

# SAMOA

## Introduction

**Area:** 2,935 sq.km.

**Population:** 180,741 (2007)

Samoa is an independent state in the South Pacific situated between latitudes 13° and 14°30' South and longitudes 171° and 173° West. The state comprises two main inhabited islands, Savai'i (1,820 sq.km) and Upolu (1,105 sq.km), and seven islets, two (Manono and Apolima) of which are inhabited.

Samoa is an oceanic volcanic archipelago that originated in the Pliocene. The islands were formed in a westerly direction with the oldest eruption, the Fagaloa volcanics, on the eastern side. The islands are still volcanically active, with the last two eruptions being in 1760 and 1905-11 respectively. Much of the country is mountainous, with Mount Silisili (1,858 m) on Savai'i being the highest point.

Samoa has a wet tropical climate with temperatures ranging between 17°C and 34°C and an average temperature of 26.5°C. The temperature difference between the rainy season (November to March) and the dry season (May to October) is only 2°C. Rainfall is heavy, with a minimum of 2,000 mm in all places. The islands are strongly influenced by the trade winds, with the Southeast Trades blowing 82% of the time from April to October and 54% of the time from May to November. The closeness of Samoa to the cyclone belt means that it is frequently affected by cyclones. Since 1990, five cyclones have of varying degrees have impacted the biodiversity, infrastructure and economy of the country.

Samoa has been independent since 1962. The majority of the 180,471 population<sup>1</sup>, which is Polynesian in origin, live on the island of Upolu. The most densely populated area is the capital city of Apia, where the population density is approximately 75 persons per sq.km. By contrast, Savai'i and rural Upolu are sparsely populated.

Agriculture using mainly traditional farming methods, tourism, pelagic fisheries, and nonu (*Morinda citrifolia*) juice export are main sources of economic development. Since the mid 1990's, a car parts factory was established in Samoa is the single biggest employer on island with a workforce of over 4000 people. The increase in construction for infrastructure and commercial buildings as part of reconstruction from devastation by the cyclones and the recent South Pacific Games in 2007 have steadily increased its workforce and the income generated for the local economy. Remittances from Samoans living overseas continue to be the highest form of foreign exchange.

The natural vegetation consists primarily of lowland and montane rain forest with additional small areas of cloud, riverine, swamp, mangrove and beach forest. Extensive deforestation has occurred as a result of commercial timber operations, land clearance for agriculture, and cyclones. Most of the lowland forest on Savai'i and Upolu has now been cleared or highly modified, but the montane forests are less disturbed and still contain a rich endemic flora and fauna. The biodiversity of Samoa including terrestrial,

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<sup>1</sup> 2006 National Population and Household Census ; Statistics Department, Ministry of Finance

marine and wetland ecosystems have been compiled in the National Biodiversity Strategy and Action Plan.

To date, two National Parks (O Le Pupu-Pu'e and Lake Lanutoo), 2 marine protected areas (Aleipata and Safata), one marine reserve (Palolo Deep), one nature reserve (Mt Vaea Reserve) over 60 traditional fisheries reserves, and four community-based conservation areas have been established with varying degrees of effectiveness. It is estimated that the protected areas now cover around 15% of the terrestrial and inshore reef areas of Samoa.

### **Summary of Wetland Situation**

There are six main wetland communities in Western Samoa, distinguished from each other by floristic, physiognomic and geographical differences. Three of these communities, coastal marsh, montane marsh and montane bog, are dominated by herbaceous species; the other three, mangrove scrub, mangrove forest and swamp forest, are dominated by woody trees.

Of the two main islands of Samoa, Upolu is the older and possesses the most wetland areas, especially herbaceous marshes in low-lying coastal basins which are separated from the sea by a sand barrier and lack a stream outlet.

The characteristic species of herbaceous marshes and bogs are *Acrostichum aureum*, *Carex graeffeana*, *Cyclosorus interruptus*, *Eleocharis dulcis*, *Paspalum orbiculare* and *Rhynchospora corymbosa*. The separation of coastal marsh from montane marsh is somewhat artificial, since both are dominated by the same species, *Eleocharis dulcis*. However, two species found in coastal marsh (*Acrostichum* and *Cyclosorus*) are rare or absent in montane marsh. Montane bog, dominated by species of *Carex* and *Paspalum*, is known only from elevations of over 1,500 metres on Savai'i.

Of the wetlands with woody vegetation, swamp forest occurs in sites where the soil is saturated with fresh water, typically inland and even in montane areas. Characteristic species include *Barringtonia samoensis*, *Erythrina fusca*, *Hibiscus tiliaceus*, *Inocarpus fagifer*, *Kleinhovia hospita*, *Palaquium stehlinii*, *Pandanus turritus* and *Terminalia richii*. *Pandanus turritus* is generally the dominant species in the swamp forest in montane craters. In eastern Upolu, there is an unusual type of mixed upland swamp forest in which lowland rain forest species and swamp forest species grow side by side.

Mangroves are confined to the two large islands, generally occurring in small stands along tidal inlets, at river mouths or as a narrow fringe along muddy and sandy shores where there is some offshore protection from extreme wave action. Two main communities are recognized; mangrove forest consisting of almost pure stands of *Bruguiera gymnorhiza*, and mangrove scrub (rarely more than 5 m high) consisting of a mixture of both *Rhizophora (mangle) samoensis* and *Bruguiera*. There is also a single small stand (less than 1 ha) of *Xylocarpus moluccensis* on white sand substrate at a stream mouth near Sala'ilua on Savai'i.

Almost all of the wetlands in Western Samoa have been disturbed to some extent either directly by human activities, cyclone damage or through the introduction of pests. The cutting and in-filling of mangroves especially for human settlements and road construction has now left much of Samoa's mangrove vegetation badly degraded. The severe cyclones of the early 1990's and 2004 affected many of the wetland areas, especially herbaceous marshes along shores which were damaged by salt water incursions.

The Samoa NBSAP identifies wetland ecosystems as follows: mangrove forests; freshwater lake; herbaceous marsh; mixed lowland species swamp forest and mixed upland swamp forest. All are considered to be high priorities for conservation based on rarity and threats in Samoa. Two wetland ecosystems (mixed lowland species swamp forest, mixed upland species swamp forest) were considered to be of global importance because of their rarity, endangered status or presence of endemic species.

Several of these wetland ecosystems have been altered, with the following wetlands now considered to be of national and global significance

### **Coastal Marsh**

#### *Apolimafou Marsh, Upolu*

A small herbaceous marsh at the west end of Upolu. Around half of this marsh has been cleared by the village for land settlement. A conservation programme is underway for its rehabilitation and protection as a priority conservation area.

#### *Falealupo Marshes (Cape Mulinu'u), Savai'i*

Two areas of coastal marsh at the extreme western end of Savai'i, degraded by past exploitation and human settlement, and severely damaged by cyclones in the early 1990's. The preservation of the village forest under a covenant agreement has increased awareness on the conservation importance of this area. The southern marsh was identified as a priority site for conservation in the NBSAP.

#### *Matautu-Satoalepai Marsh, Savai'i*

A large partially degraded marsh near Matautu Bay at the northern tip of Savai'i. The site is considered a priority site for wetland conservation.

### **Montane Marsh**

#### *Mount Le Pu'e Lake and Marsh, Upolu*

A small lake and marsh in a volcanic crater, protected in the O Le Pupu Pu'e National Park (2,857 ha; established 1978).

#### *Lake Lanoto'o, Lake Lanoata'ata and Lake Lanoanea, Upolu*

Three small lakes with fringing marshes in volcanic craters in the central highlands of Upolu. Lake Lanoto'o is the largest freshwater lake in Western Samoa. The area was declared as a National Park in 2004 (1161 acres with the lake Lanotoo at 27.15 acres)

#### *Central Savaii Upland Forests*

This proposed National Park will include all the crater lakes of Lake Mafane, Lake Mautalano and Olo Manu Uta in Savaii. The craters have small lakes with fringing marshes in volcanic craters.

### **Montane Bog**

#### *Mount Silisili Bog, Savai'i*

A small montane bog near the summit of Mount Silisili (1,858 m); the only significant montane bog in Western Samoa. The area is part of the Aopo Upland Forest Community-based Conservation Area.

### **Marine Protected Areas and Mangrove Forests**

#### *Safata Marine Protected Area, Upolu*

The MPA includes the Safata Bay mangrove forest and the previously protected Saanapu'Sataoa Mangrove Conservation Areas. The mangrove forests remains in a fairly healthy state, but is threatened by increasing encroachment from nearby villages.

The MPA was established as part of a GEF Medium Size Project between 1999-2003 in collaboration with the Government of Samoa.

#### *Apia Mangroves, Upolu*

A narrow strip of mangrove scrub along the north coast of Upolu, west of Apia harbour. The largest area of mangroves in Samoa, but degraded because of its location in the main urban area. The site is still of some importance, and is being considered for rehabilitation by the Division of Environment and Conservation and a possible Ramsar site.

#### *Aleipata Marine Protected Area, Upolu*

The MPA is amongst the 2 established among with Safata under the GEF MSP from 1999-2003. The MPA is currently managed by District Committee in partnership with the Division of Environment and Conservation of the MNRE. The area includes 1 patch of mangrove scrub at the east end of Upolu, degraded by human settlement.

### **Swamp Forest**

#### *Lalomauga Swamp Forest, Upolu*

A small patch of degraded swamp forest near the northeast coast of Upolu. Most of the original swamp is covered with village plantations, and there is an electricity power plant in the swamp which supplies the eastern coast of the island.

#### *Vaipu Swamp Forest, Upolu*

A large area of swamp forest in the uplands of eastern Upolu, with an unusual mixture of lowland rain forest and swamp forest species.

### **Reservoirs**

#### *Afulilo Dam*

Lake Lanutoo National Park is the first wetland specific protected area, while significant components of mangroves and associated inshore reef wetlands components were considered priority ecosystems during the establishment of the Aleipata and Safata MPA's. O le Pupu-Pu'e National Park has within it Crater Lake of Mt.

#### *Le Pu'e*

The MNRE has also established a Watershed Resources Division which now includes the Watershed Management Unit that is working to protect water catchment areas under the Water Catchment Protection Regulation.

### **Wetland Research**

No research relating specifically to wetlands has been carried out in Samoa, and most of the information that is available has been derived from general surveys of the terrestrial ecosystems (e.g. Ollier et al., 1979; Dahl, 1980; KRTA Limited, 1988; Pearsall and Whistler, 1991; Parks, 1992); Schuster, et al., 1996) and marine ecosystems (e.g. Bell, 1985; Andrews and Holthus, 1989; Zann, 1991, Lovell and Toloa 2001,) and as part of the Aleipata and Safata MPA's. Whistler (1992) and Parks (1992) provide the most comprehensive accounts of the flora of Western Samoa's wetlands, while Vodonaivalu (1982) Sua (1988), Schuster (1993) summarize information on the mangrove communities.

### **Wetland Area Legislation**

There is no specific legislation concerning wetland conservation in Western Samoa, although areas with potential for conservation come under the auspices of the Lands and Environment Act (1989) National Parks and Reserves Act (1974), Policy and legislation

relating to the establishment and administration of protected areas have recently been summarized by IUCN (1991).

The Forestry Act (1967) controls the conservation of water catchment areas under the Regulation on Water Catchment Protection (1992). The exploitation of marine resources is regulated through the Fisheries Protection Act (1972) and the Exclusive Economic Zone Act (1977), while the protection of traditional fisheries is under the and the Fisheries Regulations By Laws 1996. The Fish Dynamiting Act (1972) prohibits all use of dynamite for fishing.

The Protection of Wild Birds Regulation, imposed in 1981 under the Animal Ordinance of 1910 and amended in 1989, gives total protection to 15 species of birds and partial protection to three types of pigeon for which there are open seasons. Three resident waterbirds are covered by the schedule, namely the Pacific Black Duck (*Anas superciliosa*), White-browed Crake (*Porzana cinerea*) and Spotless Crake (*Porzana tabuensis*).

At international level, Samoa has ratified the Convention on the Conservation of Nature in the South Pacific (Apia Convention) and the Convention for the Protection of the Natural Resources and Environment of the South Pacific (SPREP Convention), the Convention on Biological Diversity, the World Heritage Convention, and Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention).

### **Wetland Area Administration**

With over 80% of Samoa's land under customary ownership, the majority of wetlands are administered by village councils and individuals. The Lands and Environment Act (1989) gives the right to the Government to take customary land for conservation purposes if there is a need to protect specific sites, but this right has not yet been used for wetland conservation. The O Le Pupu Pu'e National Park and Lake Lanutoo National Parks are administered by the Division of Environment and Conservation, Department of Lands and Environment.

### **Organizations involved with Wetlands**

#### *Samoan Government*

- Ministry of Natural Resources and Environment: Division of Environment and Conservation; Forestry Division and Water Resources Division  
*Responsible for administration of the Lands and Environment Act (1989), National Parks and Reserves Act (1974); Forestry Act 1967 and Water Catchment Protection Regulation 1992 and all matters concerning the protection and conservation of the environment.*
- Ministry of Agriculture and Fisheries: Fisheries Division: Responsible for the administration of the *Traditional Fisheries Reserve By Laws*

#### *Non-governmental Organizations*

- O Le Siosiomaga Society
- METI (Matuaileoo Environmental Trust Inc.)
- Conservation International: provide financial support for some actions within the Aleipata and Safata MPA's

### *Intergovernmental Organisations*

- South Pacific Regional Environment Programme (SPREP)

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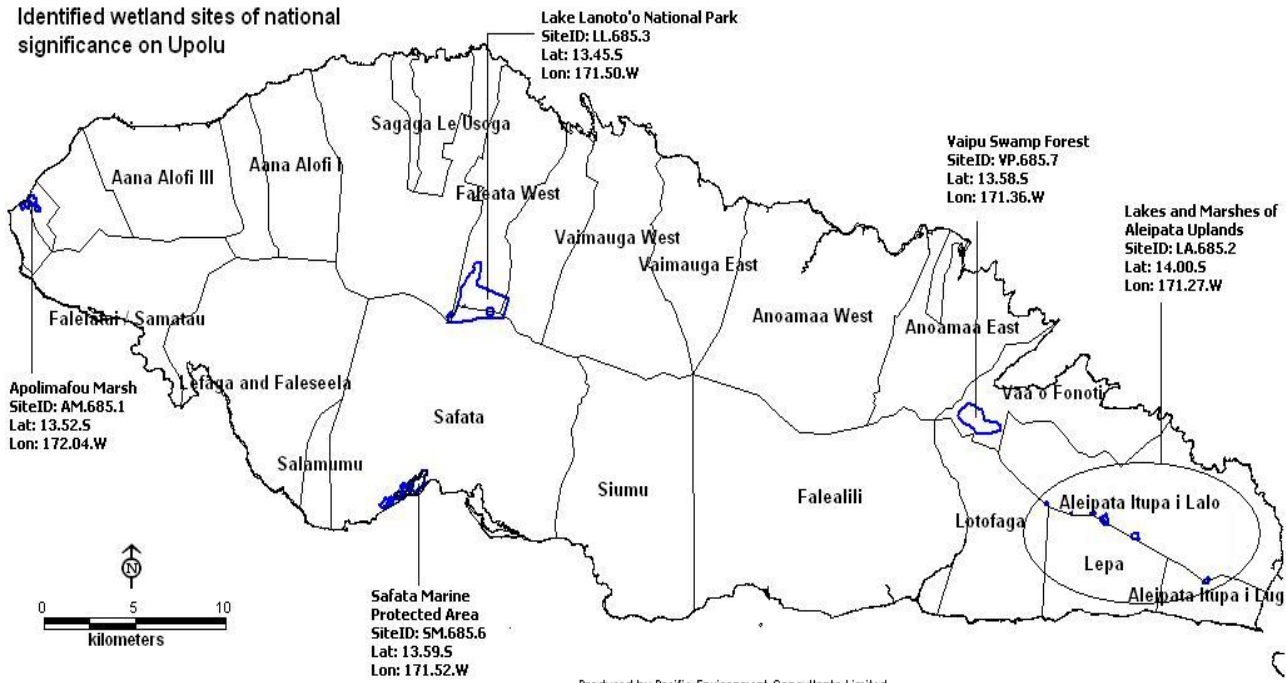
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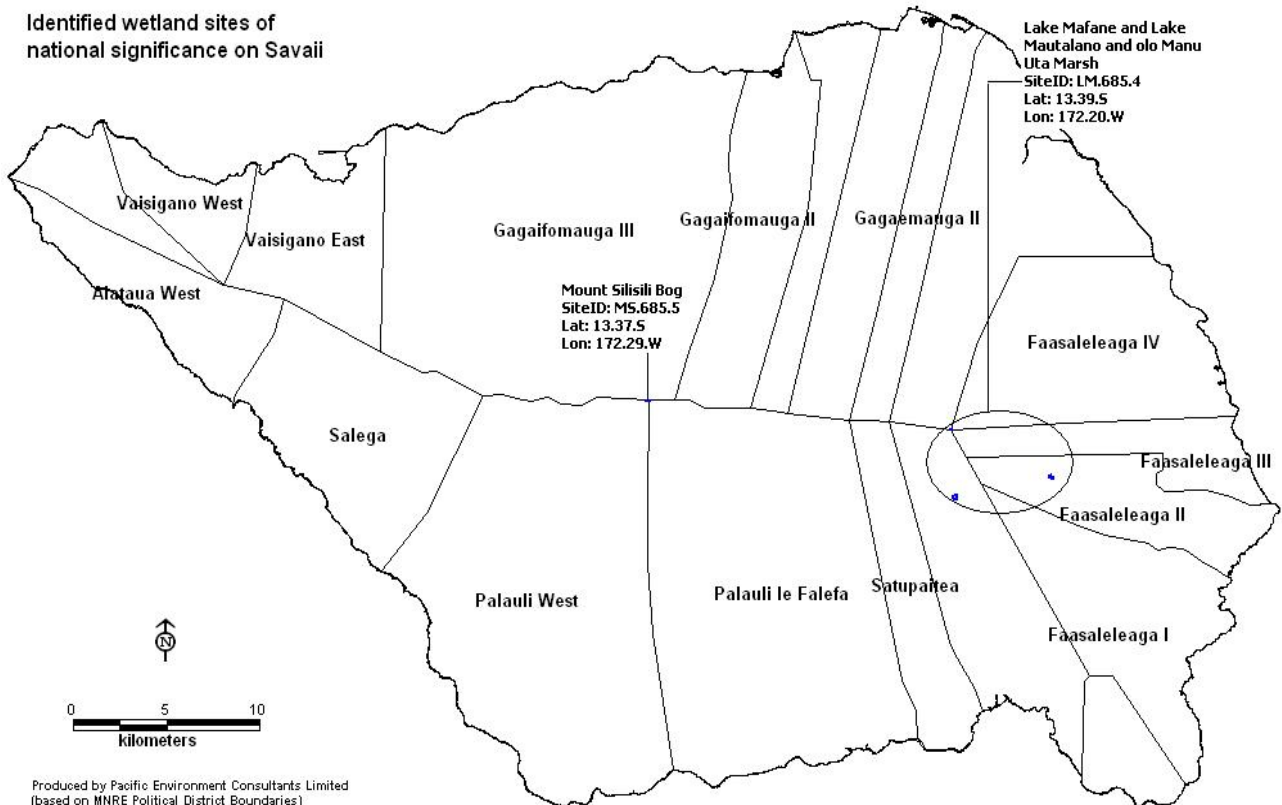


**Identified wetland sites of national significance on Upolu**



Produced by Pacific Environment Consultants Limited  
(based on MNRE Political District Boundaries)

**Identified wetland sites of national significance on Savaii**



Produced by Pacific Environment Consultants Limited  
(based on MNRE Political District Boundaries)

## List of Wetlands of National Significance

SiteID	Wetland Name
AM.685.1	<a href="#">Apolimafou Marsh</a>
LA.685.2	<a href="#">Lakes and Marshes of Aleipata Uplands</a>
LL.685.3	<a href="#">Lake Lanoto'o National Park</a>
LM.685.4	<a href="#">Lake Mafane and Lake Mautalano and Olo Manu Uta</a>
MS.685.5	<a href="#">Mount Silisili Bog</a>
SM.685.6	<a href="#">Safata Marine Protected Area</a>
VP.685.7	<a href="#">Vaipu Swamp Forest</a>

### Apolimafou Marsh

**Wetland Type:** Marine/Coastal

**Latitude:** 13.52'S

**Longitude:** 172.04'W

**Country:** Samoa

**General Location:** Near the extreme western tip of Upolu

**Elevation (m):** Near sea level

**AreaSize (ha):** 32.1999

**General Overview of the Site:** An area of herbaceous marsh at the west end of Upolu; the least disturbed of any coastal marsh in Western Samoa.

#### Ramsar Criteria for Inclusion:

Group A Criteria 1	Group A Criteria 2	Group A Criteria 3	Group A Criteria 4	Group B Criteria 5	Group B Criteria 6	Group B Criteria 7	Group B Criteria 8	Group B Criteria 9
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**Physical Features of the site:** A small area of freshwater marsh on the coastal lowlands at the west end of Upolu. The site lies adjacent to coconut plantations.

**Physical Features of the Catchment Area:** No information

**Hydrological Values:** No information.

**General Ecological Features:** Herbaceous marsh with *Eleocharis dulcis* and *Cyclosorus interruptus*. *Erythrina fusca* and *Pandanus tectorius* are found in isolated clumps along the edges of the marsh. *Ludwigia octovalvis* dominates in areas of disturbed vegetation along the roads bordering and crossing the wetland.

**Noteworthy Flora:** An excellent example of a lowland herbaceous marsh.

**Noteworthy Fauna:** The Pacific Black Duck (*Anas superciliosa*) and Purple Swamphen (*Porphyrio porphyrio*) occur in the marsh.

**Social and Cultural Values:** No information.

**Land Ownership / Tenure:** Customary ownership.

**Land Uses:** No information.

**Factors affecting the site's ecological values:** The marsh is situated directly behind a village and is threatened by further expansion of the village. Some reduction in water supply may have occurred as a result of agricultural activities in the surrounding area. There has been some disturbance to the marsh vegetation along a road which crosses the marsh.

**Conservation Measures Taken:** None.

**Conservation Measures Proposed:** Recommended for designation as a nature reserve by Holloway and Floyd (1975), and identified as a priority site for conservation by Dahl (1980) and Pearsall and Whistler (1991). Parks (1992) identified the marsh as a Grade 2 site.

**Existing scientific research with references:** No information

**Current communication / public education programs:** No information

**Current recreation / tourism:** No information

**Management Authority:** No information.

**References Cited:** Anon (1985); Dahl (1980); Holloway & Floyd (1975); Parks (1992); Pearsall & Whistler (1991).

### Lakes and Marshes of Aleipata Uplands

**Wetland Type:** Inland Wetlands

**Latitude:** 14.00'S

**Longitude:** 171.27'W

**Country:** Samoa

**General Location:** In the eastern highlands of Upolu

**Elevation (m):** 210-550 m

**AreaSize (ha):** 32.3746

**General Overview of the Site:** A series of small lakes and herbaceous marshes in a chain of volcanic craters in the Aleipata Uplands of eastern Upolu, mostly protected from human impact because of their high altitude.

#### Ramsar Criteria for Inclusion:

Group A Criteria 1	Group A Criteria 2	Group A Criteria 3	Group A Criteria 4	Group B Criteria 5	Group B Criteria 6	Group B Criteria 7	Group B Criteria 8	Group B Criteria 9
√			√		√			

**Physical Features of the site:** The Aleipata uplands on eastern Upolu comprise a long broad ridge covered with lowland rain forest. There are ten small volcanic craters along the ridge crest, at least seven of which contain interesting wetlands. Olomaga, Lanoto and Savaii craters contain freshwater lakes with a narrow fringe of herbaceous marsh and patches of *Pandanus turritus* swamp forest; Seuga, Tiatal and Olomaga craters contain patches of *Pandanus turritus* swamp forest; and Latalua crater contains a small herbaceous marsh.

**Physical Features of the Catchment Area:** No information

**Hydrological Values:** No information

**General Ecological Features:** Herbaceous marsh with *Eleocharis dukis*, swamp forest dominated by *Pandanus turritus*.

**Noteworthy Flora:** *Pandanus turritus* swamp forest.

**Noteworthy Fauna:** No information is available on the wetland fauna. The surrounding forests are reputed to support a particularly rich and varied bird life.

**Social and Cultural Values:** No information

**Land Ownership / Tenure:** Customary Ownership

**Land Uses:** None at the wetlands

**Factors affecting the site's ecological values:** There is little if any disturbance at the wetland. The lowland rain forest in this area was severely damaged by Hurricane Ofa in 1990 and again by Hurricane Val in 1991, and the vegetation now consists mainly of weeds and secondary growth.

**Conservation Measures Taken:** None

**Conservation Measures Proposed:** The central and eastern portions of the Aleipata Uplands were recommended for designation as a national park by Holloway and Floyd (1975), Dahl (1980), Anon (1985) and KRTA Limited (1988), and were identified as a priority site for conservation by Pearsall and Whistler (1991). The proposed national park (Lake Olomaga National Park) covers 1,300 ha and includes all the main wetlands.

**Existing scientific research with references:** No information

**Current communication / public education programs:** No information

**Current recreation / tourism:** No information

**Management Authority:** No information

**References Cited:** Anon (1985); Dahl (1980); Holloway & Floyd (1975); KRTA Limited (1988); Pearsall & Whistler (1991)

### Lake Lanoto'o National Park

**Wetland Type:** Inland Wetlands

**Latitude:** 13.45'S

**Longitude:** 171.50'W

**Country:** Samoa

**General Location:** In the central highlands of Upolu, 15.8 Kilometre Southwest of Apia

**Elevation (m):** 801

**AreaSize (ha):** 469.949

**General Overview of the Site:** The National park, declared in May 2003, includes Lakes Lanoto'o', Lanoata'ata and Lanoanea, three small crater lakes with fringing herbaceous marsh and *Pandanus turritus* swamp forest, in the central highlands of Upolu. The lakes are among the few remaining near-pristine lakes in Samoa, and are critical to maintaining the health of the watershed of the capital city, Apia.

#### Ramsar Criteria for Inclusion:

Group A Criteria 1	Group A Criteria 2	Group A Criteria 3	Group A Criteria 4	Group B Criteria 5	Group B Criteria 6	Group B Criteria 7	Group B Criteria 8	Group B Criteria 9
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**Physical Features of the site:** Lake Lanoto'o, Lake Lanoata'ata and Lake Lanoanea are small freshwater lakes inside steep-sided volcanic craters. The open water areas are surrounded by a narrow fringe of herbaceous swamp and *Pandanus* swamp forest. Lake Lanoto'o is the largest lake in Samoa.

Land capability of the National Park.

- Flat to rolling, well to somewhat excessively drain, land without moisture deficit. Soils have low natural nutrient levels, up to 25% stones and in some case had slight erosion occur under cultivation.

- 10% of park area is hilly well drained land without moisture deficit. Soils have low to medium natural nutrients levels and more than 50% stones at the surface with little erosion under cultivation.

- An estimate 20%of the area is classified as flat to rolling, well drained uplands without moisture deficit. Soils have low natural nutrient levels with erosion which can also be happening because of cultivation.

- There are also areas which are hilly and steep and have moderate to severe erosion potential.

- More than 50% of this National Park is classified as unsuitable for agriculture or forestry, which means its very steep and hilly with sever potential to erosion.

Geology Parent material Salani volcanic, Annual Rainfall

1990 Total 3853.1 mean rainfall 321.1  
1991 total 4275.4 mean rainfall 356.3  
1992 total 4822.8 mean rainfall 401.9  
1993 total 4562.8 mean rainfall 380.2  
1994 total 6724.8 mean rainfall 560.4  
1995 total 4149 mean rainfall 345.8  
1996 total 4289.2 mean rainfall 357.4  
1997 total 4974.3 mean rainfall 414.5

1998 total 366.3 mean rainfall 305.2  
1999 total 4670.2 mean rainfall 389.2  
2000 total 4345.1 mean rainfall 362.1  
2001 total 3889.5 mean rainfall 324.1  
2002 total 3939.7 mean rainfall 328.3  
2003 total 2885.7 mean rainfall 240.5  
2004 total 3336.2 mean rainfall 278  
2005 total 4289.1 mean rainfall 357.4

**Physical Features of the Catchment Area:** Same as Physical Features of the Site

**Hydrological Values:** The region is an important water catchment area, and includes the headwaters of the Fuluasou river system which flows north to Apia.

**General Ecological Features:** Crater lakes with herbaceous swamp dominated by *Eleocharis dulcis*, and upland swamp forest dominated by *Pandanus turritus*. Montane rainforest around the lakes includes species such as *Dysoxylum huntii*, *Cyathea spp.*, *Hibiscus tiliaceus*, *Pometia pinnata* and *Syzygium spp.* The vegetation type is intermediate between lowland forest and montane forest. Cyclones of the early 1990's (Ofa and Val) and more recently cyclone Heta of 2004, has left some of the site highly damage. The dominate vegetation type of the open consist of *Cyathea affinis*, *Cyathea lunulata*, *Clinostigma cf. oncorhyncha*, *Myristica hypagyraea*, and *Trichospermum richii*. The abundance of the two fern species and *Trichospermum richii* are indicators of server disturbances, while the other two species are most likely survivors relatively adapted to cyclones (Refer to Appendix 2)

- 227.1 hectare of the National Park is open forest;
- 242.1 hectare is forest plantation, consisting of *Pinus caribaea*, *Paraserianthes falcataria* and *Pometia pinnata*
- 359.1 hectares (estimate) is montane rainforest;
- 93.91 hectares is disturbed secondary forest, and
- 15.69 hectares is none native forest.

**Noteworthy Flora:** Vaoutu'utu used to make traditional hats, and acts as a barrier to stop erosion from land.

- Fasa (*Pandanus tectorius*) fruits are used for making leis, and roots protect small fish from predators
- Masame (*Glochidion ramiflorum*), inner barken taken internally to induce late menstrual flow.
- Fue laufao (*Epipremnum pinnatum*), is an endemic creeper
- 'U'unu (*Sarcopygme pacifica*), is an endemic genus (all three species)
- Vi vao, (*Reynoldia pleiosperma*) is an endemic species.

**Noteworthy Fauna:** The site was one of ten national areas recommended for the conservation of birds by Park et. al. (1992). The lake is an important area for the Pacific Black Duck (*Anas superciliosa*) and Spotless Crake or sooty rail (*Porzana tabuensis*). The forests contain most of Samoa's endemic bird species, notably the endangered Tooth-billed Pigeon (*Didunculus strigirostris*) manumea, Samoan Triller (*Lalage sharpei*) and Mao (*Gymnomyza samoensis*) and rare bird species including the Manu'ai Pa'u La'au (Red Headed Parrot Finch), and Manutagi (Crimson Crowned Fruit Dove), all endemic to Samoa. Around the Lake, bird species have established a stable community after destructions of habitat from the early 1990s' cyclones and Heta in 2004. Samoan Endemic Birds found at the area, Tooth-billed pigeon, Mao, Samoan starling, Flat billed kingfisher, Samoan whistler, and Samoan broadbill. Endemic Subspecies; White rump swiftlet, white throat pigeon, and many other bird species that contribute to the dispersal mechanism

**Social and Cultural Values:** None

**Land Ownership / Tenure:**

a) within the Ramsar site: Half of Lake Lanoto'o National Park is Government Land and half is Customary Land. Tenure of the land consists of:

- Government Land - approximately 69%,
- Customary Land - 26%
- Freehold Land – 5%

b) in the surrounding area: Surrounding areas are partly Government Land, partly Customary Land and partly private (freehold). Northwest from the centre of the National Park is all government land, From North East to south west of the national park boundary is all customary land

**Land Uses:**

a) within the Ramsar site: None. The area is a conservation reserve and important water source for the capital city of Apia.

b) in the surroundings/catchment: Cattle farms and small-scale plantations

**Factors affecting the site's ecological values:**

a) within the Ramsar site: Goldfish (*Carassius auratus*) were introduced into Lake Lanoto'o in about 1900 and are thriving.

b) in the surrounding area: The surrounding forests are being cleared for shifting agriculture and plantations, particularly in the northwest around Lake Lanoata'ata and Lake Lanoanea, and the entire area was badly affected by Hurricanes Ofa in 1990 , Val in 1991 and Heta in 2004. There are also some cattle farms in the area

**Conservation Measures Taken:** On 29 May 2003 Samoa's Minister of Natural Resources and Environment Tagaloa Sale Tagaloa announced the creation of this national park and that the site was Samoa's first Wetland of International Importance.

**Conservation Measures Proposed:** Funds are being sought to assist with the preparation of a plan of management for the national park in consultation with the local people, for further surveys, track improvement and for a range of education and public





**Physical Features of the site:** Lake Mafane (approximately 50 ha) and Lake Mautalano (a few ha) are small freshwater lakes with fringing herbaceous marshes, situated in steep-sided volcanic craters about 4 km apart. The crater rims rise to peaks at 1,000 and 716 m respectively. Olo Manu Uta Marsh (Maugalao Marsh) is a large herbaceous marsh situated at 625 m above sea level on the southwestern slopes of Mount Olo Manu Uta, east of Mount Maugalao. Other small volcanic craters further west along the crest of Savai'i contain smaller and as yet unmapped wetlands.

**Physical Features of the Catchment Area:** No information

**Hydrological Values:** No information.

**General Ecological Features:** Herbaceous marsh with *Eleocharis dulcis* and *Rhynchospora corymbosa*. The surrounding highlands are covered in montane rain forest and cloud forest.

**Noteworthy Flora:** No information.

**Noteworthy Fauna:** No information.

**Social and Cultural Values:** No information.

**Land Ownership / Tenure:** Lake Mafane and Lake Mautalano are partly on public land and partly under customary ownership; Olo Manu Uta Marsh is situated entirely on public land.

**Land Uses:** None. The surrounding forests are scarcely if ever used by their customary owners.

**Factors affecting the site's ecological values:** None known at the wetlands. The upland forests on northern exposures were severely damaged by Hurricane Ofa in 1990 and Hurricane Val in 1991.

**Conservation Measures Taken:** None

**Conservation Measures Proposed:** Lake Mafane and Olo Manu Uta Marsh were recommended for designation as nature reserves by Holloway and Floyd (1975), while Lake Mautalano was recommended for designation as a strict nature reserve, closed to the general public. All three sites were identified as priority areas for conservation by Dahl (1980). KRTA Limited (1988) recommended extending the boundaries of the proposed Mount Silisili National Park to include the three wetlands. It was suggested that the wetlands be grouped within a buffer zone and incorporated into the National Park, together with a corridor about 2,000 m in width linking them to the Silisili highlands. Pearsall and Whistler (1991) also recommended that the wetlands be included with the Silisili highlands in a single large protected area.

**Existing scientific research with references:** No information

**Current communication / public education programs:** No information

**Current recreation / tourism:** No information

**Management Authority:** No information.

**References Cited:** Anon (1985); Dahl (1980); Holloway & Floyd (1975); KRTA Limited

(1988); Pearsall & Whistler (1991).

### Mount Silisili Bog

**Wetland Type:** Inland Wetlands

**Latitude:** 13.37'S

**Longitude:** 172.29'W

**Country:** Samoa

**General Location:** In the central highlands of Savaii

**Elevation (m):** Over 1,500 m

**AreaSize (ha):** 0.47

**General Overview of the Site:** A montane bog dominated by species of *Carex*; the only bog of this type in Western Samoa.

#### Ramsar Criteria for Inclusion:

Group A Criteria 1	Group A Criteria 2	Group A Criteria 3	Group A Criteria 4	Group B Criteria 5	Group B Criteria 6	Group B Criteria 7	Group B Criteria 8	Group B Criteria 9
			√		√		√	

**Physical Features of the site:** A small montane bog surrounded by cloud forest near the summit of Mount Silisili (1,858 m).

**Physical Features of the Catchment Area:** No information

**Hydrological Values:** No information.

**General Ecological Features:** The bog vegetation is dominated by species of *Carex*.

**Noteworthy Flora:** A unique wetland plant community in Western Samoa. The surrounding cloud forests are very rich in endemic species, with approximately 53% of species endemic compared to 25-33% for the islands as a whole.

**Noteworthy Fauna:** The White-browed Crake (*Porzana cinerea*) and Spotless Crake (*Porzana tabuensis*) are known to occur in the area. There is a slight possibility that the endemic Samoan Woodhen (*Gallinula (Pareudiastes) pacifica*) could still survive in the moist montane forests and bogs of central Savai'i, although there are no confirmed reports since 1873. The montane forests of Savai'i (above 900 m) are also home to the endemic Samoan White-eye (*Zosterops samoensis*), known only from this island. Other interesting birds of the cloud forest include the endangered Tooth-billed Pigeon (*Didunculus str. girostris*), the Friendly Ground-Dove (*Gallicolumba stairii*), the Island Thrush (*Turdus poliocephalus*), the rare Mao (*Gymnomyza samoensis*) and an endemic subspecies of the Red-headed Parrot-finch (*Erythrura cyaneovirens gaughrani*).

**Social and Cultural Values:** No information.

**Land Ownership / Tenure:** The wetland and surrounding areas are almost entirely under customary ownership.

**Land Uses:** None. There is no human habitation in the area.

**Factors affecting the site's ecological values:** None known.

**Conservation Measures Taken:** None.

**Conservation Measures Proposed:** The central highlands of Savai'i have frequently been recommended for reserve status, but no action has been taken because the majority of the land is under customary ownership. Holloway and Floyd (1975) recommended the establishment of a large national park (8,900 ha) and this was supported by Dahl (1980) and Hay (1985). KRTA Limited (1988) endorsed the view that the establishment of the proposed Silisili National Park was of the highest priority, and proposed extending the boundaries to include Lake Mafane, Lake Mautalano and Olo Manu Uta Marsh to the east. Pearsall and Whistler (1991) similarly recommend the establishment of a large reserve encompassing all of the central highlands of Savai'i as well as a corridor of forest extending almost down to the south coast.

**Existing scientific research with references:** No information

**Current communication / public education programs:** No information

**Current recreation / tourism:** No information

**Management Authority:** No information.

**References Cited:** Anon (1985); Dahl (1980); Hay (1985); Holloway & Floyd (1975); KRTA Limited (1988); Parks et al. (1992); Pearsall & Whistler (1991); Whistler (1992).

### **Safata Marine Protected Area**

**Wetland Type:** Marine/Coastal

**Latitude:** 13°59'S

**Longitude:** 171°52'W

**Country:** Samoa

**General Location:** On the west side of Safata Bay on the south coast of Upolu

**Elevation (m):** Sea level.

**AreaSize (ha):** 100.993

**General Overview of the Site:** An area of estuarine mangrove forest, important as a nursery ground for mullet. The village that owns the site is eager to preserve it in its natural state.

**Physical features:** A large stand of mangrove forest bordering the tidal estuary of the Leaf River. In 1990, Hurricane Ofa deposited a fair amount of sand in the estuary mouth, but otherwise the ecosystem remains in good condition. One of Western Samoa's finest stands of coastal forest is found across the estuary from the mangrove forest.

**Ramsar Criteria for Inclusion:**

Group A Criteria 1	Group A Criteria 2	Group A Criteria 3	Group A Criteria 4	Group B Criteria 5	Group B Criteria 6	Group B Criteria 7	Group B Criteria 8	Group B Criteria 9
√					√	√		

**Physical Features of the site:** A large stand of mangrove forest bordering the tidal estuary mouth, but otherwise the ecosystem remains in good condition. One of Western

Samoa's finest stands of coastal forest is found across the estuary from the mangrove forest.

**Physical Features of the Catchment Area:** formation

**Hydrological Values:** The mangrove forest is an important nursery ground for a wide variety of fish species including mullet (*Mugil spp.*).

**General Ecological Features:** Mangrove forest dominated by *Bruguiera gymnorrhiza* with some *Rhizophora (mangle) samoensis*. Other species present include the ferns *Acrostichum aureum* and *Humata heterophylla*, and *Barringtonia asiatica*. The nearby coastal forest is dominated by *Diospyros elliptica*, *D. samoensis* and *Syzygium spp.*

**Noteworthy Flora:** *Trichomanes spp.* are endemic to the forest, and the high density of epiphytes is of special interest.

**Noteworthy Fauna:** Birds recorded at the site include Pacific Reef Heron (*Egretta sacra*), Pacific Black Duck (*ulnas superciliosa*), Pacific Golden Plover (*Pluvialis fulva*), Purple-capped ruit-Dove (*Ptilinopus poiphyraceus*), Samoan Whistler (*Lalage sharpen*), Samoan Broadbill (*Myiagra albiventris*) and Cardinal Honeyeater (*Myzomela cardinalis*). Flying foxes (*Pteropus sp.*) also occur in the mangroves. Common invertebrates include the mangrove crab *Scylla paramamosian* and crabs of the genus *Uca*.

**Social and Cultural Values:** No information.

**Land Ownership / Tenure:** The wetland and surrounding areas are entirely under customary ownership.

**Land Uses:** Fishing; harvesting of crabs. Villages and plantations in surrounding areas.

**Factors affecting the site's ecological values:** The site is threatened by forest clearance and landfill for human settlement, and pollution. Feral pigs cause some damage to the mangroves.

**Conservation Measures Taken:** The inhabitants of Sa'anapu village, in collaboration with the Division of Environment and Conservation, have banned dynamiting and fish poisoning in the wetland, and have established quota for crab catchers. Fishermen from neighboring villages are prohibited from fishing in the mangroves.

**Conservation Measures Proposed:** Holloway and Floyd (1975) recommended that the site be protected as a nature reserve, and this was supported by Dahl (1980). Pearsall and Whistler (1991) listed the Sa'anapu-Sataoa Mangrove Forest along with nearby coastal rain forest in their top ten priority sites for conservation in Western Samoa, and Parks (1992) identified the mangrove forest as a Grade 1 Site for conservation. The forest has recently been proposed as a Conservation Area to be established with funding from the Global Environment Facility under the guidance of the South Pacific Regional Environment Programme (SPREP).

**Existing scientific research with references:** The Division of Environment and Conservation is currently investigating the possibilities for sustainable utilization of the mangrove forest as a way of promoting its conservation.

**Current communication / public education programs:** Conservation of mangroves has become an important environmental issue in Western Samoa. Because of its relatively undisturbed condition, the Sa'anapu-Sataoa Mangrove Forest will be used as

an example of how a healthy mangrove forest should be.

**Current recreation / tourism:** There is some potential for eco-tourism along the river into the mangrove forest.

**Management Authority:** The Division of Environment and Conservation (DEC) of the MNRE has responsibility for management.

**References Cited:** Dahl (1980); Holloway & Floyd (1975); Parks (1992); Parks et al. (1992); Pearsall & Whistler (1991); Sua (1988); Zann (1991).

### Vaipu Swamp Forest

**Wetland Type:** Inland Wetlands

**Latitude:** 13.58'S

**Longitude:** 171.36'W

**Country:** Samoa

**General Location:** In the northern uplands of eastern Upolu, 24 km southeast of Apia.

**Elevation (m):** 240

**AreaSize (ha):** 183.298

**General Overview of the Site:** An area of mixed upland species swamp forest in a water-logged basin in the hills of eastern Upolu; the last significant wetland of this type in Samoa.

#### Ramsar Criteria for Inclusion:

Group A Criteria 1	Group A Criteria 2	Group A Criteria 3	Group A Criteria 4	Group B Criteria 5	Group B Criteria 6	Group B Criteria 7	Group B Criteria 8	Group B Criteria 9
			√		√		√	

**Physical Features of the site:** A large patch of swamp forest in a poorly drained basin on one of the main tributaries of the Salani River. The swamp is fed by Afulilo Falls and stream, and lies below the site of the former Punataemo'o swamp forest which was recently submerged by a hydro-electric scheme. The basic alluvium and basic colluvium soils in the central part of the basin are saturated with fresh water, and there is some open water in the northeast.

**Physical Features of the Catchment Area:** No information

**Hydrological Values:** The swamp forest is a very important water catchment area for the Salani river system.

**General Ecological Features:** The forest comprises a mixture of typical swamp forest species and lowland rain forest species, with *Barringtonia samoensis*, *Calophyllum neo-eburlicum*, *Cananga odorata*, *C. harveyi*, *Canthium merrillii*, *Clidemia hirta*, *Cyathea spp.*, *Dysoxylum samoense*, *Elaeocarpus tonganus*, *Fagraea berteriana*, *Ficus tinctoria*, *Hernandia moerenhoutiana*, *Hibiscus tiliaceus*, *Macaranga stipulosa*, *Myristica fatua*, *M. hypargyrea*, *Neonauclea forsteri*, *Pisonia sp.*, *Planchonella torricellensis*, *Pometia pinnata*, *Rhus taitensis*, *Scirpodendron ghaeri*, *Syzygium samarangense* and *Terminalia richii* (Pearsall & Whistler, 1991). The screwpine *Pandanus turritus* and various endemic

woody trees such as *Aglaia samoense*, *Clintostigma samoense* and *Sterculia fanaiho* have also been recorded. The swamp forest lies adjacent to disturbed lowland rain forest and secondary forest.

**Noteworthy Flora:** The site contains a rare type of swamp forest (mixed upland species swamp forest) with a number of endemic tree species.

**Noteworthy Fauna:** Wildlife recorded at the site includes Pacific Boa (*Candoia bibroni*), two species of flying fox (*Pteropus* sp.), Pacific Black Duck (*ulnas uperciliosa*), Mao (*Gymnomyza samoensis*) and possibly Spotless Crake (*Porzana tabuensis*). The endangered Tooth-billed Pigeon (*Didunculus trigrrostris*) is known to occur in the area.

**Social and Cultural Values:** The area is of some archaeological significance, with old Samoan settlements at both ends of the wetland. These are believed to have been occupied by the Paramount Chiefs for generations.

**Land Ownership / Tenure:** The wetland and surrounding areas are entirely under customary ownership.

**Land Uses:** None at the wetland. A hydro-electric power scheme has recently been developed in the catchment area.

**Factors affecting the site's ecological values:** The wetland is threatened by development of plantations and expansion of the road network in the area. Pigeon hunting causes some disturbance, and there may be a small amount of logging. The cyclones of 1990 and 1991 caused only limited damage to the forest. Development of the Afulilo Hydro-electric Power Project in the water catchment area resulted in the destruction of the neighbouring Punataemo'o Swamp Forest; any further expansion of this project could have a detrimental effect on Vaipu Swamp Forest.

**Conservation Measures Taken:** None

**Conservation Measures Proposed:** Holloway and Floyd (1975) recommended that the site be protected as a nature reserve, and this was supported by Dahl (1980). The site has been recognized as one of the highest priorities for conservation in Western Samoa, and was listed as the third highest priority by Pearsall and Whistler (1991) in their "Terrestrial Ecosystem Mapping for Western Samoa". The wetland has recently been proposed as a National Conservation Area.

**Existing scientific research with references:** The area has never been properly surveyed and is in urgent need of detailed study.

**Current communication / public education programs:** No information

**Current recreation / tourism:** The area has great potential for eco-tourism, although at present it is seldom visited except by pigeon hunters.

**Management Authority:** The Division of Environment and Conservation (DEC) of the MNRE has responsibility for management.

**References Cited:** Anon (1985); Dahl (1980); Holloway & Floyd (1975); Parks (1992); Parks et al. (1992); Pearsall & Whistler (1991); Whistler (1992).