

E fesoasoani tele laueleele susu i le ola ma le tamaoaiga o Amerika Samoa. Ae ui i lea, e faaeteete gata ona o mea e faia i isi itu e tafe mai iai. O latou tulaga olaola ma le vaia e ese lava ma e faigata ona toe maua. E taua laueleele vaia e ola a'e ai le tele o figota ma meaola vai e aoga lea mo le si'omaga atoa o le teritori.

Why wetlands need to be preserved

Wetlands contribute to the overall quality of life and economy of American Samoa. Yet, these are fragile ecosystems easily affected by activities elsewhere within a watershed. Their biological and physical features are unique and largely irreplaceable. Wetlands provide important breeding areas and habitat for a wide range of aquatic and terrestrial species, and this is critical to the overall environmental health of the territory.

E mana'omia muamua pemita a o le'i amataina se galuega. Ua faatulagaina faiga pemita a Amerika Samoa mo le puipuia o laueleele susu.

Permits are required before starting a building project. American Samoa's permitting process is designed to protect local wetlands.

Pe faapefea ona puipuia laueleele vaia

O le Polokalama o le Vaaia Lelei o le Gataifale o Amerika Samoa; le Ofisa o Puipuia le Si'omaga; o le Ofisa o Paka ma Ta'aloga; le Ofisa o Gataifale; ma le Ofisa o le Soifua Maloloina o loo gafa ma le va'aia ma le puipuiina o laucleele susu.

PNRS ma pemita e faaaoga ai fanua

O le aupega taua o lo o puipuia laueleele vaia ole PNRS po o le Vaega e Faailoa ma Tuufesiliina Galuega Fai a le Teritori. E tatau lava ona iai se pemita e faatagaina ai le faaaoga o se fanua po o se galuega e fai ai. O le PNRS sa faavaeina mo le faagaoioiina o le faiga o pemita ia aofia ai matagaluega uma i le faataunu'uina o nei pemita. O le Ofisa o Tamaoaiga Atina'e latou te faafoeina le PNRS.

O le pemita lea a le PNRS e tatau ai i e talosagaina ona tuuina mai ni tali i fesili e tusa i le galuega, o fea o fai ai, ma mea e oo iai le si'omaga faapea le soifua maloloina o tagata o lea nuu. O se faata'ita'iga, a fausia se fale e mafai ona afaina ai le vaitaumafa o se nuu, le laueleele vaia pei ona sau ai, ma isi mea taua e oo iai. O le agaga o le pemita i le faaaogaina o le fanua ina ia auiliiliina ai ia atugaluga.

Fuafuaga o le vaaia o laueleele vaia

Ua iai nei se fuafuaga ua saunia e le Ofisa o Atina'e mo laueleele susu. I le faamatalaina o tulaga ua iai laueleele vaia i Amerika Samoa, o nei fuafuaga o lo o iai foi ni fautuaga e puipuia ai ma faagaoioi ai.

O nei fuafuaga e o tutusa ma isi sitete ma teritori ua latou faaaogaina se manatu ia aua ne'i toe iai se mea e faaleagaina o laueleele vaia. E le faasaina ai atina'e uma e fia faia. Afai e fia suia pe faatama'ia se laueleele susu, e mafai ona faia pe a afai e le faaleagaina ai isi laueleele faapea. E faapea foi ona faatatau lenei fuafuaga i soo se galuega a le Malo o Amerika Samoa e faia.

How wetlands are being protected

The American Samoa Coastal Management Program (ASCMP), the American Samoa Environmental Protection Agency (ASEPA), the Department of Parks and Recreation (DPR), the Department of Marine and Wildlife Resources (DMWR), and the Division of Public Health (DPH) are all responsible for overseeing and protecting wetlands.

The PNRS and land use permits

The strongest mechanism for protecting wetlands is the Territory's Project Notification and Review System (PNRS). A land use permit is required before starting any land use or construction project. The PNRS was designed to streamline the permitting process (and time required to get a permit) by including all agencies' requirements into one permit process. The EDPO/ASCMP oversees the PNRS.

The PNRS's land use permit requires applicants to answer certain questions about the proposed project, its location, and its likely impacts on the environment and the health and wellbeing of residents. For instance, building a house could affect a village's water supply, damage a pristine wetland, or have other serious impacts. The purpose of the land use permit process is to spot and address these concerns.

Wetlands management plan

A wetlands management plan has been prepared recently by EDPO/ASCMP. In addition to describing the status of American Samoa's wetlands, the plan makes several recommendations to protect wetlands and their functional values.

The plan's overall recommendation is that American Samoa, in keeping with other states and territories, should adopt a "no net loss" wetlands policy. With a no net loss policy, the American Samoa Government (ASG) can direct its agencies only to permit activities not resulting in a net (or overall) loss in wetland acreage, type (e.g. mangrove, freshwater

I le faataunu'uina o nei fuafuaga, ua saunia ni tulaga e fesoasoani ma faagaoioi ai e le Malo ni ala e puipuia ma faigofie ai i le Malo ma ona tagatanu'u ona malamalama i le taua o laueleele vaia. E faapitoa nei fautuaga aga'i i mea e fai ai galuega, pemita, o le faamalosia, auai o le lautele, ma a'oa'oga, faapea ma le toe faalelei ma fausia o nisi laueleele vaia fou.

Faata'ita'iga, i le "sone" (zoning), ua vaevaea pala ma taufusi i ni vaega e faatatau i le ituaiga laueleele vaia; (o auvai ma auvai tetele; pala ua faato'aina, ma laueleele ua faapitoa ona 'vaavaaia) O laueleele i tafatafa ane o pala ma taufusi ua faailogaina foi ina ia puipuia ai ma mea e faia e ono afaina ai pala ma taufusi.

O nei fautuaga ua faia ina ia faalelei ai mea e mana'omia e le Malo e tusa o nei fanua, ina ia aua ai ne'i faapea tagatanuu o iai nisi faaopoopoga i mea e tatau ona fai. O e finagalo e faia ni suiga e ono afaina ai pala ma taufusi, ia o latou faia ni tulaga e sili atu ae le'i taliaina a latou talosaga. E le ina ia faateleina galuega a tagatanuu ae ina ia puipuia laufanua mo tagata uma o Amerika Samoa.

marsh, etc.), and/or value (e.g. the wetland's capability to provide flood protection or recreation value). This policy does not prevent development entirely. If a project requires wetlands to be modified or destroyed, it may be approved only if other wetlands on the island are restored or rehabilitated. This policy will also apply to all of the ASG's public works projects.

To carry out the policy of no net loss, the wetlands management plan makes recommendations in relation to processes the ASG can adopt to make wetlands protection easier to implement for both the ASG and residents. These recommendations focus on zoning, permitting, enforcement, public participation and education, and restoration or creation of new wetland areas.

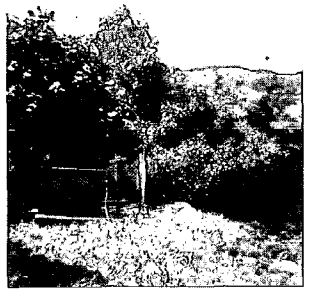
For instance, with zoning, wetlands have been divided into tiers or categories, according to the character of the wetland (namely, pristine; mixed uses, which includes wetlands used for agriculture; streams and open water bodies; disturbed wetlands; and wetland Special Management Areas). Buffer zones have been identified around some wetlands to prevent activities with the potential for adverse effects.

In most cases, these recommendations firm up processes or requirements the ASG has always had in place, so most residents will not notice any additional requirements. However, residents who wish to make adverse changes to wetlands will be required to take extra steps before being given approval for the project. The overall purpose is to not make more work for residents but to protect an important resource for all of the people in American Samoa rather than sacrificing it for the benefit of a few.

Ua fuafuaina ni sone ina ia puipuia ai togatogo mai galuega e ono afaina ai.

Buffer zones have been established around certain wetland areas to protect them from harmful activities.

O le a le uiga o le puipuia o pala ma taufusi mo tagatanu'u



O tafeaga mai sai pua'a lata ane i laueleele susu, e fai ma auala e afaina ai le soifuaga o tagata o loo taumafaina figota e maua i togatogo ma ogasami e latalata ane iai.

Runoff from piggeries pollutes nearby wetlands and can pose a health hazard to people who eat local fish or shellfish.

E ui ona o le Malo o le a faia fuafuaga i le puipuiina o pala ma taufusi, e tatau foi i tagatanuu ona faia lea galuega. Soo se tasi lava e ao ina nofo uta ia aua ne'i faaleagaina pala ma taufusi ma a'oa'o atu i tagata uma latou te le o silafiaina.

O le leaga o fale fausia, tanu ma isi galuega i luga o pala ma taufusi o lo o vaaia pea. E tatau ai ona faaitiitia galuega fai i luga o pala ma taufusi, aua e mafai ona faaleagaina ai ma le toe mafai ona suia. Faata'ita'iga, o vailaau faato'aga, e mafai ona tafe i pala ma taufusi, e mamate ai i'a ma laau o loo ola ai. O fagafao ma o latou sai, e ono afaina ai le soifua maloloina mo e taumamafa i'a ma figota. O le mea lea ua ala ai ona faia tuaoi i autafa o pala ma taufusi ina ia puipuia ai.

What wetlands protection means for residents

Although the American Samoa Government and its agencies are taking an active role in protecting and managing wetlands, responsibility for protecting them rests with all residents. Each individual is responsible for being aware of actions that would harm wetlands and of educating others who may be less aware of the effects of their actions.

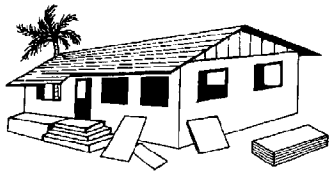
The negative effects of building, filling, and other projects within wetlands are easily seen. You should also recognize that development in areas near wetlands must be regulated since these can have negative, sometimes irreversible, impacts on wetlands. For instance, pesticides may be washed into the wetland by rain or irrigation, killing fish and vegetation. Piggeries placed on the edge of wetlands may cause health hazards for people eating fish or shellfish. This is why buffers have been developed around some wetland areas.

O ni mea e mafai ona faia nei

- Vaai po o e alala i se pala po o se taufusi. A fia fausia sou maota pe faia se sai o au mea tuaolo, po o se isi lava galuega, ia faia tulaga faapitoa e tatau ona fai. Ia faata'ita'i i mea uma ua uma ona faatulaga atu i luga e saili muamua po o lea laueleele o se taufusi. O le Ofisa o Atina'e o le Tamaoaiga e mafai ona fesoasoani atu. O lo o iai faafanua e faailoa ai tuaoi o pala ma taufusi o Tutuila ma Aunu'u , e maua i lea Ofisa.
- Fesoasoani i isi tagata o lou nuu po o nonofo i se pala po o se taufusi.
- Fautua atu i le fono a le tou nuu po o e fai ma sui, ia iloa patino tuaoi o pala ma taufusi ma su'eina fanua latalata ane e puipuia ai.
- Aua le faaotaota, lafoa'i ai asuemu, po o nisi otaota i pala ma taufusi.
- Ta'u atu i faia'oga a lau fanau o lo o e fia malamalama i pala ma taufusi ma ia latou valaau i le Ofisa o Atina'e o Tamaoaiga mo ni faamatalaga a'oa'oina.

Steps you can take now

- Determine if you live near a wetland. If you want to build a house, construct a piggery, or undertake some other activity, special precautions may be required. Follow the process outlined on page 17 under the heading "rule of thumb" to determine if the area in question is a wetland. EDPO/ASCMP staff can help you decide. Maps showing the boundaries of Tutuila and Aunu'u's wetlands are available for review at the EDPO/ASCMP office.
- Help others in your village determine if they live near a wetland.
- Suggest to your village council that the council, or representatives of the council, identify wetland boundaries within their village and decide where buffer zones should be maintained to protect the wetlands from outside impacts.
- Don't dump trash, cinders, sewage or other wastes into wetlands.
- Inform your children's teachers of your interest in wetlands and suggest they contact EDPO/ASCMP for educational information.



Mea e ao ona fai pe a afai o fia faia se galuega i luga o fanua e tau ane i pala ma taufusi

- Fuafua lelei lau galuega ma toe su'esu'e lelei lau fuafuaga. Pe mana'omia se pemita e faatagaina ai le faaaogaina o le fanua (vaai i lalo e tusa ai.) Pe mafai ona faia i se isi lava fanua? O se fanua o le a le afaina ai pala ma taufusi. Ia e tausu'e foi po o le pala po o le taufusi e vaia tele, latalata i le gataifale ma nisi mea e ono afaina ai oe.)

Faata'ita'iga o mea e faia i totonu poo autafa o pala ma taufusi e mana'omia ai pemita mo le faaaogaina o le fanua

- O le tuuina iai o ni mea tanu.
- O mea e iai ni eli ma o mea ua eliina ua tuu autafa
- Faamamaina o fanua, o fea e toe tuu iai le palapala
- Faagatusaina o le palapala
- Fausiaina o se auala
- Fausiaina o se mea tali vai

Faafesoota'i i le Ofisa o Atina'e o le Tamaoaiga mo se fesoasoani e tusa ma pemita. I itulau 37 ma le 38, e tele matagaluega e mana'omia tulaga fuafuaina mo pala ma taufusi. O le Ofisa o le Atina'e o le Tamaoaiga o lo o iai se lisi o mea e tatau ona fai mo pemita ma le taimi e mafai ai ona fai.

Faamatalaga: E iai sala tupe tetele e tuuina atu i e e le o faia ni pemita e faaaoga ai fanua ae ua amataina a latou galuega.

Steps to take if you are proposing a land use activity that may affect a wetland area

- Plan your activity before you start and critically review your plan. Will it require a land use permit? (See the list below for examples of actions requiring a land use permit.) Can another site be used instead? (A site not negatively affecting wetlands may facilitate the approval process for the land use permit. You may also find, upon further reflection, the wetland site you have chosen may be too muddy, too close to the shore, or have other problems, and another site may more suitable.)

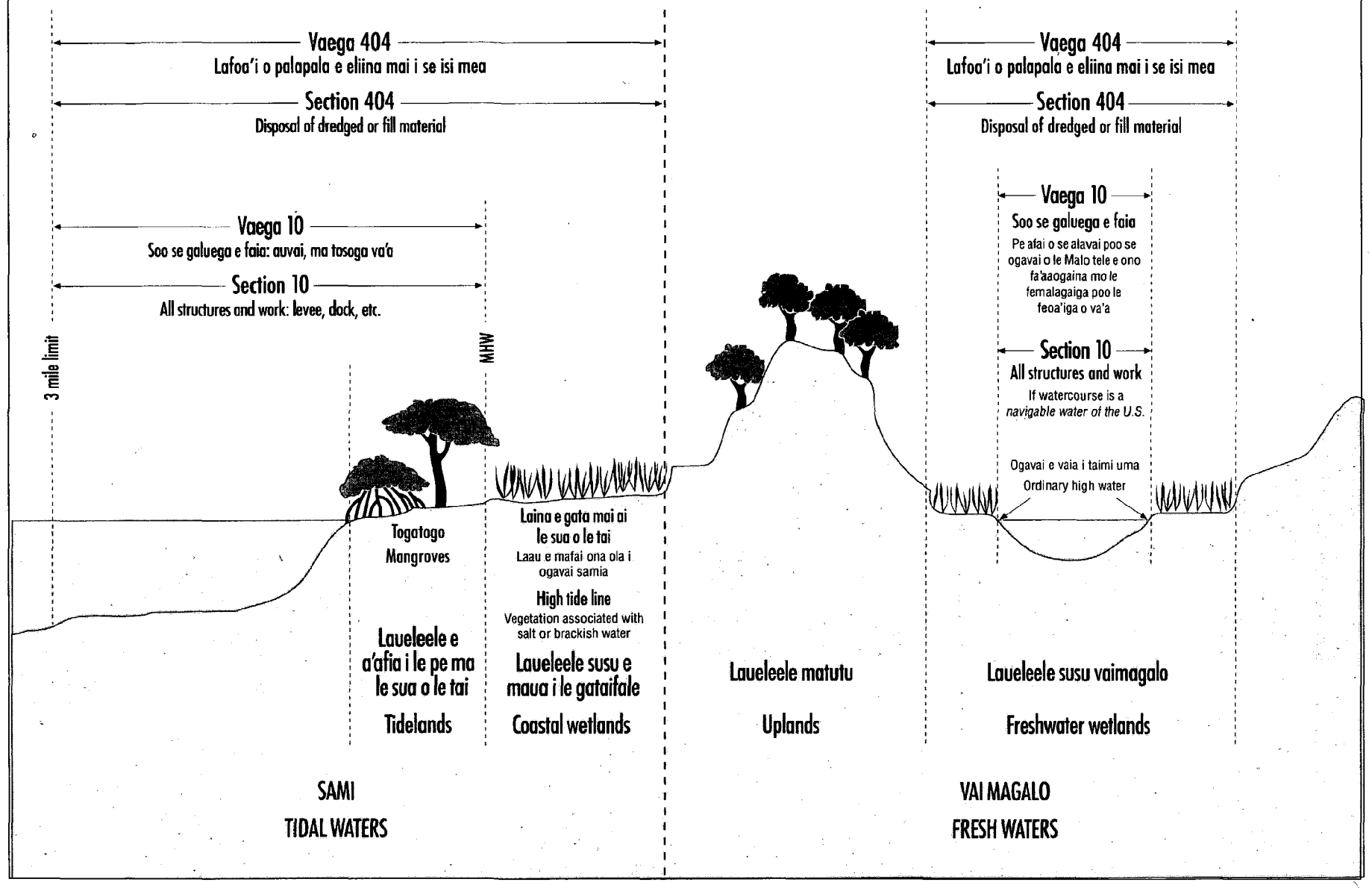
Examples of actions within or near wetlands for which a land use permit is required

- Placement of fill material
- Where ditches are built and the excavated material is deposited on the side
- Land clearing, where the soil is relocated
- Land leveling
- Road construction
- Dam construction

Contact EDPO/ASCMP for advice and guidance through the permitting maze. As the diagrams on pages and 37 and 38 demonstrate, a number of agencies have mandatory requirements associated with wetlands. EDPO/ASCMP can provide you with a checklist of actions you need to take to go through the permitting process and the approximate amount of time these actions will take.

Note: there are strict fines and penalties for those who fail to obtain a land use permit, if required, before starting their activity.

Faatulagaina o puleaga faafeterale i laueleele susu
Scope of federal wetlands jurisdiction



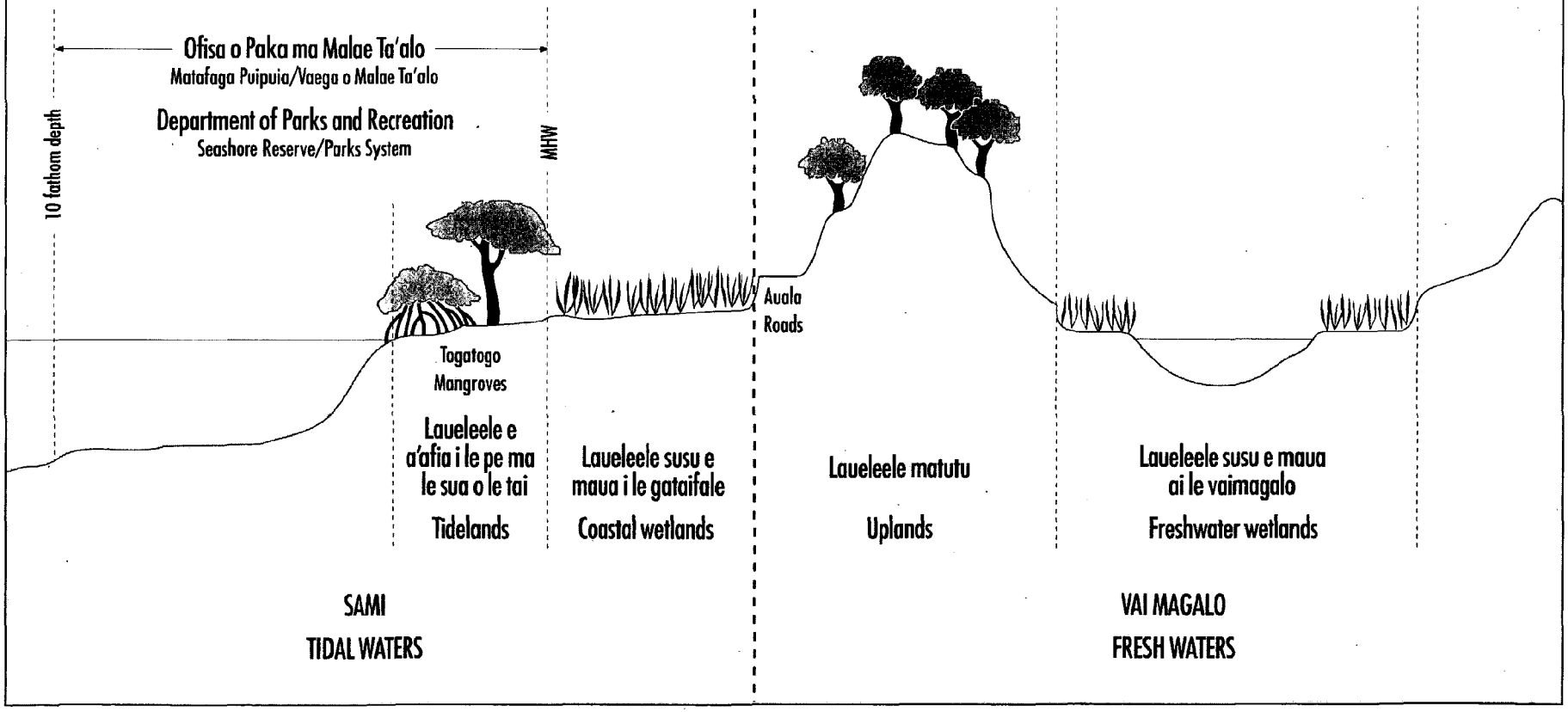
Faatulagaina o puleaga a le teritori o Amerika Samoa i ona laueleele susu
Scope of American Samoa territorial wetlands jurisdiction

Polokalama mo le Va'iga o le Gataifale ma laufanua i Amerika Samoa — American Samoa Coastal Management Program
(Pemita mo le fa'aaogaina tatau o laufanua) — (Land use permits)

Komiti e aiaia sone poo laueleele faatulagaina mo galuega eseese — Zoning Board
(E le a'afia ai laueleele o loo i lalo o le sami i le tolu maila aga'i i tai ma laueleele e a'afia i le pe ma le sua mai o le tai) — (Extends to limit of submerged and tidal lands)

Komisi mo le Puipuia o le Tulaga Lelei o le Si'osi'omiaga/ Ofisa o le Puipuia o le Si'osi'omiaga — Environmental Quality Commission/ American Samoa Environmental Protection Agency

Ofisa o Fagotaga ma le Vaomatua — Department of Marine and Wildlife Resources



E faapefea ona e faailoa atu i isi tagata

O lenei ua e silafia le aoga o le puipuia o pala ma taufusi pe faapefea ona e faailoa atu i isi tagata?

- Talanoa i lou aiga i le taua o le puipuiina o pala ma taufusi.
- Ia faailoa atu i ou tuaoi mea ua e iloaina; ave iai lenei tusi.
- Ia ta'u atu i le fono a le tou nuu ni auala e mafai ai ona puipuia tou pala ma taufusi.
- Valaau i lou sui i le Maota Fai Tulafono ma ta'u atu iai le taua o le puipuiina o pala ma taufusi i Amerika Samoa.
- Ofoina atu faatasi ma le Ofisa o Atina'e o Tamaoaiga e avea oe ma sui lagolago mo a latou fuafuaga i aoga faatatau mo pala ma taufusi.
- Faufautua i a'oga ma ia asiasi ma a'oa'o i le taua ma le aoga o pala ma taufusi i Amerika Samoa.
- Ia faia ni au fuafuaga ia atili ai ona malamalama ma iloa e le lautele le taua o le puipuiina o pala ma taufusi.

How to get the word out to others

Now you are aware of the need to protect wetlands, how can you get the word out to others?

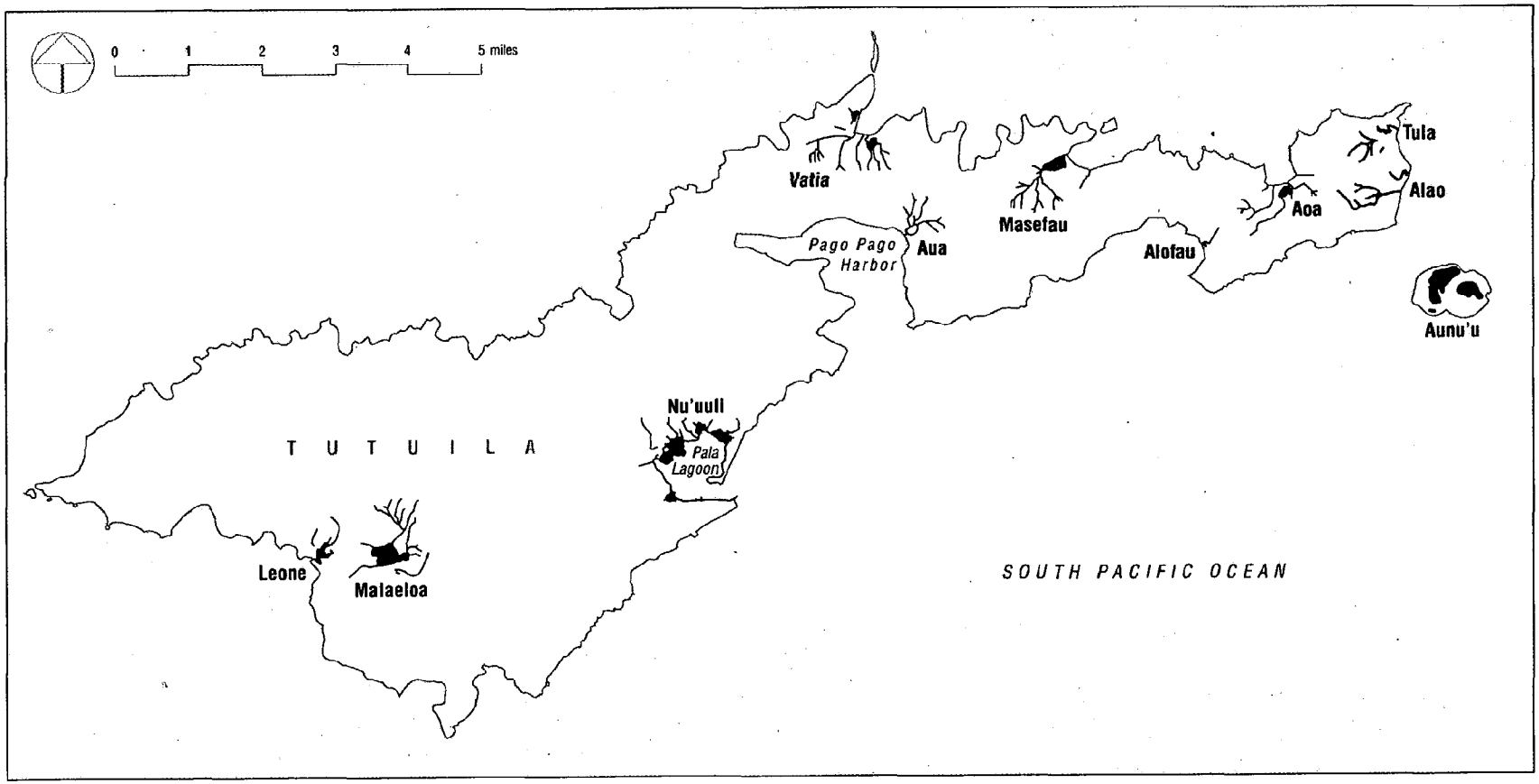
- Discuss the need to protect the wetlands with family members.
- Let your neighbors know what you have learned; lend them this booklet.
- Get your village council involved in developing steps the village can take to help protect wetlands
- Contact your Fono representative and discuss the need to protect the wetlands.
- Volunteer with EDPO/ASCMP as a co-developer of their wetlands education program.
- Get local schools involved in visiting and learning about American Samoa's unique wetlands.
- Plan an event designed to increase awareness about wetlands and the need to protect them.

Faafanua o laueleele susu (vaia) o Tutuila ma Aunu'u

O laueleele susu e sefulu-tasi o Tutuila ma Aunu'u, e iai o latou aoga e tele. O o latou aoga o loo faamatalaina faatasi ai ma ata o faafanua i itulau o loo soso'o.

Maps of wetland areas of Tutuila and Aunu'u

Each of the eleven wetland areas on Tutuila and Aunu'u is unique. A brief description of each is presented with maps on the following pages.

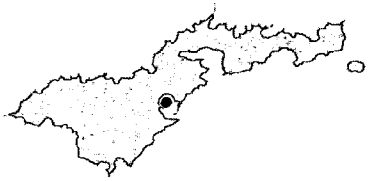


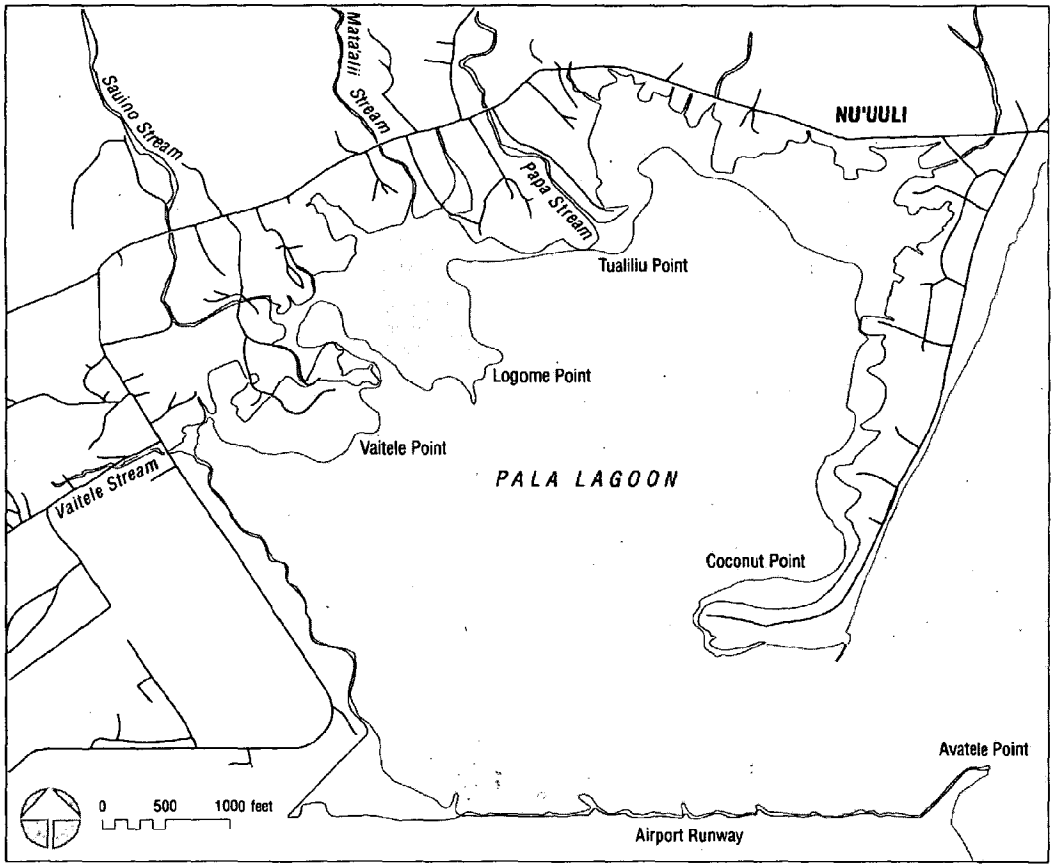
Nu'uuli Pala

Aofa'iga	123 eka
Ituaiga	Pala togatogo, pala faataufusi, pala e tu latalata i le sami, pala ua afaina, pala ua faato'aina, auvai ma alavai
Fa'atauaina	O le laueleele susu aupito sili ona tele i Tutuila ma Aunu'u; taua tele mo i'a, mea ola ma tafaoga; nofoaga mo le manu maua gata o le toloa efuefu; filifilia mo se va'aiga puipuia
Mea e-ono afaina ai	Tipiina ma le tanuina mo le faia lea o galuega tau atina'e; lafoina ai o lapisi ma mea leaga mai sai pua'a i totonu o laueleele susu

Nu'uuli Pala

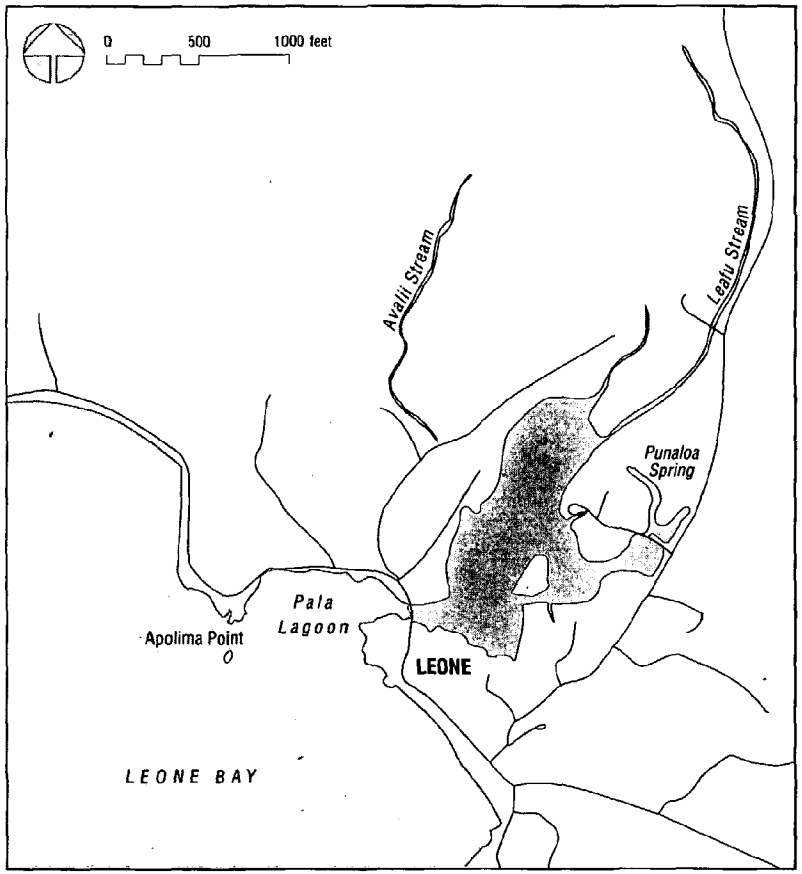
Total size	123 acres
Type(s)	Mangrove swamp, freshwater marsh, saltwater marsh, ruderal wetland, cultivated wetland, streams, open water lagoon
Features	Largest wetland area on Tutuila and Aunu'u; important area for fish, wildlife, and recreation; habitat for rare Australian gray duck; designated Special Management Area
Threats	Clearing and filling for development; waste dumping and piggeries within the wetlands Heavy metal contaminants





Leone Pala

Aofa'iga	21 eka
Ituaiga	Pala togatogo, pala vai, pala ua fa'ato'aina, auvai ma alavai
Fa'atauaina	O se nu'u mai anamua sa fausia i tafatafa ane o alavai; iai ni vaipuna se tolu; o se vaega e fa'atauaina mo fagotaga, meaola ma tafaoga; filifilia mo se va'aiga puipuia
Mea e ono afaina ai	Tipiina ma le tanuina mo galuega tau atin'e (pea ma le 50% o le pala ua fa'aleagaina), lafoina o lapisi ma mea leaga mai sai pua'a i totonu o laueleele susu



Leone Pala

Total size	21 acres
Type(s)	Mangrove swamp, freshwater swamp, cultivated wetland, streams, open water lagoon
Features	Historic village site developed around the lagoon; three springs; important area for fish, wildlife, and recreation; designated Special Management Area
Threats	Clearing and filling for development (nearly 50% of the former wetlands have been lost); waste dumping and piggeries within the wetlands

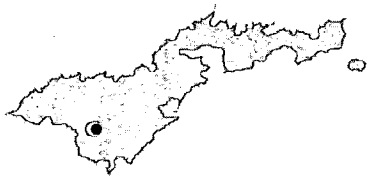
Malaeloa

Aofa'iga 72 eka

Ituaiga Pala vai, pala fa'ataufusi, auvai

Fa'atauaina Pala vai e aupito sili ona tele i Tutuila ma Aunu'u; iai se vaega e le'i fa'aleagaina pe solia fo'i e tagata; maua ai le la'au maua gata o le gatae

Mea e ono afaina ai Itiiti vaega ua fa'aleagaina; iai vaega o lea laueleele susu ua totoina ai togafa'i



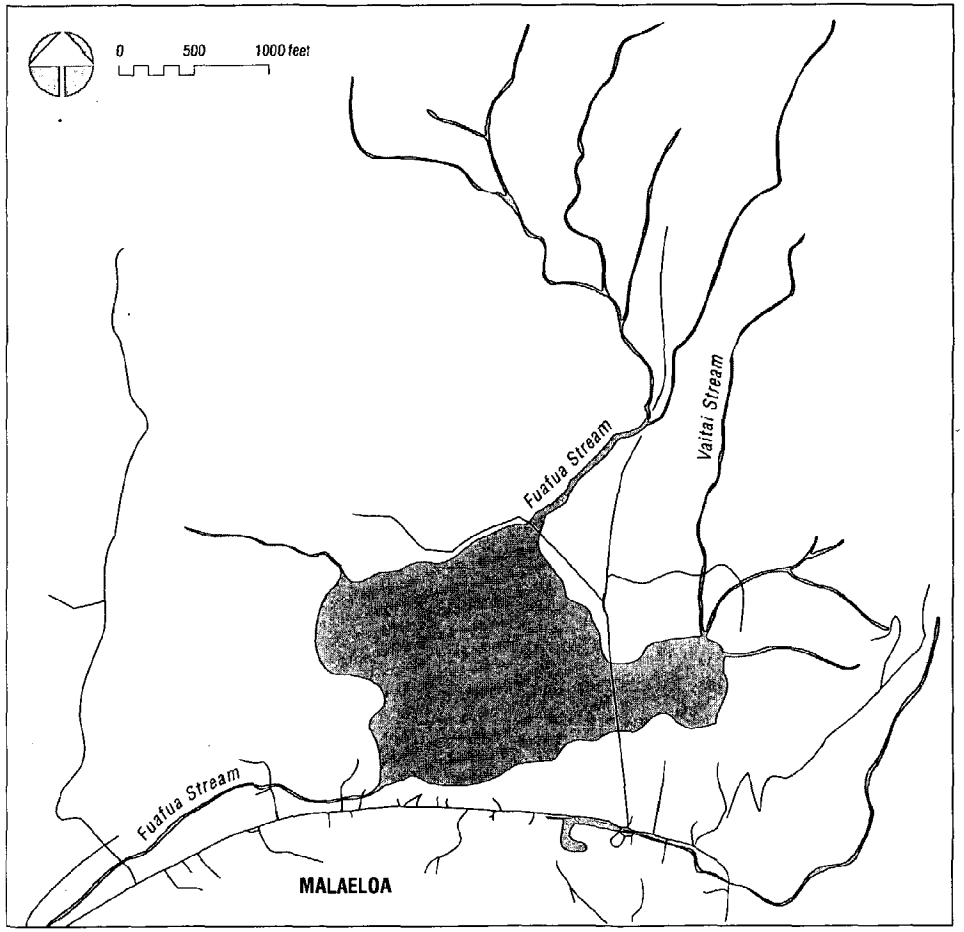
Malaeloa

Total size 72 acres

Type(s) Freshwater swamp, freshwater marsh, streams

Features Largest freshwater swamp on Tutuila and Aunu'u; pristine habitat; supports the rare gatae plant *(Erythrina fusca)*

Threats Few, relatively pristine area; some conversion of wetlands to banana plantation

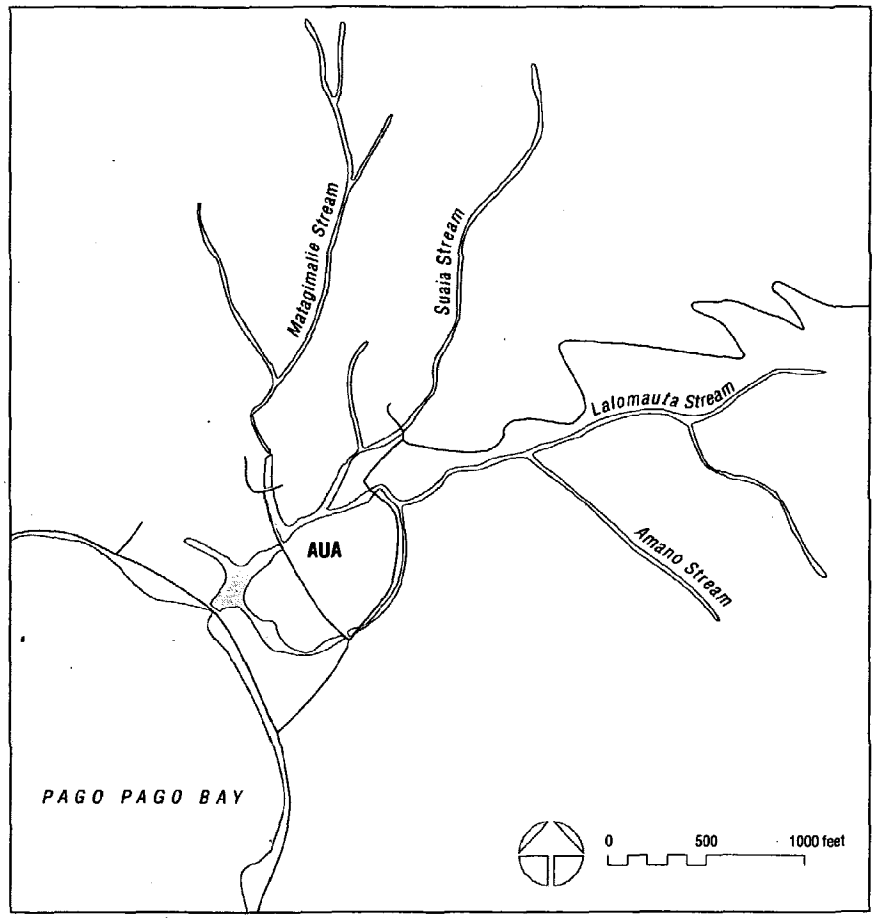


Aua

Aofa'iga	9 eka
Ituaiga	Pala togatogo, pala ua afaina, auvai
Fa'atauaina	O lenei laueleele susu e si'osi'omia ai le alalafaga o Aua
Mea e ono afaina ai	Tipiina ma tanuina mo galuega tau atina'e; suia lea o le tafe o alavai

Aua

Total size	9 acres
Type(s)	Mangrove swamp, ruderal wetland, streams
Features	Village completely surrounds the wetlands
Threats	Clearing and filling for development; stream diversions



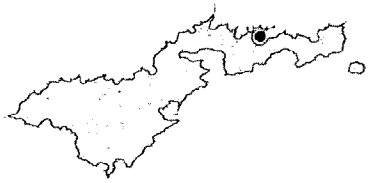
Masefau

Aofa'iga 43 eka

Ituaiga Pala togatogo, pala fa'ataufusi, auvai

Fa'atauaina O se vaega tele sa fa'ato'aina mo le faia o ma'umaga taro, ua toe fo'i lava i le laueleele susu; o togatogo sa fa'atama'ia i le afa o Ofa, ua toe tutupu mai

Mea e ono afaina ai Mamate togatogo ina ua mae'a le afa o Ofa



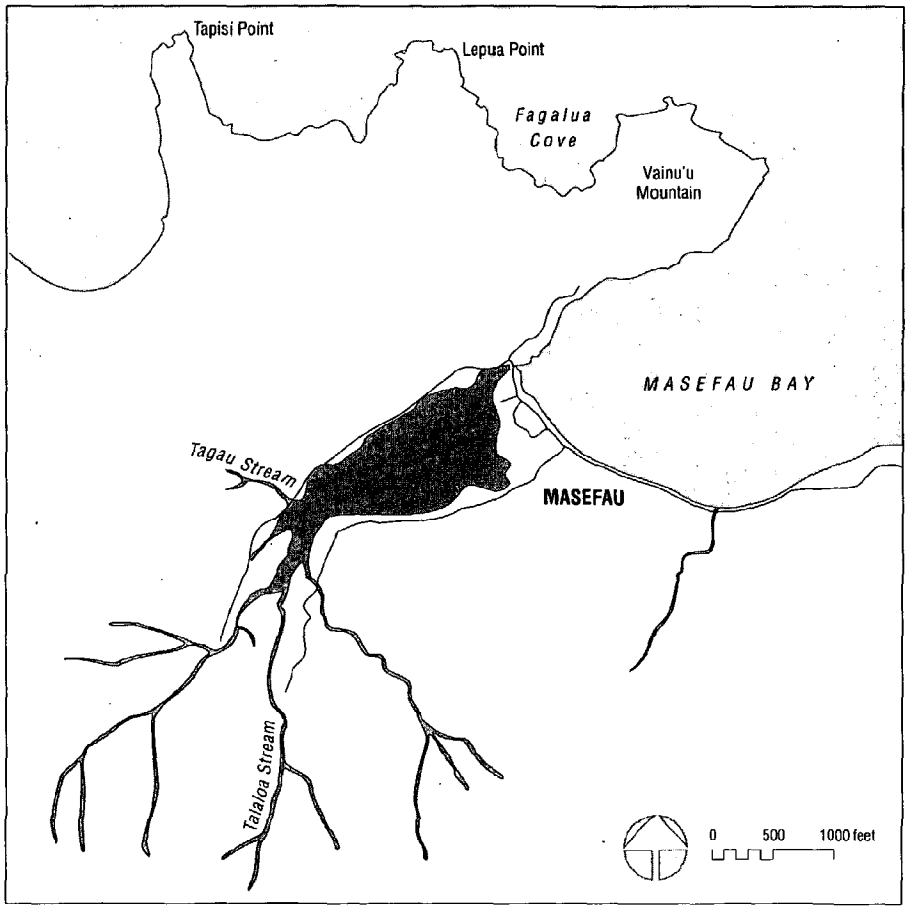
Masefau

Total size 43 acres

Type(s) Mangrove swamp, freshwater marsh, streams

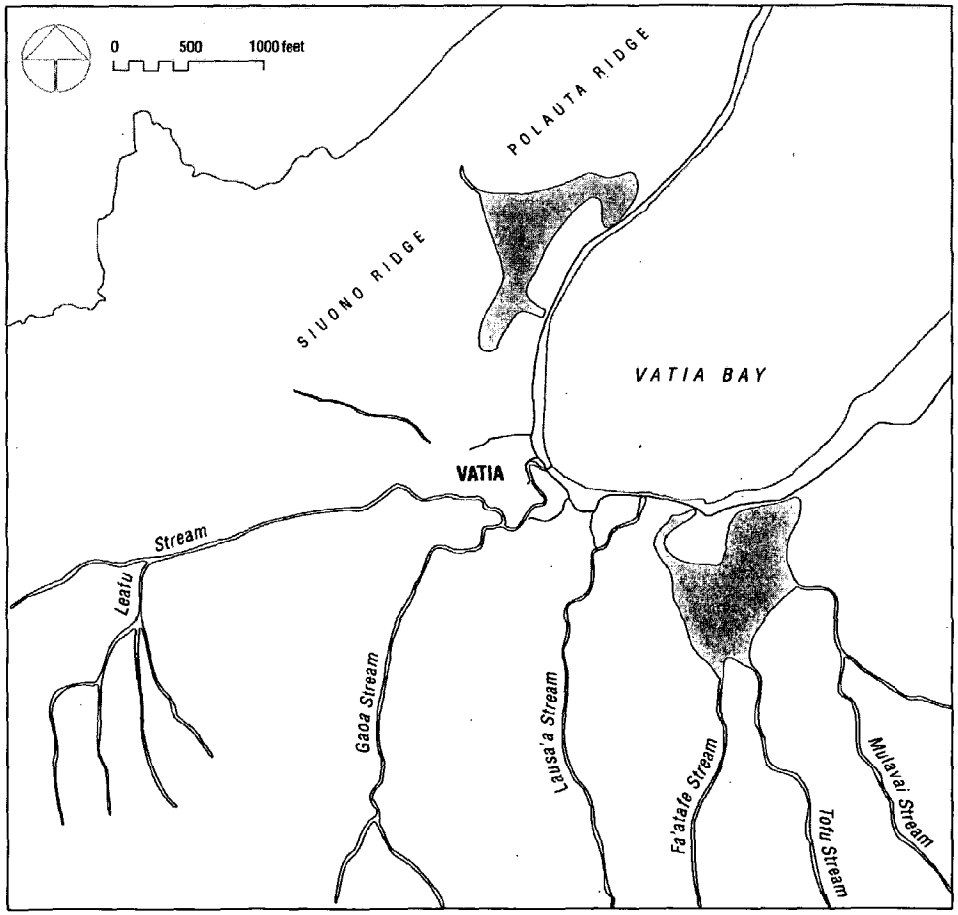
Features Large area of abandoned taro fields reverted to freshwater marsh; mangrove trees died after Hurricane Ofa but are regenerating

Threats Dead mangrove trees after Hurricane Ofa



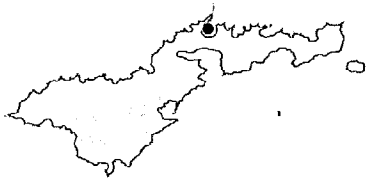
Vatia

Aofa'iga	34 eka
Ituaiga	Pala fa'ataufusi, pala togatogo, pala ua fa'ato'aina, auvai
Fa'atauaina	O le pala fa'ataufusi i Vatia sa iai ma'umaga ua le toe galuea'ina
Mea e ono afaina ai	Itiiti le afaina o le pala; laitiiti le faaopoopoga i eka o lenei laueleele susu i le 30 tausaga ua tuana'i atu nei



Vatia

Total size	34 acres
Type(s)	Freshwater marsh, mangrove swamp, cultivated wetland, streams
Features	Freshwater marsh is an abandoned taro field
Threats	Few development impacts currently exist; slight gain in wetland acreage over the past 30 years

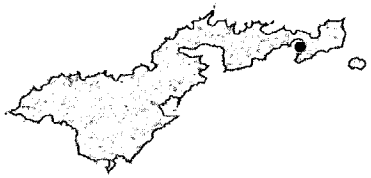


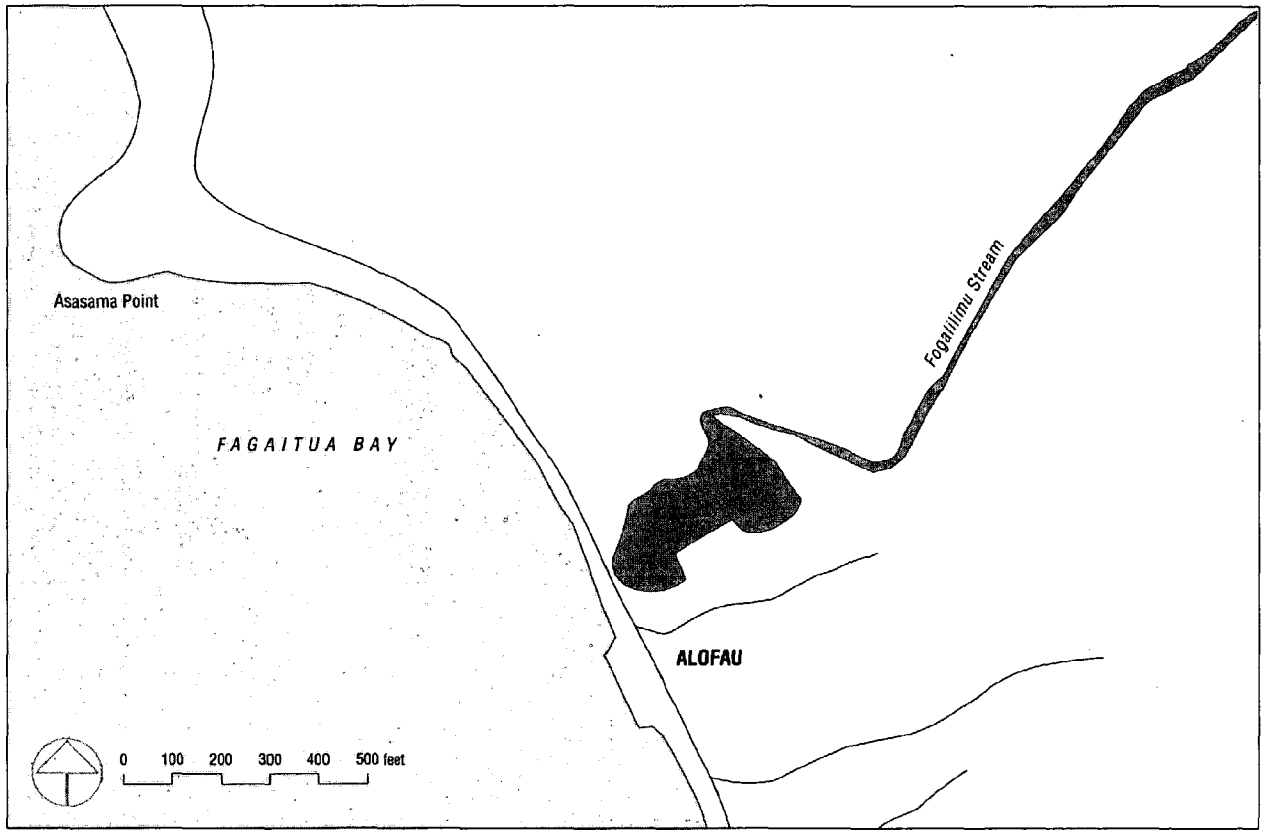
Alofau

Aofa'iga	2 eka
Ituaiga	Pala togatogo, auvai
Fa'atauaina	O le tasi lea o pala togatogo itiiti o loo totoe nei i Tutuila
Mea e oño afaina ai	Ua atina'eina le laueleele susu e le nu'u; lafoina o lapisi ma mea leaga mai sai pua'a i totonu o laueleele susu

Alofau

Total size	2 acres
Type	Mangrove swamp, streams
Features	One of the smallest remaining mangrove swamps on Tutuila
Threats	Village development into wetlands; waste dumping and piggeries within the wetlands



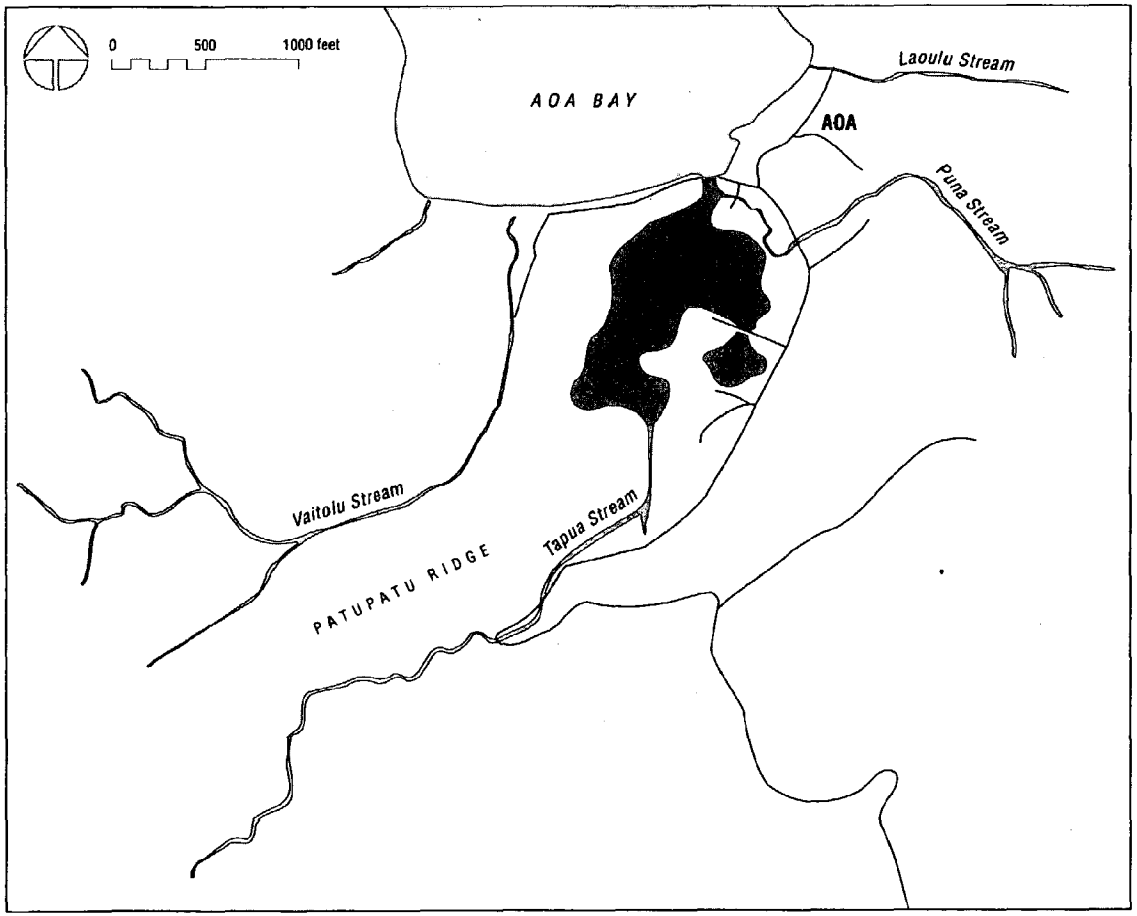


Aoa

Aofa'iga	23 eka
Itualga	Pala togatogo, pala fa'ataufusi, pala ua afaina, auvai
Fa'atauaina	O le pala taufusi sa iai se ma'umaga ua le toe galuea'ina
Mea e ono afaina ai	Tipiina ma le tanuina mo galuega tau atina'e; fa'ato'aina o laueleele ṣusu mo atina'e fa'i ma 'ulu

Aoa

Total size	23 acres
Type(s)	Mangrove swamp, freshwater marsh, ruderal wetland, streams
Features	Freshwater marsh is an abandoned taro field
Threats	Clearing and filling for development; conversion of wetlands for banana and breadfruit cultivation



Alao

Aofa'iga 15 eka

Ituaiga Pala fa'ataufusi, pala vai ua fa'ato'aina, auvai

Fa'atauaina E leai se mea e tafe iai le pala fa'ataufusi o loo i tua o le nu'u, ae peita'i e seasea lolovaia lea mea

Mea e ono afaina ai E le tele se suiga, vagana ai atina'e fa'i i isi vaega o lea laueleele susu

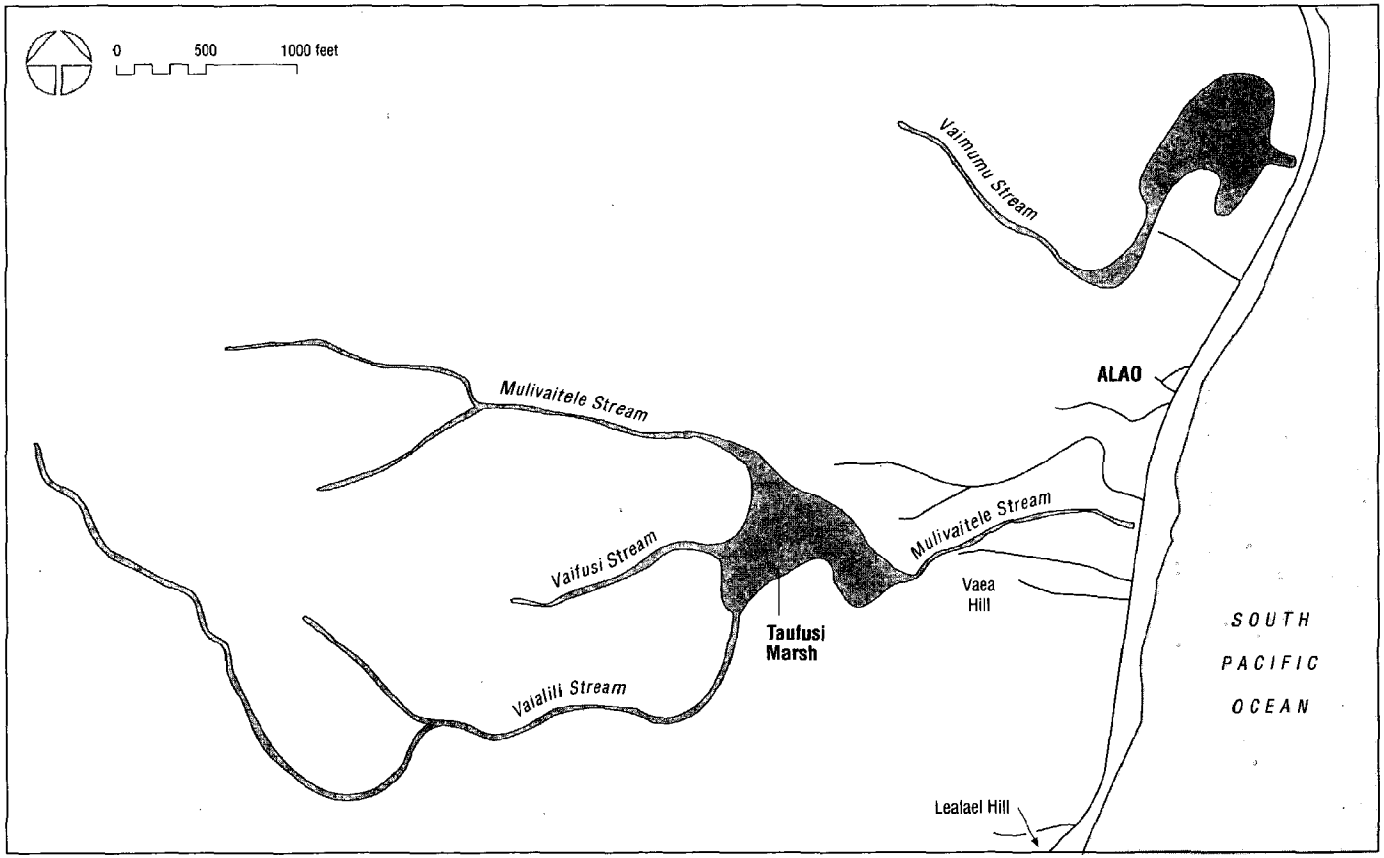
Alao

Total size 15 acres

Type(s) Freshwater marsh, cultivated freshwater wetland, streams

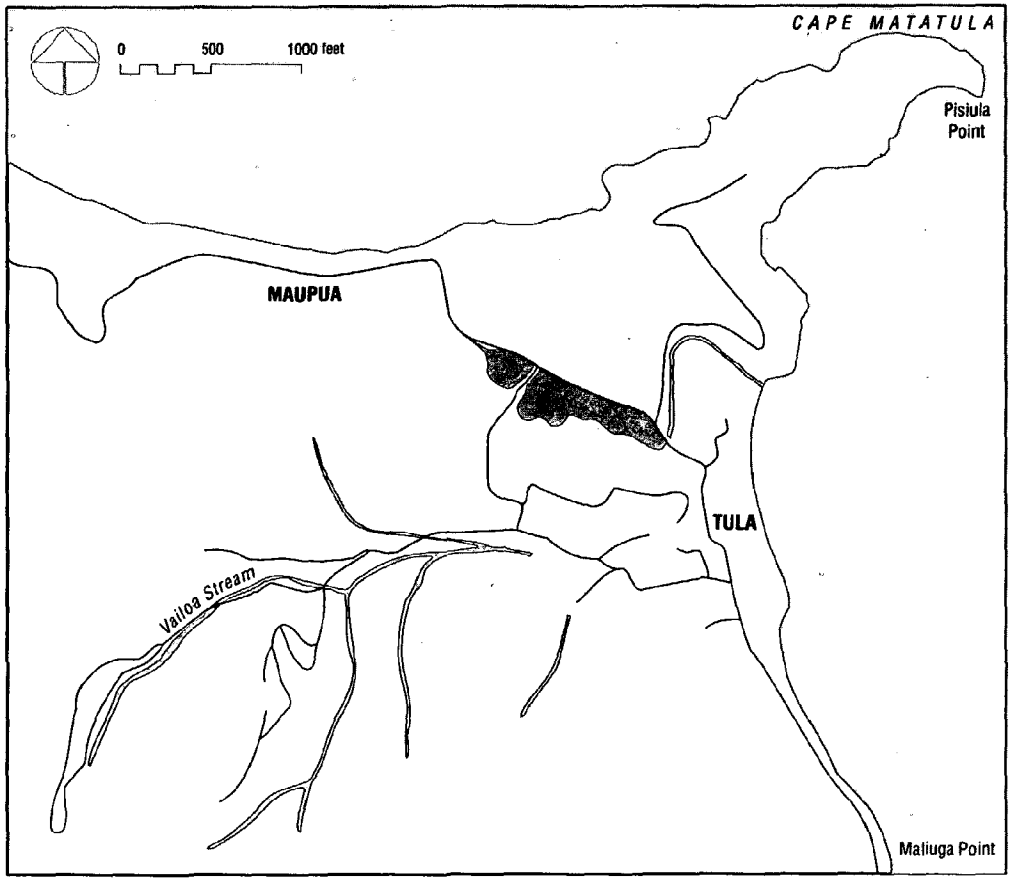
Features Freshwater marsh behind the village has no outlet but is not excessively flooded

Threats Limited village development and small scale conversion of wetlands for banana cultivation



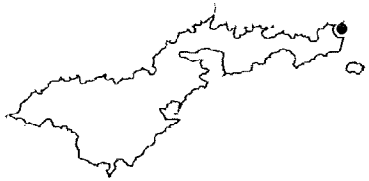
Tula

Aofa'iga	8 eka
Itualga	Pala fa'ataufusi, pala ua afaina, auvai
Fa'atauaina	O le ulua'i alalafaga lava na fa'atuina i Tutuila sa faia lea i le laueleele susu o Tula; e foliga mai sa fausia lea nu'u e si'osi'omia ai lea laueleele susu
Mea e ono afaina ai	Tipiina ma tanuina mo galuega tau atina'e, ma le suia o le tafe o auvai; fa'ato'aina mo atina'e fa'i ma niu; e silia ma le 50% o lenei laueleele susu ua fa'aleagaina



Tula

Total size	8 acres
Type(s)	Freshwater marsh, ruderal marsh, streams
Features	Site of the first village on Tutuila; the village was probably developed around the wetlands
Threats	Clearing and filling for development with changes in stream flow; conversion of wetlands for banana and coconut cultivation; over 50% of the former wetlands have been lost



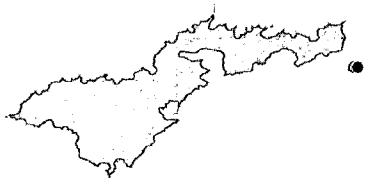
Aunu'u

Aofa'iga 112 eka

Ituaiga Pala togatogo, pala faataufusi, pala ua faato'aina, alavai

Fa'atauaina O le Pala i Aunu'u e iai sona vaega e maua ai le oneone mimiti; o Faimulivai o se tasi lea o nofoaga e mau ai le toloa efuefu; o le Pala ma Faimulivai, o ni nofoaga matagofie naua e le'i faaleagaina e tagata, o loo tumau pea lava foliga o nei vaimea talu mai aso ua te'a; o ma'umaga talo ua faia i Palapalaloa, Taufusitele, ma Lalopapa o ni ma'umaga tetele tele i Amerika Samoa ma, ua siliga atu fo'i i le 30 tausaga talu ona amata galuea'ina nei ma'umaga i ia pala; o le pala i tua o le a'oga i Aunu'u e masani ona maua ai le la'au lea o le le'ile'i; o lea fo'i pala i le a'oga faatasi ma le Pala tele i Aunu'u, e maua ai le suasami e ui mai i lalo o le palapala; o nei laueleele susu e maua mai ai ni a'oa'oga taua ma le lelei

Mea e ono afaina ai E le tele se afaina o iai; o le pala i le a'oga sa faaaogaina e lafoina ai lapisi; o le suia o alavai ua suia ai fo'i la'au e maua i le omoa'i i Aunu'u



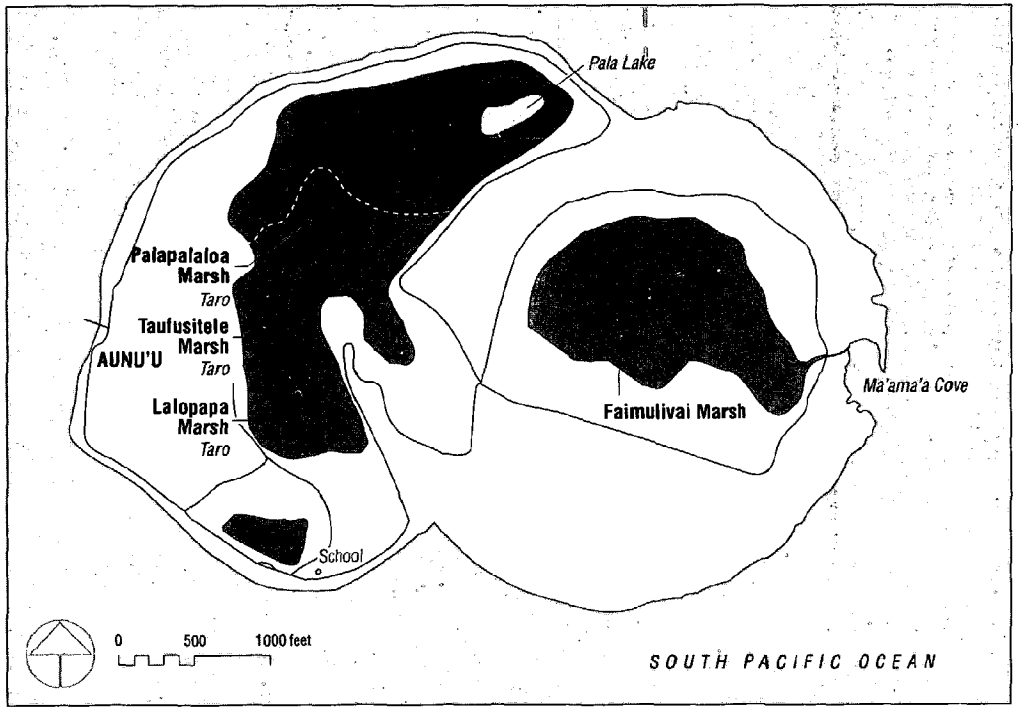
Aunu'u

Total size 112 acres

Type(s) Mangrove swamp, freshwater marsh, cultivated wetland, open water areas

Features Pala Lake (also called Mud Lake) is a "quicksand" area; Crater Lake (Faimulivai Marsh) is habitat for the rare Australian gray duck; both Pala Lake and Crater Lake are pristine habitats; taro fields (Palapalaloa Marsh, Taufusitele Marsh, and Lalopapa Marsh) are the largest taro plantations in American Samoa and have been under cultivation for over 30 years; mangrove area (School Swamp) supports the rare puzzlenut tree; Pala Lake and School Swamp may receive salt water from underground source; area has high educational value

Threats Limited development pressures, relatively pristine areas; School Swamp has been partially cleared and used to dump trash; changes in Crater Lake hydrology are changing the vegetation



Ata ma e na pu'ea
Photography/illustration credits

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3	U.S. Army Corps of Engineers
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5	Art Whistler
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7	Art Whistler
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9	U.S. Army Corps of Engineers
10	Art Whistler, Barbara Moritsch
11	BioSystems, Betty Gai
12	BioSystems
13	BioSystems
14	Art Whistler, U.S. Army Corps of Engineers, BioSystems
15	U.S. Army Corps of Engineers, Art Whistler
16	Barbara Moritsch
18	Barbara Moritsch, Tom Grignon
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20	Carolyn Fish
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24	Wim Kimmerer, BioSystems, Tom Grignon, Niki Yonkow
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Mo se fa'matalaga auiliili o laueleele susu o Amerika Samoa, poo le faiga o pemita, faafeso'ota'i mai le:

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Economic Development Planning Office
American Samoa Government
Pago Pago, American Samoa 96799

(684) 633-5155

poo le:

U.S. Army Corps of Engineers
Operations Division
Fort Shafter, Bldg. 230
Honolulu, Hawaii 96858-5440

Attn: CEPOD-CO-O

(808) 438-9258

O ni isi tusi o loo faamatalaina mai ai laueleele susu ma togatogo o lo'o lisiina ifo i lalo:

Wetland Vegetation of American Samoa: Inventory and Mapping of Wetland Vegetation in the Territory of American Samoa. 1976. Tu'ufa'atasia e W. Art Whistler. Tusia e le U.S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter, Honolulu.

A Guide to Pacific Wetland Plants. 1981. Tu'ufa'atasia e Lani Stemmermann. Lolomia e le U.S. Army Corps of Engineers, Honolulu District, Fort Shafter, Honolulu.

The Ecology of the Mangroves of South Florida: A Community Profile. 1982. Tu'ufa'atasia e William E. Odum, Carole C. McIvor, and Thomas J. Smith III. Lolomia e le U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C., FWS/OBS-81/24.

For more information about the wetlands of American Samoa or permitting processes, contact:

American Samoa Coastal Management Program
Economic Development Planning Office
American Samoa Government
Pago Pago, American Samoa 96799

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or:

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Some additional reference books on wetlands and mangroves include:

Wetland Vegetation of American Samoa: Inventory and Mapping of Wetland Vegetation in the Territory of American Samoa. 1976. By W. Art Whistler. Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter, Honolulu.

A Guide to Pacific Wetland Plants. 1981. By Lani Stemmermann. Published by U.S. Army Corps of Engineers, Honolulu District, Fort Shafter, Honolulu.

The Ecology of the Mangroves of South Florida: A Community Profile. 1982. By William E. Odum, Carole C. McIvor, and Thomas J. Smith III. Published by U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C., FWS/OBS-81/24.