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## **Ramsar Small Grants Fund for Wetland Conservation and Wise Use (SGF)**

### **PROGRESS REPORT**

- 1. Country:** SAMOA
- 2. Project Number/Code:** GDP 10000-000-435947
- 3. Project Title:** Improved Management of Lake Lanoto'o Samoa's First Ramsar Site
- 4. Executing Agency:** Ministry of Natural Resources, Environment & Meteorology (MNREM)
- 5. Period Covered:** 1 July 2005 – 31 May, 2006

### **6. Summary of Overall Project Progress:**

A project team composed of staff of the various division of MNREM was formed as a Technical Team to assist the Project Manager in the implementation of project activities. The Project Team and Manager were able to compile a Summary Report of Existing Information on Lake Lanoto'o, organized and started the initial detail surveys on the site's flora and fauna ecologies; and prepare a list of stakeholders for engagement in the formulation of an effective management/development plan for the site.

### **7. Specific Outputs/Results Achieved (As per quarter work-plan):**

- A Technical Team was formed at the outset of the project composed of staff of the relevant Divisions of the project's Executing Agency (MNREM) to assist the Project Manager in the implementation of project activities. The Team has held nine (9) meetings. (*Please refer to Appendix 1 for details*).
- A Summary Report of Existing Information was being prepared which include GIS maps of the site's land capability, landuse, forest ecology and land tenure attributes (*Please refer to Appendix 2 for details*).
- Plans were formulated for surveying baselines on the site's flora and fauna, which include the establishment of permanent stations (transects) and a system for assessing and monitoring the status of site's ecology. (*Please refer to Appendix 3 and 4 for details*).
- A list of stakeholders to be engaged in the formulation of a management-development plan of the site was formulated. (*Please refer to Appendix 5 for details*).
- Awareness activities on the site was carried out during the National Environment Week 2005 in October-November, and the National Water Conservation Day in February 2006.
- In addition GIS information on the project site as indicated in bullets number 2 and 3 above were gathered and centralized into a data and information base on



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the project at the Terrestrial Resources Conservation Section of the DEC:  
MNREM.

### **8. Challenges/Issues Encountered:**

- Project was schedule to start on 1 July, 2005 but first installment of project funding only took place in the first week of September, 2005. Thus actual detail implementation arrangements were made and started from September.
- Implementation of planned surveys were not possible to continue as planned in November 2005 to February 2006 due to bad weather (heavy rainfall and flooding), and were continued from March 2006 and progress of field survey was slow due to thick vegetation and difficult access to the planned survey stations/transects.
- The finalization of stakeholders of the project site took time as the site has not been surveyed on the ground as planned in order to fully identify the customary landowners of part of its sections.

### **9. Solutions Applied (to address issues and challenges):**

- Part of another project which undertook bird survey with two main targeted endemic species – Samoa's Tooth-billed Pigeon and Giant Forest Honey-eater – were carried out for this information need of the site.
- During bad weather periods the Project Technical Team worked mainly on gathering and centralizing existing ecological data and relevant GIS information at TRCS:DEC:MNREM which coordinate the project.
- The project site was demarcated using the compiled relevant GIS maps.

### **10. Recommendations for Future Action:**

- It is recommended to extend the period of the project implementation for another six months in order to effectively complete its activities (*Please refer to Appendix 6 & 7 for details*), due to the following reasons:
  - Project funding arrived two months later than expected starting date 1 July 2006
  - Field work was forestalled in November 2006 – February due to bad weather conditions
  - Conditions for carrying out proper surveys at the site is very difficult as it takes time and effort to access and establish surveying stations

In addition more time is needed to finalize and engage the stakeholders of the site and carry out a full ground survey of its boundaries.

### **11. Report Prepared By:** Tapa Suaesi – Project Coordinator



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### **APPENDICES:**

(All appendices are on separate files)

1. PROJECT TECHNICAL TEAM (**Filename: Appendix 1&2 – Technical Team & Rep Ex Info**)
2. SUMMARY OF PAST SURVEYS ON LAKE LANOTO'O (**Filename: Appendix 1 &2 – Technical Team & Rep Ex Info**)
3. FLORA SPECIES REPORT ON INITIAL INVENTORY SURVEY (**Filename: Appendix 3 – Flora**)
4. SPECIE REPORT ON INITIAL INVENTORY SURVEY(**Filename: Appendix 4 – Fauna**)
5. RAMSAR LAKE LANOTO'O STAKEHOLDER LIST(**Filename: Appendix 5 – Stakeholder List**)
6. PROJECT BUDGET(**Filename: Appendix 6 – Project Budget**)
7. WORKPLAN JULY – DECEMBER 2006(**Filename: Appendix 7 – Project Update & Proposed Extension**)

## Appendix ? : **Summary of Past surveys on Lake Lanotoo**

Prepared by Samani Tupufia

Terrestrial Biodiversity Officer (Fauna)

Terrestrial Resources Conservation Section

DEC: MNREM

### **Introduction**

Lake Lanotoo was first proposed as a National Parks in 1975 by the Government of Samoa in accordance with the recommendations highlighted in the UNDAT and IUCN report. The total area for the national park is 1161 acres with the lake Lanotoo size at 27.15 acres. The main reason for declaring Lake lanotoo as National Park is that, it was looked at as a tourist attraction. At the mean time there is no known management plan for this national park. The formulation of a management plan for Lake Lanotoo National Park is the soul output for the current survey conducted by the Ministry of Natural Resources Environment and Meteorology.

### **1991 Lowland Survey**

During coastal Lowland survey there was no vegetation survey but was highlighted that its surrounding areas were severely damaged by two known impact; the cyclones of the early 90s (Ofa and Val) and forest clearance for agriculture which was noticed increasingly over the past ten years.

### **Birds**

Manumea or tooth-billed pigeon was recorded on this site by Dr Ulf Beichle in 1987 and was also known to be providing a large area of habitat for birds.

Results of bird counts show a decline comparing to the 1982 birds survey done by Tim Lovegrove. In contrast the Island thrush which has not been recorded in the 1982 was observed near the lake during the counts.

### **1997 Samoa Upland Survey:**

#### **Plants**

Quoting on the vegetation it identifies as an intermediate between lowland forest and montane forest. With the dominant species of *Dysoxylum samoense*, *Planchonella samoensis*, *Calopygium neobudicum*, *Palaquium steblinii*, *macatanga stipulosa* and *Myristica fatua*.. There was no known survey for insects or invertebrates done on this national park during the upland survey in the late '90s.

### **Forest Type**

Based on the SAMFRIS forest survey, about 227.1 hectare of the Lanotoo National Park is open forest based on forest type, and another 242.1 hectare to as forest plantation the forest plantation has Caribbean pine and tamaligi with some native species like tava mainly.

### **Ecology**

359.1 hectares estimating is montane rainforest, 93.91 hectares is disturbed secondary forest and about 15.69 hectares is non-native forest which is classified as the National Parks areas for ecology. Refer to Ecology Map.

#### Ecology of the lake:

From personal observation without any technical input the lake is an oligotrophic lake, which is characterized by the water been clear and appears to be blue-green in the sunlight. Low Nutrient availability is due to low input from external sources. As sited by Whistler<sup>1</sup> in The Samoan Rainforest, Lake Lanotoo can be classified as a montane marsh, sine it is formed in an old extinct volcanic cone and with the height of more than 300m elevation. (*Refer to image1and 2*) No studies on any fish or shell fish species found on the Lake Lanoto'o yet.

#### Land Capability

Within the National Parks there are areas in which are 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 occurs under cultivation.(1b).

10% of the National Parks area is hilly well drained land without moisture deficit. Soil have low to medium natural nutrients levels and more than 50% stones at the surface with little erosion under cultivation.(2c )

About 20%of the area is classified as flat to rolling well drained uplands without moisture deficit. Soils have low natural nutrients level with erosion which can also be happened because of cultivation.(2f).

There are also areas which are hilly and steep and have moderate to severe erosion potential.(3b)More than 50% of this National Park is classified as unsuitable for agriculture or forestry. Which means its very steep and hilly with severe potential to erosion. Refer to *Land Capability Map*.

#### Land Tenure

Land tenure most of the land is Government Land including a slice of customary land and less than 5% is free hold land.

#### Geology

Salani volcanics: ?

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<sup>1</sup> Arthur Whistler. The Samoan Rainforest pg 36

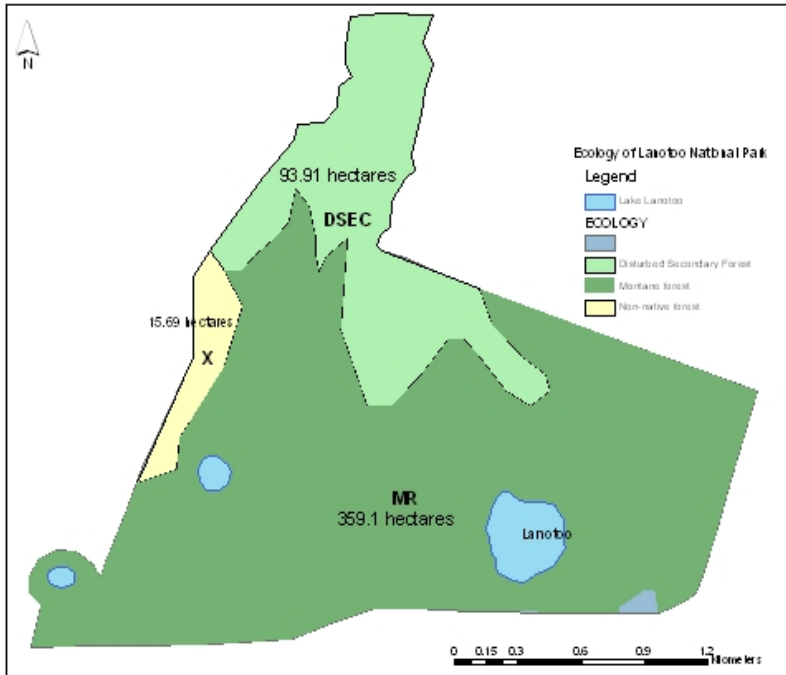
## Reference

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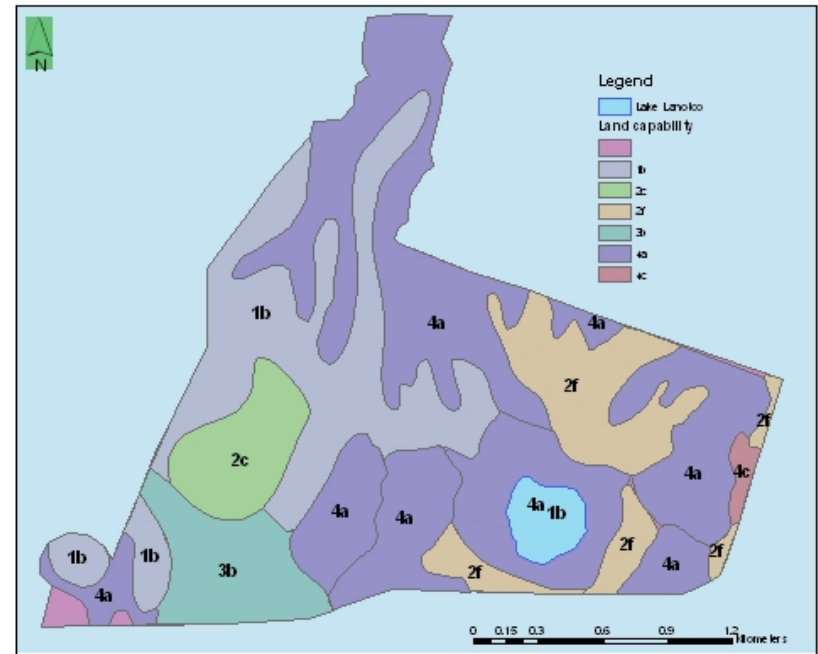
Cedric S. A. Whistler. T.S.Tuaillemafua; 1997. The Conservation of Biological Diversity in the Upland Ecosystem of Samoa. Apia.

Geoff. P. R. Hay; 1991. The Conservation of the Biological Diversity in the Coastal Lowlands of Western Samoa. Department of Conservation. New Zealand.

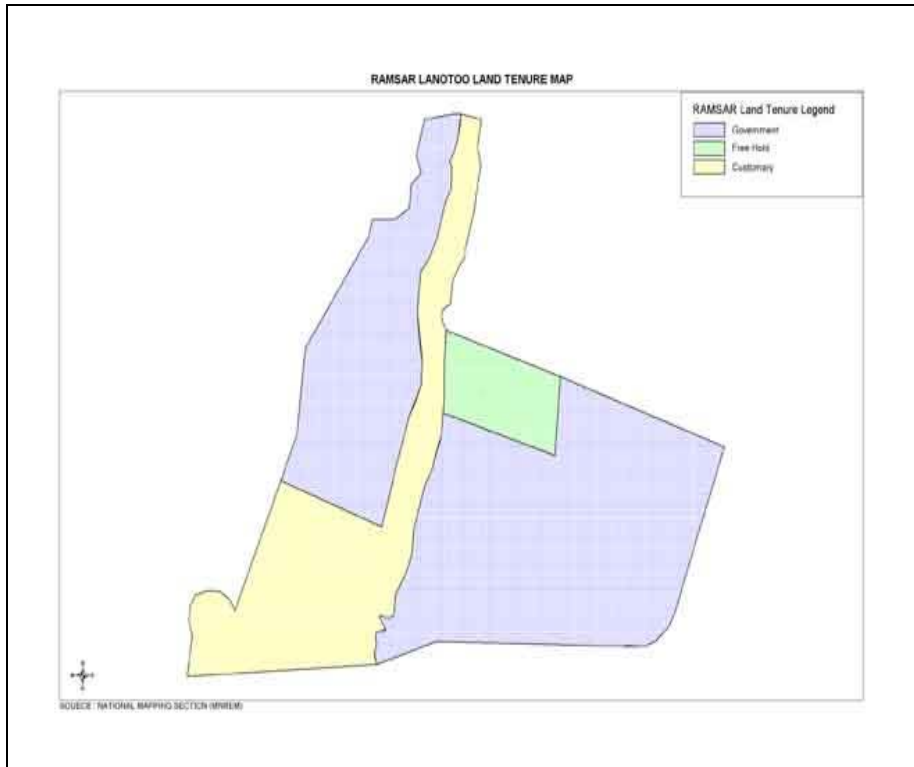
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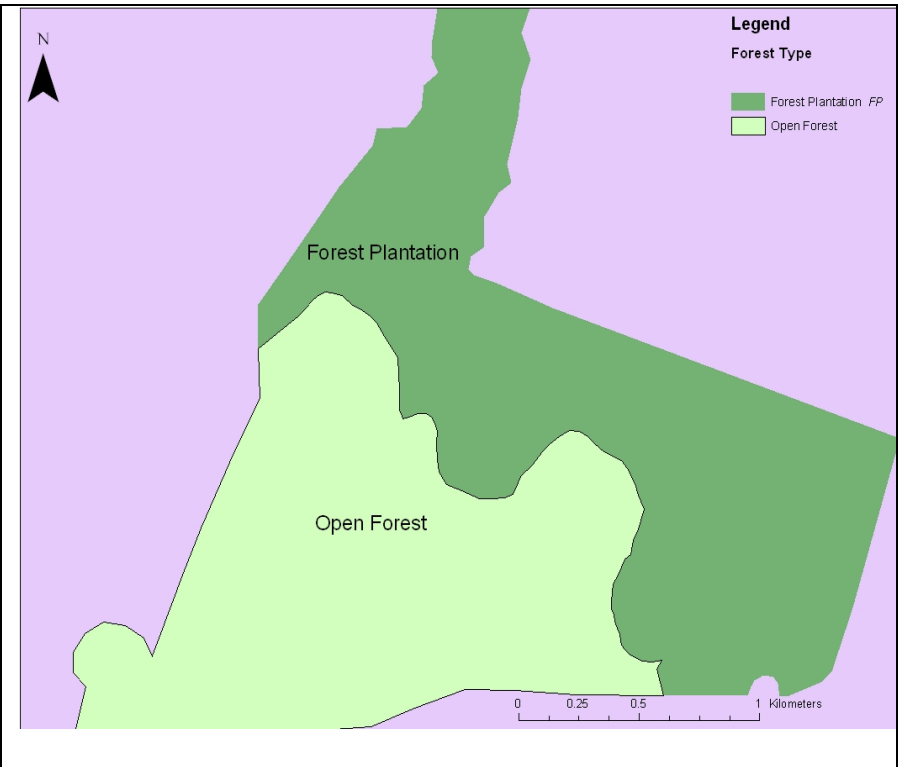
Map 1. Ecology



Map 2. Land capability



Map 3. Land Tenure



Map 4. Forest Type





Image 1. Lake Lanoto'o (close-up shot)



Image 2. Lake Lanoto'o (wider shot)

**APPENDIX 1: PROJECT TECHNICAL TEAM**  
 Prepared by Susau Siolo  
 Senior Terrestrial Biodiversity Officer  
 Terrestrial Resources Conservation Section  
 DEC: MNREM

<b>DIVISION</b>	<b>ROLE</b>	<b>NAME</b>	<b>DESIGNATION</b>
Environment & Conservation	Project Manager	Faumuina S.P.Liu	Assistant CEO Environment & Conservation
	Project Coordinator	Tepa Suaesi	Principal Terrestrial Conservation Officer
	Stakeholder/Management Plan Consultation Coordination	Susau Siolo	Senior Terrestrial Conservation Officer
	Flora Baseline Survey Coordination	Natasha Doherty	Terrestrial Biodiversity Officer (Flora)
	Fauna Baseline Survey Coordination	Samani Tupufia	Terrestrial Biodiversity Officer (Fauna)
	Freshwater Ecology Baseline Survey Coordination	Malama Momoemausu	Principal Marine Resources Conservation Officer
Forestry	Samoa's Forest Resources Information System (SAMFRIS) Forest Types & Ecology Inventories of site	Nanai Tony Leutele	Assistant CEO Forestry
		Muaausa Pau Ione	Senior Draughtman
		Iosefatu Reti	Assistant Regional Forest Officer
Water Resources	Water Resources Conservation & Rehabilitation	Maturo Paniani	Principal Water Resources Officer
		Larissa Toelupe	Senior Water Resources Officer
Technical Services	Land Surveying	Safuta To'elau Iulio	Assistant CEO Technical Services
	GIS Mapping	Leo'o Polutea	Principal Technical Services Officer
		Nomeneta Sam Sali	Technical Services Officer
Corporate Services (Capacity Building Section)	Education, Media & Public Awareness and Project Coordinator of Samoa's World Heritage Program	Tuiolo Schuster	Principal Capacity Building Officer
Land Management	Land Tenure System/Management Issues	Faainoino Laulala	Principal Land Management Officer

## APPENDIX 2: SUMMARY OF PAST SURVEYS ON LAKE LANOTOO

Prepared by Samani Tupufia  
Terrestrial Biodiversity Officer (Fauna)  
Terrestrial Resources Conservation Section  
DEC: MNREM

### Introduction

Lake Lanotoo was first proposed as a National Park in 1975 by the Government of Samoa in accordance with the recommendations highlighted in the UNDAT and IUCN report. The total area for the national park is 1161 acres with the lake Lanotoo size at 27.15 acres, there are also two other smaller lakes found within the park area: Lake Lanoanea and Lake Lanoataata. The main reason for declaring Lake Lanotoo as National Park is that, it was looked at as a tourist attraction. At the mean time there is no known management plan for this national park. The formulation of a management plan for Lake Lanotoo National Park is the soul output for the current survey conducted by the Ministry of Natural Resources Environment and Meteorology.

Lake Lanoto'o is one of the few remaining lakes in Samoa still in pristine natural form. It is located on the central mountain range of the island of Upolu and forms the core part of the watershed area for the Apia Township, the capital of Samoa. It also supplies water for the south-west side of the Upolu Island.

The Government of Samoa has taken several steps to ensure that Lake Lanoto'o remains in a pristine condition. These include declaring Lake Lanoto'o a National Park in 1975, and Samoa's first Ramsar site on World Biodiversity Day, May 24<sup>th</sup>, 2003. In 2004 it ratified the Ramsar Convention on Wetlands.

To meet the country's obligations within the Wetlands Convention, the Ministry of Natural Resources, Environment & Meteorology (MNREM) Division of Environment & Conservation (DEC) identified the need to improve the management of the Lake Lanoto'o site; given the Ramsar status of Lake Lanoto'o, its critical water supply role for the capital city of Samoa and protect the unique biodiversity of the area. Improved management of Lake Lanoto'o was made possible with funds provided by Ramsar Small Grants Fund for Wetland Conservation and Wise Use, WWF's Global Freshwater Program, Samoa's Ministry of Natural Resources, Environment & Meteorology and Dr Bill Phillips (Main Stream Environment Consulting); in developing the project, the Division of Environment & Conservation, with assistants from the Forestry Division and Watershed Division.

### **Vegetation type**

The upland ecosystem survey of 1997 identified the vegetation type as 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 1997 survey revealed that the dominate vegetation type of the open consist of *Cyathea affinis* (**Olioli**), *Cyathea lunulata* (**Olioli**), *Clinostigma* cf. *oncorhyncha* (**Niu vao**), *Myristica hypagyraea* (**Atone**), and *Trichospermum richii* (**Ma'o ui**). 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 (Schuster, Tuailmafua & Whistler, 1998).

Based on the Samoa Forest Resource Information Systems (SamFRIS) Reportb 2003

- 227.1 hectare of the National Park is open forest;
- 242.1 hectare is forest plantation, consisting of *Pinus caribaea* (Caribbean pine), *Paraserianthes falcata* (**Tamaligi pepe**) and *Pometia pinnata* (**tava**); (See Forest Type Map 1 Appendix 1)
- 359.1 hectares (estimate) is montane rainforest;b
- 93.91 hectares is disturbed secondary forest, and

- 15.69 hectares is none native forest. (See Ecology Map 2 Appendix 1)

### **Land Capability**

Within the National Park there are areas in which land is:

- 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 (1b).
- 10% of park area is hilly well drained land without moisture deficit. Soil have low to medium natural nutrients levels and more than 50% stones at the surface with little erosion under cultivation (2c )
- 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 (2f).
- There are also areas which are hilly and steep and have moderate to severe erosion potential (3b)
- 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 (4a) (See Land Capability Map 3 Appendix 1)

### **Land Tenure**

Tenure of the land consists of:

- Government Land - approximately 69%,
- Customary Land - 26%
- Freehold Land – 5% (See Land Tenure Map 4 Appendix 1)

### **1991 Lowland Survey**

During coastal Lowland survey there was no vegetation survey but was highlighted that its surrounding areas were severely damaged by two known impact; the cyclones of the early 90s (Ofa and Val) and forest clearance for agriculture which was noticed increasingly over the past ten years.

### **Birds**

Manumea or tooth-billed pigeon was recorded on this site by Dr Ulf Beichle in 1987 and was also known to be providing a large area of habitat for birds.

Results of bird counts show a decline comparing to the 1982 birds survey done by Tim Lovegrove. In contrast the Island thrush which has not been recorded in the 1982 was observed near the lake during the counts.

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**Ecology**

359.1 hectares estimating is montane rainforest, 93.91 hectares is disturbed secondary forest and about 15.69 hectares is non-native forest which is classified as the National Parks areas for ecology. Refer to Ecology Map.

**Geology**

Salani volcanics: Generally rocks are “deeply weathered” with relatively “few boulders that are scattered on the ground surface frequently show onion-skin weathering”. “The soil is usually over 12 inch thick”. Deep gorges are cut into this type of rocks such as in ‘Vanu River Savaii and Fagataloa River in Upolu” and as well as valleys are a common feature, which make them distinguishable from aerial observations.

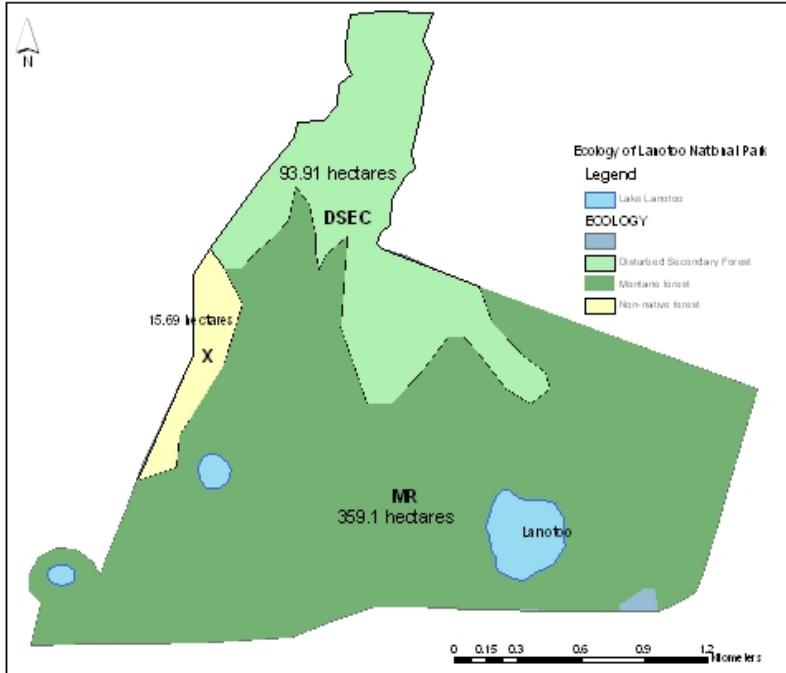
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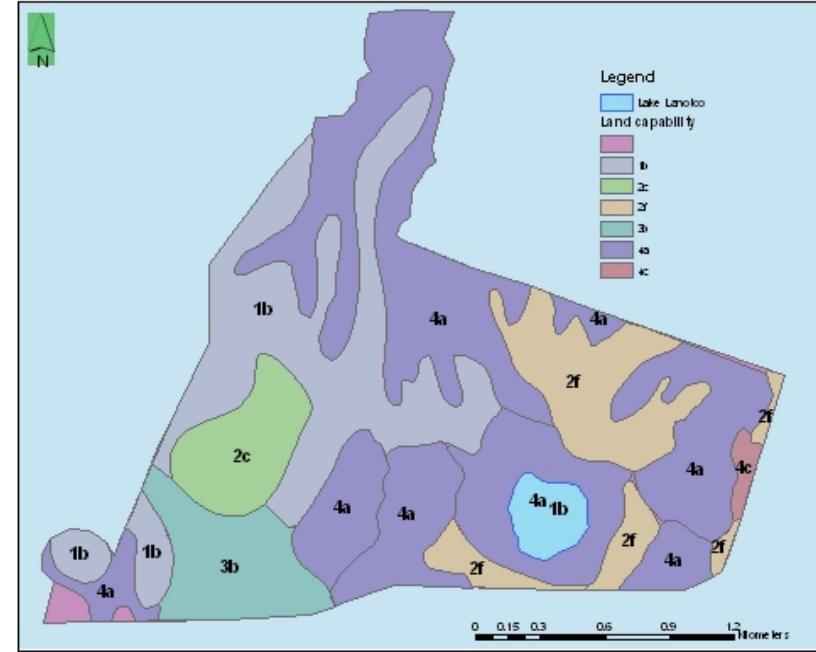
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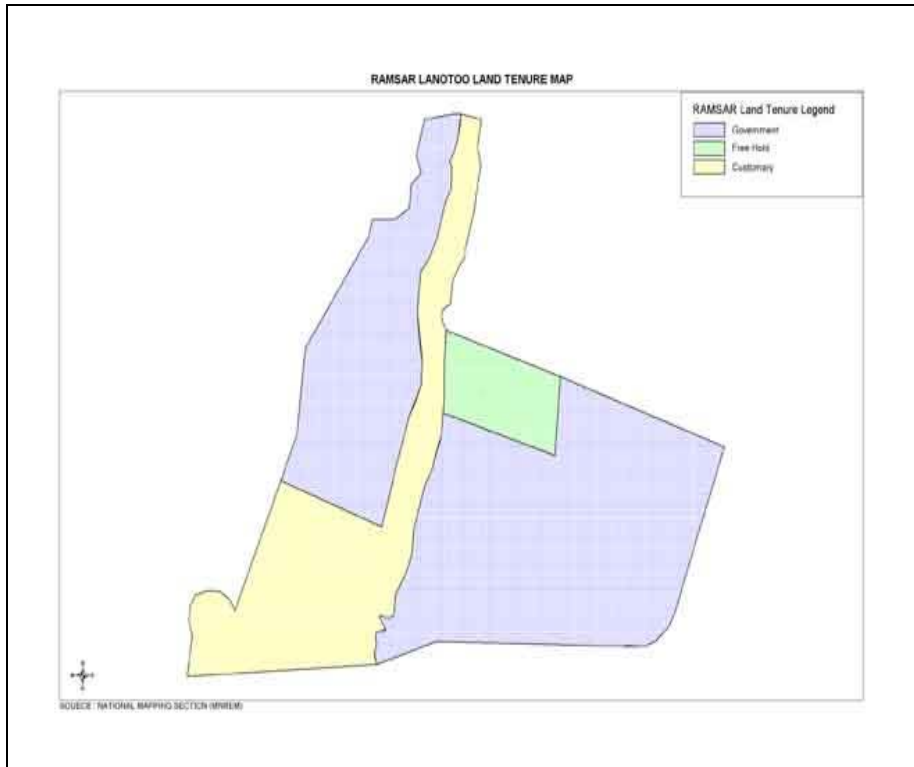
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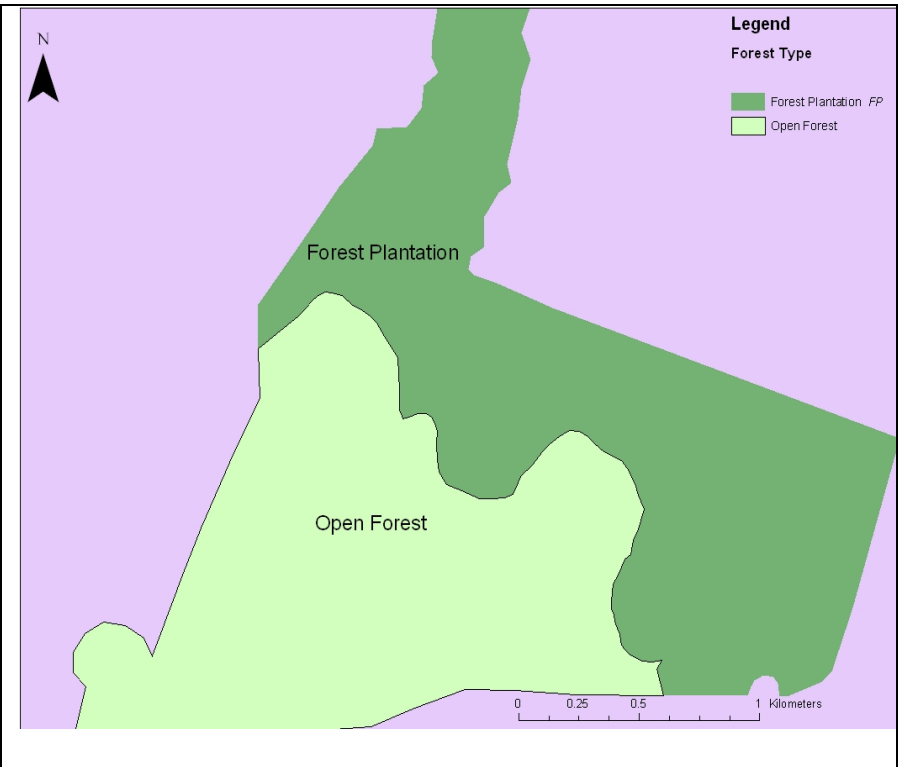
Map 1. Ecology



Map 2. Land capability



Map 3. Land Tenure



Map 4. Forest Type





Image 1. Lake Lanoto'o (close-up shot)



Image 2. Lake Lanoto'o (wider shot)

## Appendix

**APPENDIX 3: FLORA SPECIES REPORT ON INITIAL INVENTORY SURVEYS**  
 Prepared by Natasha Doherty  
 Terrestrial Biodiversity Officer (Flora)  
 Terrestrial Resources Conservation Section  
 DEC: MNREM

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**1. PROJECT AIMS AND OBJECTIVES**

**1.1 Project Aim**

This project aims to:

1. Undertake a detailed site inventory to inform planning, identify areas of degradation that require attention, and confirm the distribution and status of biodiversity in the area;

2. Use the inventory findings to promote wise uses of the resources within the Ramsar site, as well as focusing on necessary rehabilitation work;
3. Develop a wise use management framework through consultations with the customary owners of the land, that would be supported by a range of education and public awareness raising activities;
4. As part of local consultations, promote alternative income generating activities; and,
5. Use inventory findings to establish appropriate monitoring measures to ensure the ecological character of the site is retained and any threats to this can be detected as early as possible

These aims correspond with the following Operational Objectives from the Ramsar Strategic Plan 2003-2008

- 1 (Inventory and assessments);
- 3 (Integration of wise use into sustainable development);
- 6 (Local communities, indigenous people and cultural values);
- 9 (Communication, education and public awareness); and,
- 11 (Management planning and monitoring of Ramsar sites)

## **1.2 Project Objectives**

### **1.2.1 General Objective**

To develop and gain support for long-term sustainable management practices at Lake Lanuto'o in order to secure a high quality water supply for Samoa's capital city, and to protect the biodiversity and ecological character of this Ramsar site.

### **1.2.2 Specific Objectives**

1. To complete a detailed ecological survey of species and resource use inventory of the Ramsar site to inform planning, identify areas of degradation that require attention, and confirm the distribution and status of biodiversity in the area;
2. To promote wise uses of the resources within the Ramsar site, as well as target necessary rehabilitation work;
3. To develop a wise use management framework through consultations with the customary owners of the land and other government agencies as necessary;
4. To raise awareness among stakeholders of the importance of protecting Lake Lanoto'o;
5. To develop, promote and implement alternative income generating activities for the local people in order that unsustainable land-use practices are discontinued; and,
6. To establish appropriate monitoring to ensure the ecological character of the site is retained and any threats to this can be detected as early as possible.

This report will focus on the first aim – Undertake a detail site inventory. However, a complete inventory of the National Park area has not yet been completed, only four belt transects have been completed around Lake Lanoto'o, and this report focuses solely on the flora of Lake Lanoto'o; a separate report on fauna of the area is being prepared. Currently work is being carried out to complete 12 more transects around Lake Lanoto'o. It is hoped in the future we will be able to survey the entire National Park area.

## **2.METHODOLOGY**

The methodology used was adapted from Smith & Smith's book, "Ecology & Field Biology. Sixth Edition. 2001". A 500m buffer zone was created around Lake Lanoto'o, starting from the waters edge. Within in this, sites to be surveyed were randomly selected using a grid overlay and a random number table created in Microsoft Excel 2003.

### **2.1 Methodology in office**

1. Determine total area of the site to be sampled; divide by 10 to obtain the total sample area.
2. Create a map of Lake Lanoto'o with a grid overlay.
3. In excel create a random number table. The random numbers created are then used to select which squares to sample in.
4. Coordinates of the random squares selected to be sampled are recorded into a GPS.

### **2.2 Methodology in field**

1. Locate random squares using the coordinates recorded in the GPS.
2. Once at a location layout a belt transect; length 100m, width 10m, divided the length of transect into segments of 10m. Pound 2 sticks into the ground, 10m apart to get width of transect, connect sticks with string. This will mark the start of transect. Next, measure out 100m using a 100m measuring tape, mark the length of the transect with a string; pounding 2 sticks into the ground, 10m apart to mark the end of the transect. Next divide transect into segments of 10m. Finally divide the 10m segments in 5m quadrats. This is done by running string down the middle of transect (See Figure 1 Appendix 2 for diagram of transect)
3. Once transect has been laid out, record the vegetation present within each 10m quadrat by listing the species and given their total estimates (abundance and coverage) and sociability (See Appendix 4 Methodology for a more detailed account of methodology used)

## **3. FIELD SURVEY**

The survey was carried out from the 18 – 19 April 2006; two transects a day were surveyed. All four transects had been set up the week before on 12 – 13 April 2006.

### **3.1 Survey team**

One of the goals of the survey was institutional strengthening for MNREM staff; for this reason the survey team comprised of local personnel. Both floral and fauna surveys were conducted at the same time and are made up of the same team of people.

#### **Talie Foliga**

Team leader and Botanist

Talie works for the DEC in the National Park & Reserves Sections as Senior Park Ranger. Talie's is considered to be very knowledgeable on Samoan plants, having worked in the past

with Dr. Art Whistler, an American Botanist who has written several books and articles on the plants of Samoa. Talie was with the survey team for one day, 19<sup>th</sup> April 2006.

### **Samani Tupufia**

GIS Specialist and fauna surveyor

Samani works for the DEC in the Terrestrial Section as a fauna officer and GIS specialist. He designed the fauna survey of Lake Lanoto'o, created maps of the area and GPS our location in the field. He has conducted bird surveys in the past. Samani was with the. The survey has provided him with the chance to add entomological survey to his knowledge. Samani was with the team for both days of the survey.

### **Natasha Doherty**

Assistant Botanist

Natasha works for the DEC in the Terrestrial Section as a flora officer. She designed the flora survey of Lake Lanoto'o. The survey has provided her with the chance to add botanical and scientific survey techniques to his knowledge. Natasha was with the team for both days of the survey

### **Eti Malolo**

Assistant entomologist

Eti works for the Watershed Division as a Watershed Management Officer. He has conducted flora and bird surveys in the past. He was thus considered because of his knowledge on conducting surveys. Eti was with the team for both days of the survey.

### **Joe Reti**

Assistant botanist

Joe works for the Forestry Division and has conducted both flora and bird surveys in the past. He was thus considered because of his knowledge on conduction surveys. Joe was with the team for both days of the survey.

### **Larissa Toelupe**

Assistant botanist

Larissa works for the Water Division, she is the Senior Watershed Management Officer and has conducted flora surveys in the past, thus she was considered. She was only with the team on April 18<sup>th</sup> 2006

The team was assisted at various times by other staff from the Ministry of Natural Resources, Environment & Meteorology and by casual works.

## **4. SURVEY RESULTS**

Four belt-transects, 100m by 10m were laid out along the east side of Lake Lanoto'o. See Appendix 1 Survey Map for location of these four transects the 500m buffer zone around the lake and proposed transects.

### **Results from Transect 1:**

- Dominate species **100%** coverage of area: *Freycinetia spp* ('ie'ie), *Clidemia hita* (Laau lau mamoe/ Vao fulu), and *Cyathea spp* (Olioli(tree fern)).
- Species covering **80%** of transect: *Cordyline fruticosa* (Ti vao) and *Funtumia elastica* (Pulu vao)

- **40%** coverage of transect: *Spathoodea campanulata* (**Fa'apisi**), *Passiflora foetida* (**Pasio vao**)
- **30%** coverage of transect: *Ficus tinctoria* (**Mati**), *Rhus taitensis* (**Tavai**), *Paraserianthes falcataria* (**Tamaligi pepe**)
- **20%** coverage of transect: *Alphitonia zizphoides* (**Toi**), *Palaquium stehlinii* (**Gasu**), *Reynoldsia pleiosperma* (**Vi vao**), *Angiopteris evecta* (**Gase**), (**Laa ta ie**<sup>1</sup>), *Hedychium flavescens* (**Teuila (Cream ginger)**)
- **10%** coverage of transect: *Cestrum nocturnum* (**Teine o le po/ Ali o le po**), and five unknown species of plants.

## Results from Transect 2

- Dominant plant species in transect 2 *Cythaea* spp (**Olioli (tree fern)**) covering **90%** of area.
- **70%** coverage of transect: *Clidemia hirta* (**Laa lau mamoe/ vao fulu**), and *Paraserianthes falcataria* (**Tamaligi pepe**)
- **60%** coverage of transect: *Freycinetia* spp ('ie 'ie)
- **50%** coverage of transect: *Mikania micrantha* (**Fue Saina**), *Cordyline fruticosa* (**Ti vao**), *Musa xparadisiaca* (**Taemanu**)
- **40%** coverage of transect: (**Vao povi**), *Hedychium flavescens* (**Teuila cream ginger**)
- **30%** coverage of transect: *Cestrum nocturnum* (**Teine o le po/ Ali o le po**), *Passiflora foetida* (**Pasio vao**)
- **20%** coverage of transect: *Palaquium stehlinii* (**Gasu**)
- **10%** coverage of transect: *Glochidion ramiflorum* (**Masame**), *Heliconia laufao* (**Laufao**), (**Red Teuila**), (**Ofe, bamboo**), *Kyllinga* sp. (**Vao tuise**), (**Teuila red**), *Syzygium inophylloides* (**Asi**), *Rhus taitensis* (**Tavai**), *Reynoldsia pleiosperma* (**Vi vao**), *Dysoxylum maota* (**Maota**), *Funtumia elastica* (**Pulu vao**), *Lantana camara* (**Latana**), (**Guava**), (**lau ta ie**)

## Results from transect 3

- **100%** coverage of area *Mikania micrantha* (**Fue saina**)
- **80%** coverage of area: *Clidemia hirta* (**Laa lau mamoe/ Vao fulu**), *Freycinetia* spp ('ie 'ie)
- **70%** coverage of area: *Cyathea* spp.(**Olioli (tree fern)**)
- **50%** coverage of area: *Elaeocarpus floridanus* (**A'amati'e**), *Passiflora foetida* (**Pasio vao**), *Pandanus tectorius* (**Fasa**)
- **40%** coverage of area: *Piper graeffei* (**Avaava aitu solosolo / Fue manogi**), *Hedychium flavescens* (**Teuila (cream ginger)**), *Glochidion ramiflorum* (**Masame**), *Dissotis* sp.(pink lady),
- **30%** coverage of area: *Cordyline fruticosa* (**Ti vao**), *Spiraeanthemum samoense*, *Weinmannia affinis*, *Cythaea* sp. (**Lau magamaga**), *Fagraea berteriana* (**Pualulu**), *Lantana camara* (**Latana**), *Crodeum* sp. (**Lau ulu**)
- **20%** coverage of area: *Paraserianthes falcataria* (**Tamaligi pepe**), *Syzygium inophylloides* (**Asi**), *Cabthium merrillii* (**Olasina**), *Zingiber zerumbet* (**Faua povi / Avapui**), *Reynoldsia pleiosperma* (**Vi vao**), *Antidesma sphaerocarpum*, *Trichospermum richii* (**Maosina/ Ma'oui**)
- **10 %** coverage of area: *Cestrum nocturnum* (**Teine o le po/ Ali o le po**), *Syzygium samoense* (**Fena vao**), (**Guava**), *Epipremnum pinnatum* (**Fue Laufao**), *Ficus tinctoria* (**Mati**), *Cerbera manghas* (**Leva**), *Asplenium nidus* (**Lau gapapa**), *Spathoodea campanulata* (**Fa'apisi**), *Elattostachys falcate* (**Taputoi**), *Alyxia bracteolosa* (**Lau maile**),

<sup>1</sup> Names highlighted in yellow are missing scientific names.

*Syzygium inophylloides* (**Asi toa**), *Clinostigma samoense* (**Niu vao**), *Planchonella* sp., *Laportea* sp., *Paspalum conjugatum* (T-grass)

#### Results from transect 4

- 100% coverage of area: *Clidemia hirta* (**Laau lau mamoe/ Vao fulu**) *Cyathea* spp. (**Olioli (Tree fern)**), *Freycinetia* spp ('ie 'ie)
- 90% coverage of area: *Mikania micrantha* (**Fue Saina**)
- 80% coverage of area: *Cestrum nocturnum* (**Teine o le po/ Ali o le po**), *Piper graeffi* (**Avaava aitu solosolo/ Fue manogi**)
- 70% coverage of area: *Cordyline fruticosa* (**Ti vao**)
- 60% coverage of area: *Epipremnum pinnatum* (**Fue Laufao**)
- 50% coverage of area: *Funtumia elastica* (**Pulu vao**)
- 40% coverage of area: *Passiflora foetida* (**Pasio vao**), *Angiopteris evecta* (**Gase**)
- 30% coverage of area: *Syzygium inophylloides* (**Asi Vai**), *Trichospermum richii* (**Maosina / Ma'oui**), *Cyrtandra* sp., *Barringtonia samoensis* (**Falaga**), *Dysoxylum huntii* (**Maotamea**) *Mucuna gigantean/ Entada phaseoloides* **Tupe/tifa**
- 20% coverage of area: *Glochidion christophersenii* (**Masame vao**), *Castilla elastica* (**Pulu mamoe**) *Davallia solida* (**Lau gase**) *Myristica inutilis* (**Atone**)
- 10% coverage of area: *Paraserianthes falcata* (**Tamaligi pepe**) *Weinmannia affinis*, *Asplenium nidus* (**Lau gapapa**), *Cyrtandra* sp. (**Lau magamaga**) *Fagraea berteriana* (**Paululu**), (**Vaomageso/ogoogo**), *Piper* spp. *Phymatosorus grossus* (**Lau auta**) *Neonauclea forsteri* (**Afa**), (**Vae paa**), *Musa xparadisica* (**Taemanu**), *Faradaya amicornum* (**Mamalupe**), *Aglaiia samoensis* (**Laga'ali**), *Elaeocarpus ulianus*, *Pisonia umbellifera*, *Orchid epiphyte* (See Appendix 3 for Results tables)

#### 5. CONCLUSION

Vegetation results collected from all four belt-transects indicate that, the east side of Lake Lanoto'o is highly disturbed vegetation. This is known because of the high presence of successional vegetation and/or alien species such as: *Clidemia hirta* (**Laau lau mamoe/ Vao fulu**), *Cestrum nocturnum* (**Teine o le po/ Ali o le po**), *Mikania micrantha* (**Fue Saina**); and also the high presence of secondary forest species such as: *Cyathea* spp. (**Olioli (Tree fern)**), *Paraserianthes falcata* (**Tamaligi pepe**), *Elattostachys falcate* (**Taputoi**), *Glochidion ramiflorum* (**Masame**), *Funtumia elastica* (**Pulu vao**), *Rhus taitensis* (**Tavai**), *Alphitonia zizphoides* (**Toi**), *Neonauclea forsteri* (**Afa**), and *Castilla elastica* (**Pulu mamoe**). Disturbance in the area is most likely the result of cyclones Ofa and Val in the early 1990's and more recently cyclone Heta in 2004.

The information collected corresponds with the information collected in the 1997 Ecological Upland Survey which identified some of the area surrounding Lake Lanto'o as having vegetation characteristic of a site highly damaged by cyclones. The dominant vegetation type of the open consists of *Cyathea affinis* (**Olioli**), *Cyathea lunulata* (**Olioli**), *Clinostigma* cf. *oncorhyncha* (**Niu vao**), *Myristica hypagryaea* (**Atone**), and *Trichospermum richii* (**Ma'o ui**). The abundance of the two fern species and *Trichospermum richii* are indicators of severe disturbances, while the other two species are most likely survivors relatively adapted to cyclones. The vegetation between the trees and ferns is dominated by the weedy alien shrub *Clidemia hirta* (**Laau lau mamoe/ Vao fulu**) (Schuster, et al., 1997).



## **6. CONSTRAINTS**

1. In the field we were unable to locate exactly the coordinates which were recorded into the GPS for the random sites. So we located the squares as best we could with the location we had on the GPS and using topography maps.
2. Due to the thickness of the vegetation and ruggedness of the terrain we were not able to divide the transactions again into 5m quarts, nor were we able to run a second 100m line. We therefore, only had one 100m line and the 10m segments (See figure 2 Appendix 2)
3. We had initially planned to survey 37 sites within the 500m buffer zone, however, 10 sites fell outside of the National Park boundary, so we planned to do 27, however, advice from other team members suggested that we need not do so many, 16 would be sufficient – four on the east side of the Lake, another four on the south, west and north side.
4. Team members were not always available to conduct surveys due to other work commitments.
5. Ecological survey of Lake Lanoto'o started later than had been planned due to the rainy season at the beginning of the year.
6. During flora survey we were able to easily identify: trees, vines, shrubs and herbs, however, less so for fern species, mosses and fungi. Little is known of the ferns, mosses and fungi of Samoa.
7. The team also had difficulty with reaching the National Park area because of a lack of office vehicles.

## 7.REFERENCE

Samoa Forestry Resource Information Systems (SamFRIS)., (2003). *SamFRIS Report*. Forestry Division of the Ministry of Agriculture, Forestry & Fisheries. Government of Samoa.

Schuster, C., Tuaillemafua, T., & Whistler, A. (1998). *The Conservation of Biological Diversity in Uplands Ecosystems of Samoa*. Pg 51. Wellington, New Zealand.

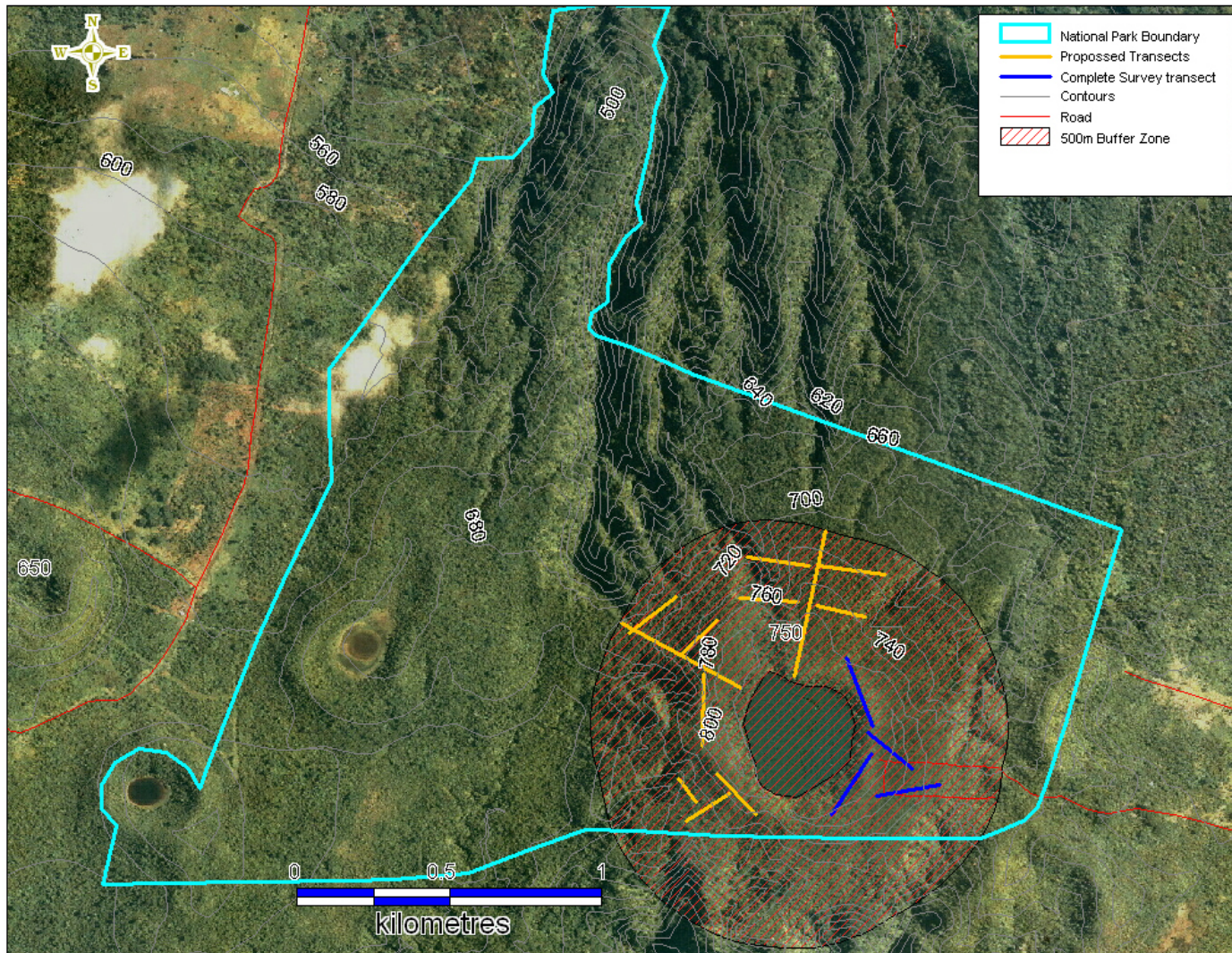
Smith, R., & Smith, T. (2001). *Ecology & Field Biology. Sixth Edition*. Pg 725. Benjamin Cummings. United States of America.

# APPENDICES

## APPENDIX 1: MAPS

### SURVEY MAP

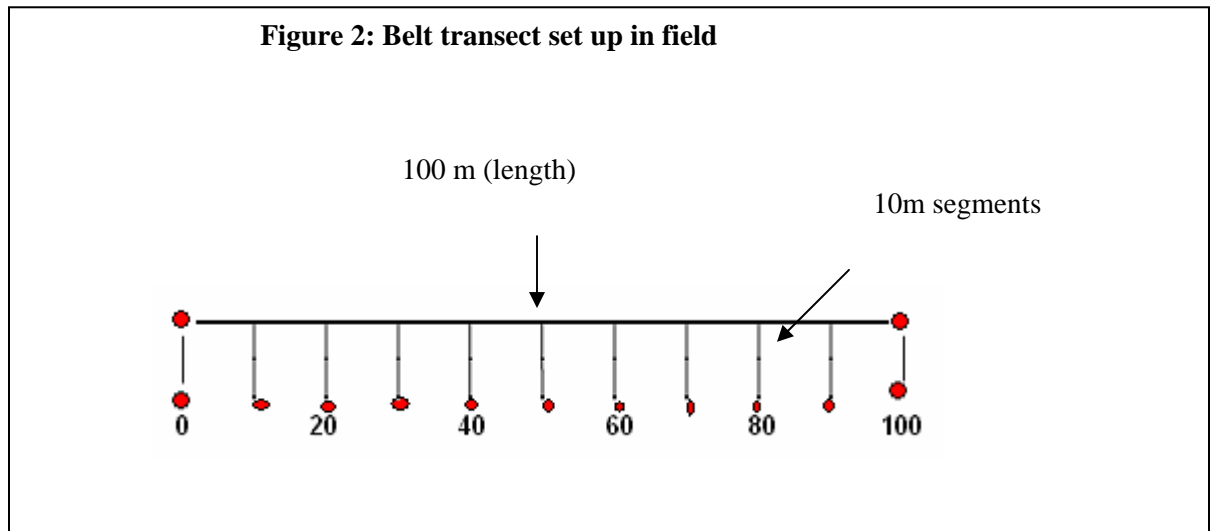
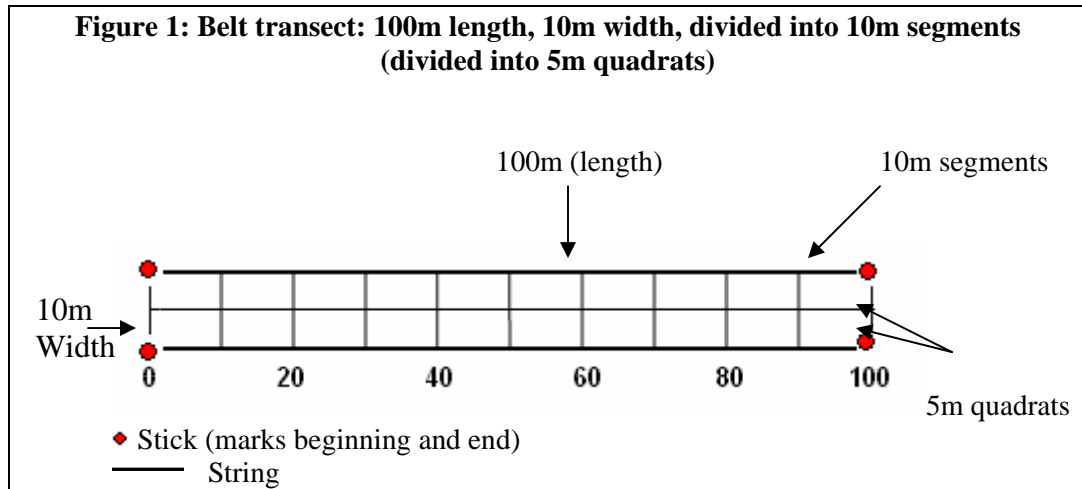
Map of Lake Lanoto'o showing the 500m buffer where survey carried out, the transects completed and proposed transects



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## APPENDIX 2: FIGURES



## APPENDIX 3: RESULTS TABLES

### Key to understanding results table with paired values

<b>Table A: Total Estimate Scale (abundance plus coverage)</b>	
+	Individuals of a species sparsely present in the stand: coverage very small
1	Individuals plentiful, but coverage small.
2	Individuals very numerous if small; if large, covering at least 5% of area.
3	Individuals few or many, collectively covering 6-25% of the area.
4	Individuals few or many, collectively covering 26-50% of the area.
5	Plants cover 51-75% of the area.
6	Plants cover 76-100% of the area.

<b>Table B: Sociability Classes</b>	
Class 1	Shoots growing singly
Class 2	Scattered groups or tufts of plants
Class 3	Small, scattered patches or cushions
Class 4	Large patches or broken mats
Class 5	Very large mats of stands or nearly pure populations that almost blanket the area

For example if a plant species has the value of 4.4, the first figure is the total estimate and the second figure is the sociability. Once a number of plots have been surveyed, the community characteristics can be combined.

## Results tables for Transects

### Transect 1, Lake Lanoto'o (18<sup>th</sup> April 2006)

Scientific Name	Samoan Name	Transect 1 Plot number										Frequency (%)
		1	2	3	4	5	6	7	8	9	10	
<i>Freycinetia spp.</i>	'ie 'ie	+1	3.4	3.3	3.4	6.5	+1	3.2	+1	4.4	2.1	100
<i>Clidemia hirta</i>	Laau lau mamoe/ Vao fulu	5.4	5.4	1.1	1.2	1.1	5.5	1.2	6.5	3.3	3.1	100
	Laau ta 'ie	4.4	+1									20
<i>Cyathea spp.</i>	Olioli (tree fern)	4.4	4.4	1.2	+1	+1	+1	+1	+1	+1	+1	100
<i>Angiopteris evecta</i>	Gase	+1		+1								20
<i>Paraserianthes falcata</i>	Tamaligi pepe	+1							+1	+1		30
<b>Unknown 1</b>		1.2				+1						20
<i>Cordyline fruticosa</i>	Ti vao		+1	+1	+1	+1		+1	+1	+1	+1	80
<i>Passiflora foetida</i>	Pasio vao		+1	+1		+1					+1	40
<i>Reynoldsia pleiosperma</i>	Vi vao		+1							+1		20
<i>Palaquium stehlinii</i>	Gasu		+1							+1		20
<i>Hedychium flavescens</i>	Teuila (cream ginger)		+1	3.3								20
<i>Funtumia elastica</i>	Pulu vao			+1	+1	+1	+1	+1	+1	+1	+1	80
<i>Rhus taitensis</i>	Tavai			+1	+1		+1					30
<b>Unknown2</b>					+1							10
<i>Ficus tinctoria</i>	Mati				+2	+1		+1				30

<b>Unknown3</b>					+.1							10
<b>Unknown4</b>					+.1							10
<b>Unknown5</b>							+1					10
<i>Spathoodea campanulata</i>	<b>Fa'apisi</b>						1.1	1.1	+1	+1		40
<i>Alphitonia zizphoides</i>	<b>Toi</b>						+1				+1	20
<b>Unknown 6</b>								+1				10
<i>Cestrum nocturnum</i>	<b>Teine o le po/ Ali o le po</b>										+1	10

<b>General recordings</b>	
<b>Transect #</b>	1
<b>Grid #</b> (taken from map)	
<b>Surveyor (s)</b>	ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	0-10m
<b>Date/ Time</b>	18/04/2006 11:08am
<b>Waypoint</b> (only taken at beginning of transect)	049
<b>Coordinates</b>	S 13°54'43.3" W171°49'22.5"
<b>Elevation</b>	762m
<b>Weather</b>	Partly Cloudy
<b>General description of vegetation</b>	Highly disturbed vegetation
<b>Topography</b>	Gentle slope

<b>General recordings</b>	
<b>Transect #</b>	1
<b>Grid #</b> (taken from map)	
<b>Surveyor (s)</b>	ND, ST, LT, EM, JR.
<b>Location on</b>	10-20m



<b>transect</b> (divided into 10m intervals)	
<b>Date/ Time</b>	18/04/2006      11:34am
<b>Waypoint</b> (only taken at beginning of transect)	051
<b>Coordinates</b>	S 13°54'43.7" W171°49'22.9"
<b>Elevation</b>	757m
<b>Weather</b>	Partly Cloudy
<b>General description of vegetation</b>	Highly disturbed vegetation
<b>Topography</b>	Gentle slope

<b>General recordings</b>		
<b>Transect #</b>	1	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	20-30m	
<b>Date/ Time</b>	18/04/2006      11:44am	
<b>Waypoint</b> (only taken at beginning of transect)	052	
<b>Coordinates</b>	S 13°54'43.8" W171°49'23.1"	
<b>Elevation</b>	762m	
<b>Weather</b>	Partly Cloudy	
<b>General description of vegetation</b>	Highly disturbed vegetation	
<b>Topography</b>	Gentle slope	



<b>General recordings</b>		
<b>Transect #</b>	1	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	30-40m	
<b>Date/ Time</b>	18/04/2006	11:50am
<b>Waypoint</b> (only taken at beginning of transect)	053	
<b>Coordinates</b>	S 13°54'43.9" W171°49'23.6"	
<b>Elevation</b>	762m	
<b>Weather</b>	Partly Cloudy	
<b>General description of vegetation</b>	Highly disturbed vegetation	
<b>Topography</b>	Gentle slope	

<b>General recordings</b>		
<b>Transect #</b>	1	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	40-50m	
<b>Date/ Time</b>	18/04/2006	12:06pm
<b>Waypoint</b> (only taken at beginning of transect)	054	
<b>Coordinates</b>	S 13°54'43.6" W171°49'23.9"	
<b>Elevation</b>	755m	
<b>Weather</b>	Partly Cloudy	
<b>General</b>	Highly disturbed vegetation	

<b>description of vegetation</b>	
<b>Topography</b>	Gentle slope, rolling hills

<b>General recordings</b>	
<b>Transect #</b>	1
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	50-60m
<b>Date/ Time</b>	18/04/2006 12:10pm
<b>Waypoint</b> (only taken at beginning of transect)	055
<b>Coordinates</b>	S 13°54'43.8" W171°49'24.2"
<b>Elevation</b>	764m
<b>Weather</b>	Sunny
<b>General description of vegetation</b>	Highly disturbed vegetation
<b>Topography</b>	Gentle slope, rolling hills

<b>General recordings</b>	
<b>Transect #</b>	1
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	60-70m
<b>Date/ Time</b>	18/04/2006 12:17pm
<b>Waypoint</b> (only taken at beginning of transect)	056
<b>Coordinates</b>	S 13°54'43.9"

	W171°49'24.4"
<b>Elevation</b>	764m
<b>Weather</b>	Sunny with a few clouds
<b>General description of vegetation</b>	Highly disturbed vegetation
<b>Topography</b>	Gentle slope, rolling hills

<b>General recordings</b>		
<b>Transect #</b>	1	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	70-80m	
<b>Date/ Time</b>	18/04/2006	12:25am
<b>Waypoint</b> (only taken at beginning of transect)	057	
<b>Coordinates</b>	S 13°54'43.8" W171°49'25.0"	
<b>Elevation</b>	751m	
<b>Weather</b>	Partly Cloudy	
<b>General description of vegetation</b>	Highly disturbed vegetation	
<b>Topography</b>	Gentle slope, rolling hills	

<b>General recordings</b>		
<b>Transect #</b>	1	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	80-90m	
<b>Date/ Time</b>	18/04/2006	12:30am

<b>Waypoint</b> (only taken at beginning of transect)	058
<b>Coordinates</b>	S 13°54'43.9" W171°49'25.3"
<b>Elevation</b>	750m
<b>Weather</b>	Partly Cloudy
<b>General description of vegetation</b>	Highly disturbed vegetation
<b>Topography</b>	Gentle slope, rolling hills

<b>General recordings</b>		
<b>Transect #</b>	1	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	90-100m	
<b>Date/ Time</b>	18/04/2006	12:34am
<b>Waypoint</b> (only taken at beginning of transect)	059	
<b>Coordinates</b>	S 13°54'44.0" W171°49'25.3"	
<b>Elevation</b>		
<b>Weather</b>	Partly Cloudy	
<b>General description of vegetation</b>	Highly disturbed vegetation	
<b>Topography</b>	Gentle slope, rolling hills.	

Transect 2, Lake Lanoto'o (18<sup>th</sup> April 2006)

Scientific Name	Samoan Name	Transect 2 Plot number										Frequency (%)
		1	2	3	4	5	6	7	8	9	10	
<i>Clidemia hirta</i>	Laau lau mamoe/ Vao fulu	2.3	5.4	6.5	+1	+1	+1			+1		70
<i>Cyathea spp.</i>	Olioli (tree fern)	2.2	+1	+1	+1		+1	1.1	+1	1.1	+1	90
<i>Cestrum nocturnum</i>	Teine o le po / Ali o le po	4.4			1.2				3.3			30
<i>Passiflora foetida</i>	Pasio vao	+1	+1	+1								30
Mikania micrantha	Fue Saina	+1			+1		5.5	3.3	2.3			50
	Vao povi	+1	5.5	+1					1.2			40
Musa xparadisiaca	Taemanu	+1		+1	+1	+1			+1			50
<i>Cordyline fruticosa</i>	Ti vao	+1		+1	+1	+1		3.2				50
<i>Freycinetia spp</i>	'ie 'ie	+1		+1	+1	3.2	3.2			3.2		60
	Guava		+1									10
	Laau ta 'ie		5.4									10
<i>Palaquium stehlinii</i>	Gasu		+1	+1								20
<i>Paraserianthes falcataria</i>	Tamaligi pepe		+1	+1	+1	+1	+1	+1	+1			70
Lantana camara	Latana			2.2								10
	Unknown 5				+1	+1						20
<i>Funtumia elastica</i>	Pulu vao					+1						10

Dysoxylum maota	<b>Maota</b>					+1						10
Reynoldsia pleiosperma	<b>Vi vao</b>					+1						10
Rhus taitensis	<b>Tavai</b>					+1						10
Syzygium inophylloides	<b>Asi</b>					+1						10
<b>Unknown 1</b>							5.3			+1		20
<i>Hedygium flavescens</i>	<b>Teuila (cream ginger)</b>						1.3	6.5		3.2	6.5	40
Kyllinga sp.	<b>Vao tuise</b>								1.2			10
	<b>Ofe Bamboo</b>								+1			10
Heliconia laufao	<b>Laufao</b>								+1			10
	<b>Teuila (red)</b>									3.2		10
Glochidion ramiflorum	<b>Masame</b>									+1		10

<b>General recordings</b>	
<b>Transect #</b>	2
<b>Grid #</b> (taken from map)	Surveyor (s) ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	0-10m
<b>Date/ Time</b>	18/04/2006 13:20am
<b>Waypoint</b> (only taken at beginning of transect)	060
<b>Coordinates</b>	S 13°54'39.7" W171°49'28.2"
<b>Elevation</b>	761m
<b>Weather</b>	Sunny with a few clouds
<b>General</b>	Highly disturbed vegetation – mostly invasive species

<b>description of vegetation</b>	
<b>Topography</b>	Gentle slope, rolling hills.

<b>General recordings</b>	
<b>Transect #</b>	2
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	10-20m
<b>Date/ Time</b>	18/04/2006 13:28am
<b>Waypoint</b> (only taken at beginning of transect)	061
<b>Coordinates</b>	S 13°54'39.3" W171°49'28.3"
<b>Elevation</b>	773m
<b>Weather</b>	Sunny with a few clouds
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Moderate slope

<b>General recordings</b>	
<b>Transect #</b>	2
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	20-30m
<b>Date/ Time</b>	18/04/2006 13:20am
<b>Waypoint</b> (only taken at beginning of transect)	062

<b>Coordinates</b>	S 13°54'38.9" W171°49'28.4"
<b>Elevation</b>	780m
<b>Weather</b>	Sunny with a few clouds
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Moderate slope.

<b>General recordings</b>		
<b>Transect #</b>	2	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	30-40m	
<b>Date/ Time</b>	18/04/2006      13:38am	
<b>Waypoint</b> (only taken at beginning of transect)	063	
<b>Coordinates</b>	S 13°54'38.8" W171°49'28.7"	
<b>Elevation</b>	776m	
<b>Weather</b>	Sunny with a few clouds	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Gentle slope	

<b>General recordings</b>		
<b>Transect #</b>	2	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	40-50m	



<b>Date/ Time</b>	18/04/2006 13:44am
<b>Waypoint</b> (only taken at beginning of transect)	064
<b>Coordinates</b>	S 13°54'38.6" W171°49'29.0"
<b>Elevation</b>	777m
<b>Weather</b>	Overcast
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Gentle slope

<b>General recordings</b>		
<b>Transect #</b>	2	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	50-60m	
<b>Date/ Time</b>	18/04/2006 13:50am	
<b>Waypoint</b> (only taken at beginning of transect)	065	
<b>Coordinates</b>	S 13°54'38.4" W171°49'29.4"	
<b>Elevation</b>	763m	
<b>Weather</b>	Overcast	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Moderate slope	

<b>General recordings</b>		
<b>Transect #</b>	2	<b>Surveyor (s)</b>
<b>Grid #</b> (taken		ND, ST, LT,

from map)		EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	60-70m	
<b>Date/ Time</b>	18/04/2006 13:55am	
<b>Waypoint</b> (only taken at beginning of transect)	066	
<b>Coordinates</b>	S 13°54'38.3" W171°49'29.4"	
<b>Elevation</b>	787m	
<b>Weather</b>	Sunny, with a light breeze	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Steep slope	

<b>General recordings</b>		
<b>Transect #</b>	2	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	70-80m	
<b>Date/ Time</b>	18/04/2006 13:58am	
<b>Waypoint</b> (only taken at beginning of transect)	067	
<b>Coordinates</b>	S 13°54'38.0" W171°49'29.7"	
<b>Elevation</b>	802m	
<b>Weather</b>	Sunny, with a light breeze	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Steep slope	

<b>General recordings</b>		
<b>Transect #</b>	2	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	80-90m	
<b>Date/ Time</b>	18/04/2006 14:02am	
<b>Waypoint</b> (only taken at beginning of transect)	068	
<b>Coordinates</b>	S 13°54'37.8" W171°49'29.8"	
<b>Elevation</b>	800m	
<b>Weather</b>	Sunny, with a light breeze	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	moderate slope	

<b>General recordings</b>		
<b>Transect #</b>	2	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, LT, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	90-100m	
<b>Date/ Time</b>	18/04/2006 14:02am	
<b>Waypoint</b> (only taken at beginning of transect)	069	
<b>Coordinates</b>	S 13°54'37.9" W171°49'29.8"	
<b>Elevation</b>	796m	
<b>Weather</b>	Sunny, with a light breeze	
<b>General</b>	Highly disturbed vegetation – mostly invasive species	

<b>description of vegetation</b>	
<b>Topography</b>	gentle slope

**Transect 3, Lake Lanoto'o (19<sup>th</sup> April 2006)**

		Transect 3 Plot numbers										
Scientific Name	Samoan Name	1	2	3	4	5	6	7	8	9	10	Frequency (%)
<i>Clidemia hirta</i>	Laau lau mamoe/ Vao fulu	+1	+1	+1	+1	+1	+1	+1	+1			80
<i>Cyathea spp.</i>	Olioli (Tree fern)	+1	+1		+1	+1	+1	+1		+1		70
<i>Cestrum nocturnum</i>	Teine o le po / Ali o le po		+1									10
<i>Mikania micrantha</i>	Fue Saina	+1	+1	+1	+1	+1	+1	+1	5.4	5.4	2.2	100
<i>Syzygium samoense</i>	Fena vao	+1										10
<i>Cordyline fruticosa</i>	Ti vao			+1					+1		+1	30
<i>Freycinetia spp</i>	'ie 'ie	6.5	6.5	6.5	6.5	6.5	6.5	5.5			+1	80
	<b>Guava</b>			+1								10
<i>Piper graeffei</i>	Avaava aitu solosolo / Fue manogi	+1	+1			+1				+1		40
<i>Paraserianthes falcataria</i>	Tamaligi pepe			+1	+1							20
<i>Epipremnum pinnatum</i>	Fue Laufao		+1									10
<i>Syzygium inophylloides</i>	Asi	+1			+1							20
<i>Spiraeanthemum samoense</i>	_____					+1	+1			+1		30
<i>Hedychium flavescens</i>	Teuila (cream ginger)							+1	6.5	6.5	6.5	40

<i>Deddecarpus</i>		+1		+1								20
<i>Elaeocarpus floridanus</i>	<b>A'amati'e</b>	+1	+1	+1		+1		+1				50
<i>Weinmannia affinis</i>	_____	+1							+1	+1		30
<i>Glochidion ramiflorum</i>	<b>Masame</b>		+1	+1		+1		+1				40
<i>Cabthium merrillii</i>	<b>Olasina</b>	+1		+1								20
<i>Ficus tinctoria</i>	<b>Mati</b>		+1									10
<i>Cerbera manghas</i>	<b>Leva</b>		+1									10
<i>Asplenium nidus</i>	<b>Lau gapapa</b>		+1									10
<i>Cythaea spp.</i>	<b>Lau magamaga</b>		+1	+1						+1		30
<i>Zingiber zerumbet</i>	<b>Faua povi / Avapui</b>		+1				+1					20
<i>Reynoldsia pleiosperma</i>	<b>Vi vao</b>			+1						+1		20
<i>Passiflora foetida</i>	<b>Pasio vao</b>			+1	+1	+1	+1	+1				50
<i>Fagraea berteriana</i>	<b>Pualulu</b>			+1		+1				+1		30
<i>Spathodea campanulata</i>	<b>Fa'apisi</b>			+1								10
<i>Pandanus tectorius</i>	<b>Fasa</b>			+1	+1	+1	+1			+1		50
<i>Elattostachys falcata</i>	<b>Taputoi</b>			+1								10
<i>Antidesma sphaerocarpum</i>	_____	+1		+1								20
<i>Trichospermum richii</i>	<b>Maosina/ Ma'oui</b>			+1		+1						20
<i>Alyxia bracteolosa</i>	<b>Lau maile</b>			+1								10
<i>Lantana camara</i>	<b>Latana</b>				+1			+1			+1	30
<i>Syzygium inophylloides</i>	<b>Asi toa</b>					+1						10
<i>Dissotis sp.</i>	<b>Pink Lady</b>						+1	6.5	+1		3.3	40
<i>Clinostigma</i>	<b>Niu vao</b>						+1					10

<i>samoense</i>												
<i>Planchonella sp.</i>							+1					10
<i>Crodealum sp.</i>	<b>Lau ulu</b>						+1	+1			+1	30
<i>Laportea spp</i>									2.2			10
<i>Paspalum conjugatum</i>	T-Grass								+1			10

<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	0-10m	
<b>Date/ Time</b>	19/04/2006 12:06am	
<b>Waypoint</b> (only taken at beginning of transect)	080	
<b>Coordinates</b>	S 13°54'37.0" W171°49'30.8"	
<b>Elevation</b>	806m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Flat area – on top of a mountain ridge.	
<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	10-20m	
<b>Date/ Time</b>	19/04/2006 12:21pm	
<b>Waypoint</b> (only taken at beginning of transect)	081	

<b>Coordinates</b>	S 13°54'36.6" W171°49'30.6"
<b>Elevation</b>	805m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Flat area – on top of a mountain ridge.

<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	20-30m	
<b>Date/ Time</b>	19/04/2006      12:26pm	
<b>Waypoint</b> (only taken at beginning of transect)	082	
<b>Coordinates</b>	S 13°54'36.3" W171°49'30.4"	
<b>Elevation</b>	803m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Flat area – on top of a mountain ridge.	

<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM,

		JR.
<b>Location on transect</b> (divided into 10m intervals)	30-40m	
<b>Date/ Time</b>	19/04/2006 12:33pm	
<b>Waypoint</b> (only taken at beginning of transect)	083	
<b>Coordinates</b>	S 13°54'36.2" W171°49'30.5"	
<b>Elevation</b>	801m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Flat area – on top of a mountain ridge.	

<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	40-50m	
<b>Date/ Time</b>	19/04/2006 12:36pm	
<b>Waypoint</b> (only taken at beginning of transect)	084	
<b>Coordinates</b>	S 13°54'35.7" W171°49'30.7"	
<b>Elevation</b>	800m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Flat area – on top of a mountain ridge.	



<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	50-60m	
<b>Date/ Time</b>	19/04/2006 12:39pm	
<b>Waypoint</b> (only taken at beginning of transect)	085	
<b>Coordinates</b>	S 13°54'35.2" W171°49'31.0"	
<b>Elevation</b>	796m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Gentle slope.	

<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	60-70m	
<b>Date/ Time</b>	19/04/2006 12:44pm	
<b>Waypoint</b> (only taken at beginning of transect)	086	
<b>Coordinates</b>	S 13°54'34.9" W171°49'31.2"	
<b>Elevation</b>	796m	
<b>Weather</b>	Fine sunny day	

<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Gentle slope.

<b>General recordings</b>	
<b>Transect #</b>	3
<b>Grid #</b> (taken from map)	
<b>Surveyor (s)</b>	ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	70-80m
<b>Date/ Time</b>	19/04/2006 12:48pm
<b>Waypoint</b> (only taken at beginning of transect)	087
<b>Coordinates</b>	S 13°54'34.6" W171°49'31.3"
<b>Elevation</b>	795m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Gentle slope.

<b>General recordings</b>	
<b>Transect #</b>	3
<b>Grid #</b> (taken from map)	
<b>Surveyor (s)</b>	ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	80-90m
<b>Date/ Time</b>	19/04/2006 12:49pm
<b>Waypoint</b> (only taken at beginning)	088

of transect)	
<b>Coordinates</b>	S 13°54'34.2" W171°49'31.7"
<b>Elevation</b>	794m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Gentle slope.

<b>General recordings</b>		
<b>Transect #</b>	3	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	90-100m	
<b>Date/ Time</b>	19/04/2006	12:50pm
<b>Waypoint</b> (only taken at beginning of transect)	089	
<b>Coordinates</b>	S 13°54'34.0" W171°49'31.6"	
<b>Elevation</b>	794m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Flat area.	

Transect 4, Lake Lanoto'o (19<sup>th</sup> April 2006)

Scientific Name	Samoan Name	4 Plot number										Frequency (%)
		1	2	3	4	5	6	7	8	9	10	
<i>Clidemia hirta</i>	Laau lau mamoe/ Vao fulu	5.4	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	100
<i>Cyathea spp.</i>	Olioli (Tree fern)	1.1	1.1	1.1	2.1	3.1	3.1	3.1	2.1	+1	+1	100
<i>Cestrum nocturnum</i>	Teine o le po/ Ali o le po	5.4	6.5	6.5	5.5	+1		+1	+1	+1		80
<i>Mikania micrantha</i>	Fue Saina	+1		+1	+1	+1	+1	+1	1.2	+1	6.5	90
<i>Cordyline fruticosa</i>	Ti vao		+1	+1	+1		+1	+1	+1		+1	70
<i>Freycinetia spp</i>	'ie 'ie	+1	1.2	+1	3.2	3.2	+1	3.2	1.2	+1	3.2	100
<i>Piper graeffi</i>	Avaava aitu solosolo/ Fue manogi	+1	1.2	1.2	+1	+1	+1		+1	+1		80
<i>Paraserianthes falcataria</i>	Tamaligi pepe		+1									10
<i>Epipremnum pinnatum</i>	Fue Laufao	+1		+1		1.2	+1	+1			+1	60
<i>Syngium inophylloides</i>	Asi Vai		+1						+1	+1		30
<i>Spiraeanthemum samoense</i>	_____	+1			+1	+1		+1	+1	+1	+1	70
<i>Elaeocarpus floridanus</i>	A'amati'e						+1			+1		20
<i>Heliconia laufao</i>	Laufao						+1	+1				20
<i>Weinmannia affinis</i>	_____										+1	10
<i>Glochidion christophersenii</i>	Masame vao				+1					+1		20
<i>Trichospermum richii</i>	Maosina / Ma'oui							+1	+1	+1		30
<i>Asplenium nidus</i>	Lau gapapa		+1									10

<i>Cythaea spp.</i>	<b>Lau magamaga</b>								+1				10
<i>Passiflora foetida</i>	<b>Pasio vao</b>								+1	1.2	+1	+1	40
<i>Fagraea berteriana</i>	<b>Paululu</b>								+1				10
<i>Castilla elastica</i>	<b>Pulu mamoe</b>	+1				+1							20
<i>Angiopteris evecta</i>	<b>Gase</b>	+1		+1			+1				+1		40
	<b>Vaomageso/ogoogo</b>	+1											10
<i>Funtumia elastica</i>	<b>Pulu vao</b>	+1	+1	+1	+1		+1						50
<b>Unknown 7 (fern)</b>		1.2	1.2	+1	+1	+1	+1	+1			+1		80
<b>Cyandra spp.</b>		+1	2.2					+1					30
<b>Piper spp.</b>			1.2										10
<i>Phymatosorus grossus</i>	<b>Lau auta</b>		+1										10
<i>Davallia solida</i>	<b>Lau gasese</b>		+1	+1									20
<i>Neonauclea forsteri</i>	<b>Afa</b>			+1									10
<i>Myristica inutilis</i>	<b>Atone</b>			+1	+1								20
<i>Barringtonia samoensis</i>	<b>Falaga</b>			+1	+1	+1							30
<i>Dysoxylum huntii</i>	<b>Maotamea</b>		+1		+1							+1	30
<b>Mucuna gigantean/ Entada phaseoloides</b>	<b>Tupe/tifa</b>							+1			+1	+1	30
	<b>Vae paa</b>										+1		10
<i>Musa xparadisiaca</i>	<b>Taemanu</b>										+1		10
<i>Faradaya amicornum</i>	<b>Mamalupe</b>										+1		10
<i>Aglaia samoensis</i>	<b>Laga'ali</b>											+1	10
<b>Elaeocarpus ulianus</b>			+1										10

<i>Pisonia umbellifera</i>			+1									10
<i>Orchid epiphyte</i>											+1	10

<b>General recordings</b>	
<b>Transect #</b>	4
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	0-10m
<b>Date/ Time</b>	19/04/2006 9:32am
<b>Waypoint</b> (only taken at beginning of transect)	070
<b>Coordinates</b>	S 13°54'38.3" W171°49'30.8"
<b>Elevation</b>	800m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Moderate slope

<b>General recordings</b>	
<b>Transect #</b>	4
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	10-20m
<b>Date/ Time</b>	19/04/2006 9:49am
<b>Waypoint</b> (only taken at beginning)	071

of transect)	
<b>Coordinates</b>	S 13°54'38.7" W171°49'30.9"
<b>Elevation</b>	801m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Moderate slope

<b>General recordings</b>		
<b>Transect #</b>	4	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	20-30m	
<b>Date/ Time</b>	19/04/2006	10:05am
<b>Waypoint</b> (only taken at beginning of transect)	072	
<b>Coordinates</b>	S 13°54'38.9" W171°49'31.0"	
<b>Elevation</b>	801m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Moderate slope	

<b>General recordings</b>		
<b>Transect #</b>	4	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.

<b>Location on transect</b> (divided into 10m intervals)	30-40m
<b>Date/ Time</b>	19/04/2006 am
<b>Waypoint</b> (only taken at beginning of transect)	073
<b>Coordinates</b>	S 13°54'39.0" W171°49'31.0"
<b>Elevation</b>	805m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Gentle slope

<b>General recordings</b>		
<b>Transect #</b>	4	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	40-50m	
<b>Date/ Time</b>	19/04/2006 10:25am	
<b>Waypoint</b> (only taken at beginning of transect)	074	
<b>Coordinates</b>	S 13°54'39.4" W171°49'31.0"	
<b>Elevation</b>	785m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Moderate slope	



<b>General recordings</b>		
<b>Transect #</b>	4	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	50-60m	
<b>Date/ Time</b>	19/04/2006 10:32am	
<b>Waypoint</b> (only taken at beginning of transect)	075	
<b>Coordinates</b>	S 13°54'39.7" W171°49'31.1"	
<b>Elevation</b>	785m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Moderate slope	

<b>General recordings</b>		
<b>Transect #</b>	4	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	60-70m	
<b>Date/ Time</b>	19/04/2006 10:39am	
<b>Waypoint</b> (only taken at beginning of transect)	076	
<b>Coordinates</b>	S 13°54'39.9" W171°49'31.4"	
<b>Elevation</b>	801m	

<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Moderate slope

<b>General recordings</b>	
<b>Transect #</b>	4
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	70-80m
<b>Date/ Time</b>	19/04/2006      10:48am
<b>Waypoint</b> (only taken at beginning of transect)	077
<b>Coordinates</b>	S 13°54'40.1" W171°49'31.5"
<b>Elevation</b>	799m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Gentle slope

<b>General recordings</b>	
<b>Transect #</b>	4
<b>Grid #</b> (taken from map)	
<b>Location on transect</b> (divided into 10m intervals)	80-90m
<b>Date/ Time</b>	19/04/2006      10:55am

<b>Waypoint</b> (only taken at beginning of transect)	078
<b>Coordinates</b>	S 13°54'40.4" W171°49'31.8"
<b>Elevation</b>	799m
<b>Weather</b>	Fine sunny day
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species
<b>Topography</b>	Gentle slope

<b>General recordings</b>		
<b>Transect #</b>	4	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)		ND, ST, TF, EM, JR.
<b>Location on transect</b> (divided into 10m intervals)	90-100m	
<b>Date/ Time</b>	19/04/2006	11:03am
<b>Waypoint</b> (only taken at beginning of transect)	079	
<b>Coordinates</b>	S 13°54'40.8" W171°49'31.8"	
<b>Elevation</b>	809m	
<b>Weather</b>	Fine sunny day	
<b>General description of vegetation</b>	Highly disturbed vegetation – mostly invasive species	
<b>Topography</b>	Moderate slope	

## APPENDIX 4: METHODOLOGY

### Improved management of Samoa's first Ramsar site, Lake Lanoto'o

#### Goal:

#### Objectives:

##### General Objective:

To develop and gain support for long-term sustainable management practices at Lake Lanoto'o in order to secure a high quality water supply for Samoa's capital city, and to protect the biodiversity and ecological character of this Ramsar site.

##### Specific Objectives:

1. To complete a detailed site an ecological survey, species and resources use inventory of the Ramsar site to inform planning, identify areas of degradation that require attention, and confirm the distribution and status of biodiversity in the area;
2. To promote wise uses of the resources within the Ramsar site, as well as target necessary rehabilitation work;
3. To develop a wise use management framework through consultations with the customary owners of the land and other government agencies as necessary;
4. To raise awareness among stakeholders of the importance of protecting Lake Lanoto'o
5. To develop, promote and implemented alternative income generating activities for the local people in order that unsustainable land use practices are discontinued; and,
6. To establish appropriate monitoring to ensure the ecological character of the site is retained and any threats to this can be detected as early as possible.

The above objectives were taken from SectionB.2 Structure and contents of Detailed Project Proposal, Ramsar Small Grants Fund for Wetland and Wise Use (SGF).

#### Equipment:

- 16,206 meters of string  
Justification: each belt transect requires 438m of string: three 100m in length and eleven 10m in length, plus 28m extra for tying (see Figure 1 for diagram of belt transect). Belt transects are then left in place for, in order to be found easily again.
- 100 meter measuring tape  
Justification: to measure out length of transect.
- 148 sticks which can be pounded into the ground  
Justification: to hold string in place. This can be collected in the field.
- Pencils  
Justification: for making notes.
- Water proof note books  
Justification: to make recordings

- Plastic bags (Zip lock bags)  
Justification: for taking plant samples if a plants can not be identified in the field
- Sticky Labels  
Justification: to label plastic bag that holds plant sample
- Digital Camera  
Justification: take photos of belt transect and plants to be entered into the database.
- GPS  
Justification: to find sample area in the field.
- Bush Knife/ Machete  
Justification: clear path to survey area
- Maps  
Justification: to locate survey area.
- Waterproof Torch  
Justification: for camping
- Lantern  
Justification: for camping
- Batteries  
Justification: for GPS
- Laptop  
Justification: for entering data
- Plant identification booklet  
Justification: to identify plants found in belt transects
- Plant Cutters  
Justification: to take plant samples
- Walkie talkies  
Justification: to communicate with
- Tents  
Justification: for camping
- Sleeping bags  
Justification: for camping
- First Aid kit  
Justification: in case an accident occurs while we are out in the field.
- Projector  
Justification: for presentation of results gathered from ecological survey
- Marking Tapes:

Justification: to mark trails

## **Methodology**

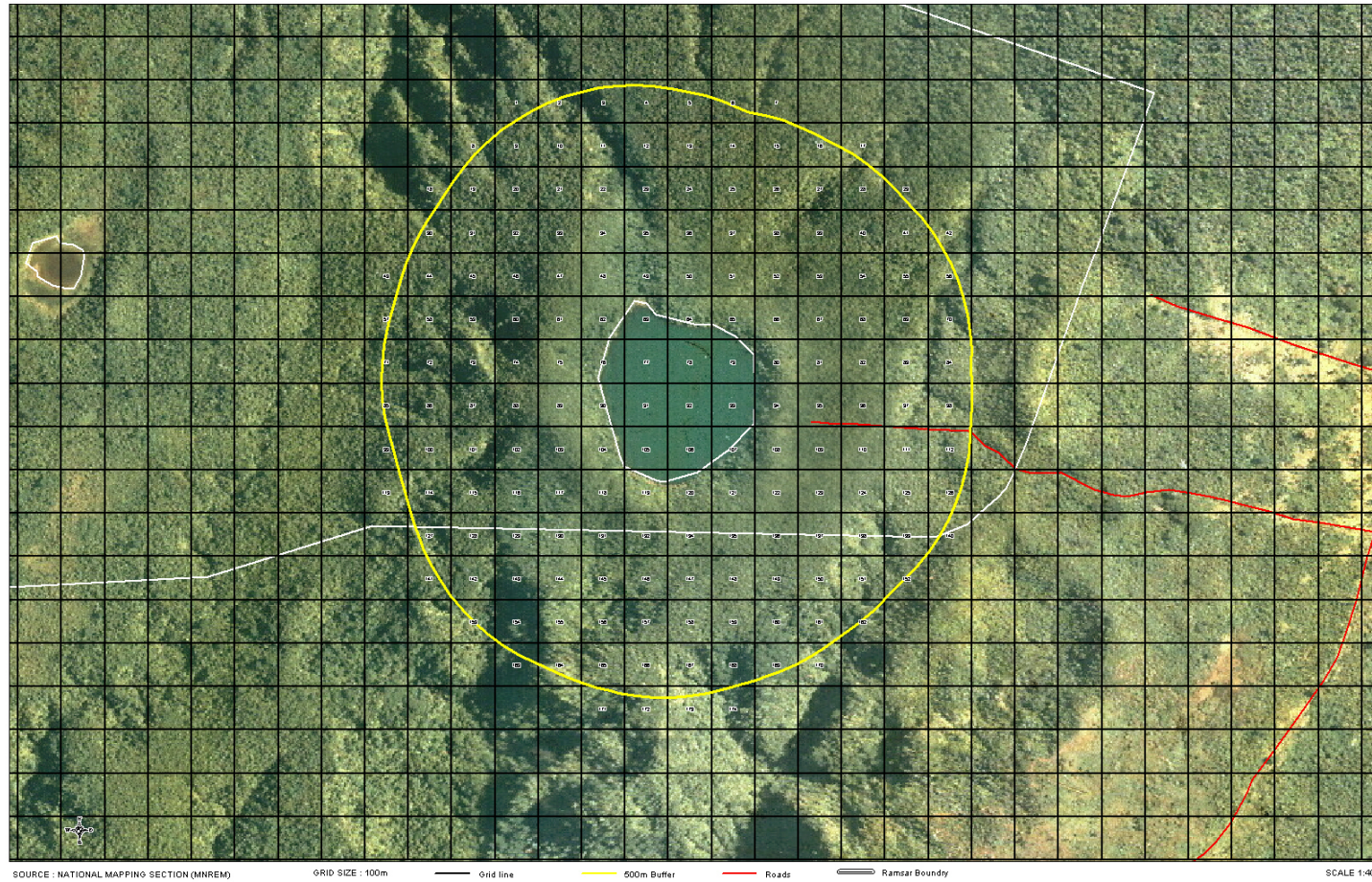
### **Method: (In office)**

#### **Sampling plant populations at Lake Lanoto'o using the Belt Transect Method**

1. Determine total area of the site to be sampled; divide by 10 to obtain the total sample area.
  - The total National Park Area is 1161 acres; however, we are only interested in carrying out a detailed ecological survey of the area immediately surrounding Lake Lanoto'o. We have therefore, created a 500m buffer zone around the lake which is equal to about 376 acres.
  - Lake Lanoto'o  $376\text{acres}/10 = \underline{\underline{37.6 \text{ samples or } 37 \text{ samples}}}$
2. In Mapinfo create a map of Lake Lanoto'o with a 500m buffer zone, overlaid with a numbered grid (Map 1)

Map 1: Numbered grid map of Lake Lanoto'o

RAMSAR LANOTOO MAP



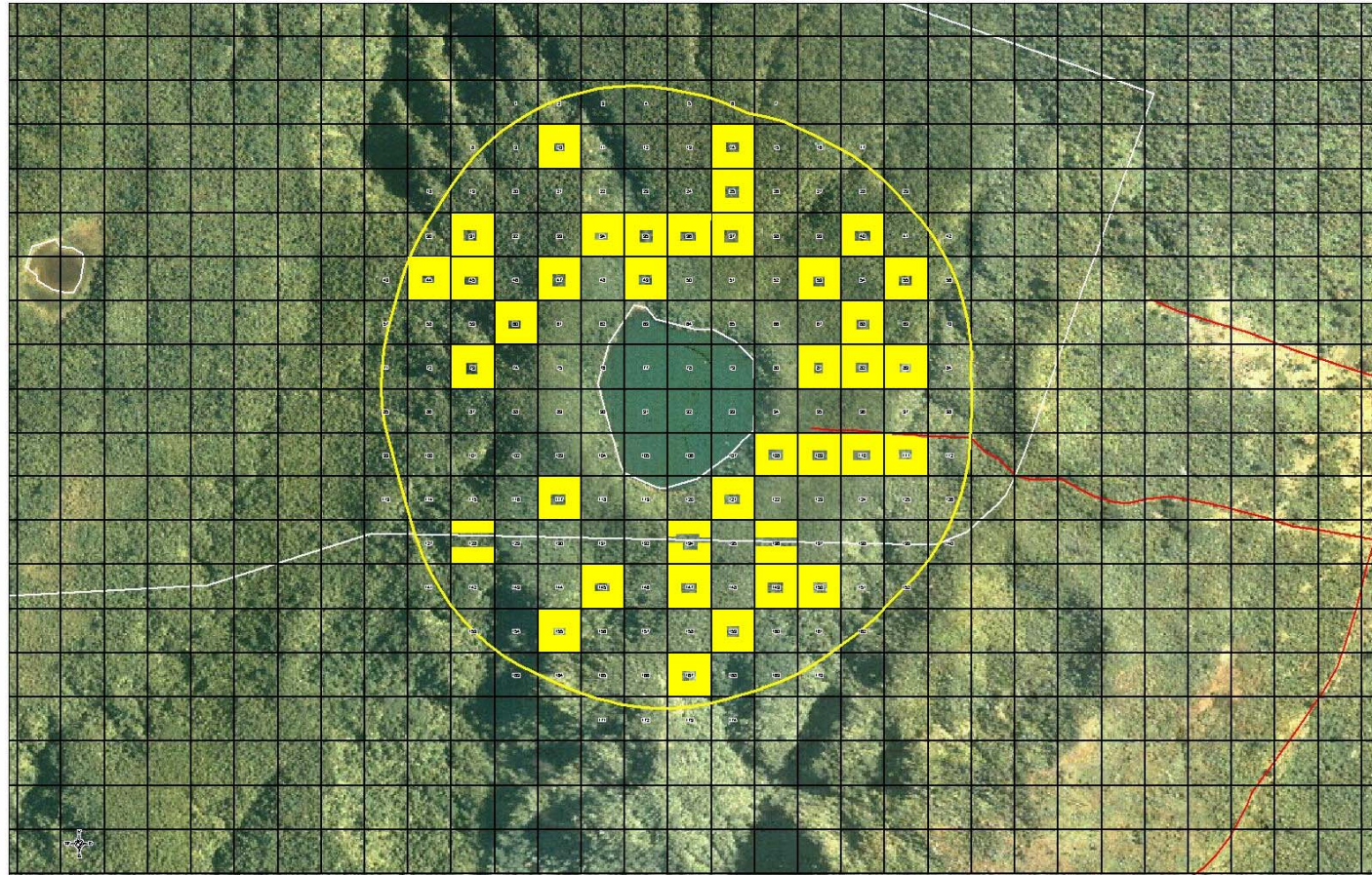
3. In excel create a random number table (see below) using the following formula =RAND()\*180. The random numbers created are then used to select which squares to sample in. If we look at the top of the first column in the random number table, our first number is 162, however, we would ignore this number because the cell does not fall completely within the 500m buffer zone. We would also ignore numbers where the whole square does not fall within the 500m buffer zone, squares that fall within the lake and squares with values which are higher than our highest numbered square on our grid, which is 174. We would also ignore numbers which we have already been selected and continue on to the next. We would continue in this fashion until we have selected 37samples (Map 2)

Random number table							
162	28	82	127	10	73	31	108
113	34	117	150	60	167	149	163
140	17	47	110	111	114	179	40
42	126	9	141	35	136	3	56
25	63	152	31	161	162	65	10
128	110	147	19	15	83	178	159
10	82	1	36	149	55	79	65
174	73	53	14	45	117	161	155
109	145	44	60	176	81	134	145
43	68	172	147	161	162	111	49
162	37	35	114	24	137	107	12
145	161	118	98	119	65	13	56
110	148	118	36.	171	69	34	153
121	155	59	32	158	34	1	131
63	124	68	55	156	32	11	86
67	89	115	102	102	77	41	128
120.	147	82	155	53	134	133	126
128	91	92	13	124	13	45	115
47	44	1	24	121	46	151	52
97	126	89	30	108	40	39	3
161	71	29	171	49	156	49	174
108	74	81	175	99	94	132	50
131	111	27	116	1	10	163	57
72	51	80	98	36	100	145	164
135	78.	62	51	47	71	90	12
178	103	167	111	110	173	150	49
119	156	179	160	9	110	16	176
164	83	0.03825	95	20	89	91	5
49	50	16	72	122	37	105	50
5	141	115	71	49	128	141	20



## Map 2: Areas in yellow to be surveyed

### RAMSAR LANOTOO MAP



SOURCE : NATIONAL MAPPING SECTION (MNREM)

GRID SIZE : 100m

Grid line

500m Buffer

Roads

Ramsar Boundary

SCALE 1:4000

- 10 of the survey areas shown above fall outside of the National Park area (shown in white) these areas will, therefore, not be surveyed.

The following table shows the grid numbers (areas in yellow above) which will be sampled, with the coordinates which will be used to locate the areas in the field.

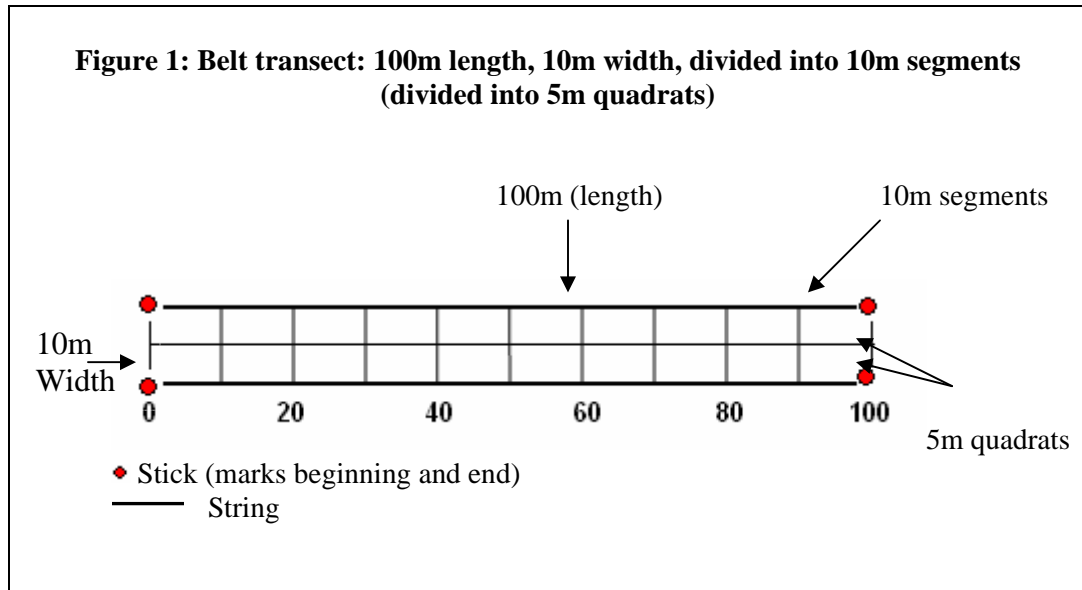
<b>Grid #</b>	<b>Long</b>	<b>Lat</b>
10	-171.830216	-13.905077
14	-171.826515	-13.905074
25	-171.826514	-13.905978
31	-171.832065	-13.906886
34	-171.829289	-13.906884
35	-171.828364	-13.906883
36	-171.827439	-13.906883
37	-171.826513	-13.906882
40	-171.823738	-13.90688
44	-171.83299	-13.90779
45	-171.832064	-13.90779
47	-171.830214	-13.907788
49	-171.828363	-13.907787
53	-171.824662	-13.907785
55	-171.822812	-13.907783
60	-171.831138	-13.908693
68	-171.823736	-13.908688
73	-171.832063	-13.909597
81	-171.824661	-13.909592
82	-171.823736	-13.909592
83	-171.82281	-13.909591
108	-171.825585	-13.911401
109	-171.824659	-13.9114
110	-171.823734	-13.911399
111	-171.822809	-13.911399
117	-171.83021	-13.912308
121	-171.826509	-13.912305
128	-171.83206	-13.913213
134	-171.827434	-13.91321
136	-171.825583	-13.913208
145	-171.829284	-13.914115
147	-171.827433	-13.914113
149	-171.825583	-13.914112
150	-171.824657	-13.914111
155	-171.830208	-13.915019
159	-171.826507	-13.915017
167	-171.827432	-13.915921

Areas in blue fall outside the National Park boundary, they will therefore not be surveyed

- Coordinates of the random squares selected to be sampled are recorded into a GPS.

**In the field**

- Locate random squares using the coordinates recorded in the GPS.
- Once at a location layout a belt transect; length 100m, width 10m, divided the length of transect into segments of 10m. Pound 2 sticks into the ground, 10m apart to get width of transect, connect sticks with string. This will mark the start of transect. Next, measure out 100m using a 100m measuring tape, mark the length of the transect with a string; pounding 2 sticks into the ground, 10m apart to mark the end of the transect. Next divide transect into segments of 10m. Finally divide the 10m segments in 5m quadrats. This is done by running string down the middle of transect. Figure 1 shows what transect should look like.



- Once transect has been laid out measurement of the vegetation present within each 5m quadrat can begin.
  - Identify and record various species found within 10m quadrat (Table 1). If a species can not be identified bag and label the sample. For example, Specimen 1 BT (Belt Transect) 1. If the same species is found again in another transect, example transect 6, or even further down the same transect, list the species in the Species table as the specimen number it was first found as. (Table 1)

**Table 1: Species found within Belt transect 1.**  
**Location 0-10**

African tulip  
 Tamaligi  
 Rubber tree  
 Koster's curse  
 Cream ginger/yellow ginger  
 Specimen 1, BT1

- Next estimate abundance and coverage of individual species. The scales are given in Table 2. Table 5 shows table used in field.

<b>Table 2: Total Estimate Scale (abundance plus coverage)</b>	
+	Individuals of a species sparsely present in the stand: coverage very small
1	Individuals plentiful, but coverage small.
2	Individuals very numerous if small; if large, covering at least 5% of area.
3	Individuals few or many, collectively covering 6-25% of the area.
4	Individuals few or many, collectively covering 26-50% of the area.
5	Plants cover 51-75% of the area.
6	Plants cover 76-100% of the area.

Lastly estimate the sociability of each

- species – whether the plants grow singly, in clumps, mats or pure populations, scale given in Table 3. Table 5 shows field table.

<b>Table 3: Sociability Classes</b>	
Class 1	Shoots growing singly
Class 2	Scattered groups or tufts of plants
Class 3	Small, scattered patches or cushions
Class 4	Large patches or broken mats
Class 5	Very large mats of stands or nearly pure populations that almost blanket the area

The following tables give an example what should be recorded in the field.

<b>Table 4: General recordings</b>		
<b>Transect #</b>	1	<b>Surveyor (s)</b>
<b>Grid #</b> (taken from map)	456	Jane Doe Joe Blogs
<b>Location on transect</b> (divided into 10m intervals)	10-20m	
<b>Date/ Time</b>	23/01/2006	10:25am
<b>Waypoint</b> (only taken at beginning of transect)	001	
<b>Coordinates</b>	S 13°50'50.6" W171°45'44.5"	
<b>Elevation</b>	700m	
<b>Weather</b>	Cloudy with a light shower	
<b>General description of vegetation</b>	Area of cultivation: pine trees and taro.	
<b>Topography</b>	Gentle slope	

<b>Table 5: Total estimate (abundance &amp; coverage) and Sociability of plant species</b>		
<b>Species</b>	<b>Total estimate</b>	<b>Sociability</b>
African tulip	4	1
Tamaligi	3	3
Rubber tree	6	5
Koster's Curse	6	5
Cream Ginger	5	4

7. Once all the vegetation has been measured within the 100m belt transect repeat steps 1-3 (in the field) until all 100 samples have been conducted.





## **APPENDIX 4: FAUNA SPECIE REPORT ON INITIAL INVENTORY SURVEY**

### **Introduction**

An ecological survey for the Lake Lanotoo National Park was proposed and conducted by staff of Ministry of Natural Resources, Environment and Meteorology led by Division of Environment and Conservation, Terrestrial Section.

This project is funded under the RAMSAR Convention on wetlands. The field work was concentrated within 500m buffer zone coming from water marks. (Refer to map1).

The team was selected from Ministry of Natural Resources Environment and Meteorology field technical officers. Members include Senior Reserves officer, Watershed officer, forestry officer and two terrestrial conservation officers. With the assistance from the crops division in identifying insects collected from the field.

### **Objectives**

The main objective is the collection of the biodiversity data from the National Park both around and inside the Lake, Both the fauna and flora from the Lake Lanotoo national Park. Second main object is the formulation of a management plan for the Lake Lanotoo National Park.

### **Study Area.**

Lake Lanotoo was first proposed as a National Park in 1975 by the Government of Samoa. The total area is 1161 acres with the lake Lanotoo at 27.15 acres. The parent material is Salani volcanics, a moderately to strongly weathered olivine basalt stated in Kear and Woods<sup>1</sup>. It is a crater lake, very steep in some areas and muddy with the vegetation type as mainly open forest and forest plantation. With ecology of mostly montane forest disturbed secondary forest and small piece of land with is non native forest. (Refer to ecology, forest type map).

The site is mostly government lands and small percentage falls into customary land and free hold land.

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<sup>1</sup> Kear and Woods. 1959: The Geology and Hydrology of Western Samoa.



### **Methods:**

The survey collection techniques were designed by fauna species officer. Three main collection techniques were employed:

Pitfalls - Pot plants sunk into the ground to trap flightless, ground living insects and arachnids, cockroaches, spiders and so on. The container should be placed in a hole with the upper rim flush with the ground surface. A killing agent and representatives such as ethylene glycol etc should be placed in traps that are not emptied daily.

Hand Collect: this technique is basically collecting of snails and other insects with moving around each transects.

Five minute bird count: for the birds, since it's a 500m buffer zone we are working on there will be a few bird counts depending on the suitability of the location.

Aerial Nets: this is for catching moths and butterflies.

### **Results:**

#### **Snails:**

Searches for land snails were made on each plots within the 4 transects. The snails were hand collected mostly, most were encountered in leaf litter and on small plants. Specimens collected were preserved in alcohol. The results to date are given in appendix 1. from the samples collected it shows a diverse in land snails in the area.

#### **Five minute bird count:**

The result of the bird count is given in appendix 2. Two bird counts were made, one was on the ridge and second on the first transect for the plants and fauna survey. 19 species of Birds recorded during the 2 five minute bird count and Samoan Triller and Polynesian starling were seen and heard during the count, Two of the birds that was not recorded in this area during past surveys. Manumea and Mao two of Samoa's endemics and are classified as endangered species were heard and seen in this particular area.

## Snails

### Appendix 1

<u>Snail Scientific Name</u>	<u>Habitat/ Description</u>	<u>Identification</u>
Pleuropoma fulgora	Indigenous, found mostly in forest litter.	Shell strongly keeled, colors pale yellow to dull yellowish brown usually but not always reddish brown.
Pleuropoma plicatilis	Savaii and Upolu, and its endemic to Samoa mostly found on trees.	Largest samoan helicimid similar to the pleuropoma beryllina but larger. Shell white or yellow sometimes pink.
Ustodes upolensis	Lake Lanotoo and its endemic to Samoa, encountered mostly at hill side, ridge and damp 2400ft elevation	
Truncatella querinii	Upolu and Savaii and its indigenous and found under leaf litter	
Laevicaulis alte (Gaupapa)	Found on all the major islands and its an introduced species. And find mostly in disturbed lowland area	Generally black or dark gray
Eua expansa	Upolu and Savaii and its endemic to Samoa. Habitat: forest from low to high elevation.	A grayish white and sometime plae tan colored shell also with faint dark spiral line and flecks
Eua montana	Upolu and Savaii and its endemic to Samoa, mostly encountered at high elevation.	Dullish white
Succinea putamen	Upolu and Savaii and its endemic to Samoa, find mostly in mid-elevation. Inside forest but sometimes in open forest	

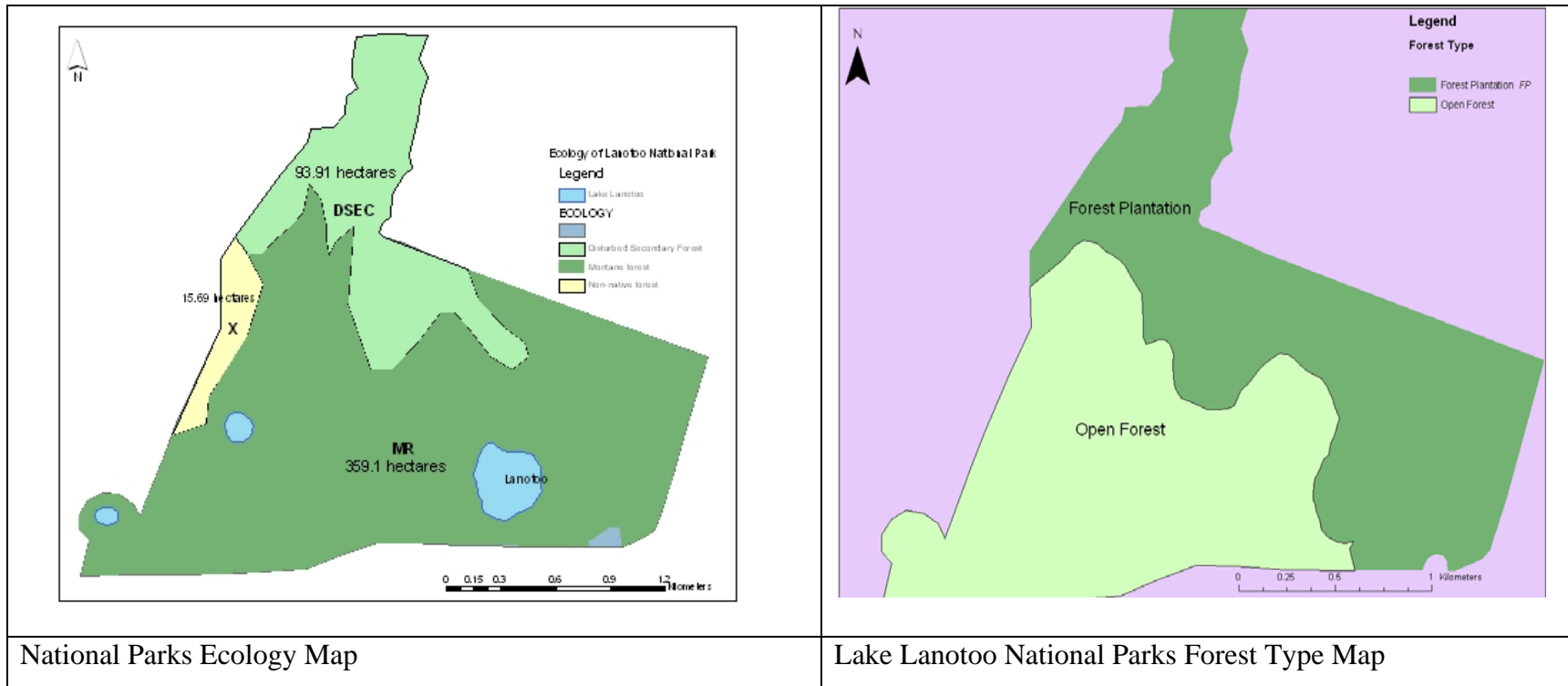
Liardetia samoensis	Upolu and its widespread in the pacific and can be found from low to upper elevation	Very tinny
Paropea achatinaceum	Found on all main islands and its an introduced species but mostly found at ground leaf litter.	Shell shape very variable often confused with allopeas
Opeas hannense	Upolu and Savaii and introduced and found at ground litter.	

## Apenndix 2

<b>Birds</b>	
	Seen/heard
Eastern Reef Heron	0
Pacific Black Duck	0
Jungel Fowl	0
Peregrine Falcon	0
Band Rail	1
White Browed Crake	0
Spotless Crake	0
Purple Swamphen	0
Samoan Moorhen	0
Feral Pigeon	0
White Throat Pigeon	1
Friendly Ground Dove	0
Pacific Pigeon	1
Tooth billed Pigeon	1
Many Color Fruit Dove	1

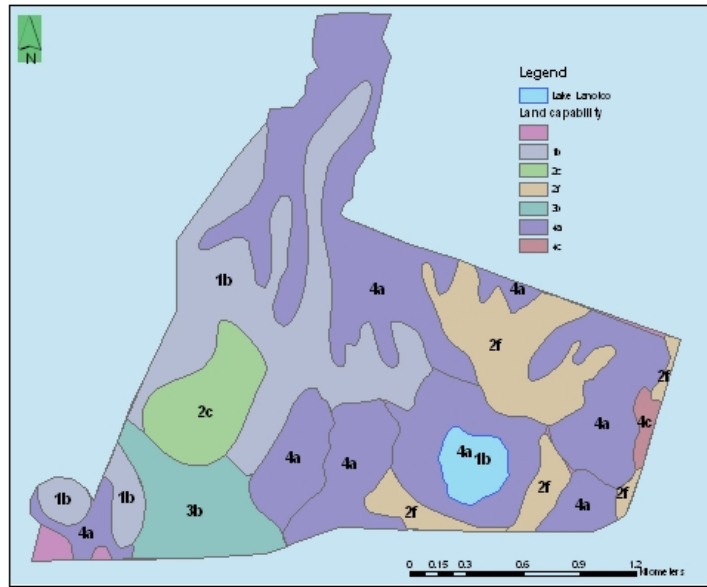
Crimson crowned fruit dove	1
Blue Crowned lory	1
Long Tailed Cuckoo	0
Barn Owl	0
White Rumped Swiftlet	1
Flat billed Kingfisher	1
Polynesia Starling	1
Samoan Starling	1
Common Myna	0
Jungle Myna	0
Red vented bulbul	0
Island Thrust	0
Scarlet Ribon	1
Samoan Fan Tail	1
Samoan Broadbill	1
Samoan Whistler	1
Polynesia Triller	1
Samoan Triller	1
Samoan White Eye	0
Samoan Parrotfinch	0
Cardinal Honeyeater	1
wattled Honeyeater	1
Mao	1
Bat	1

### Appendix 3 (Maps)

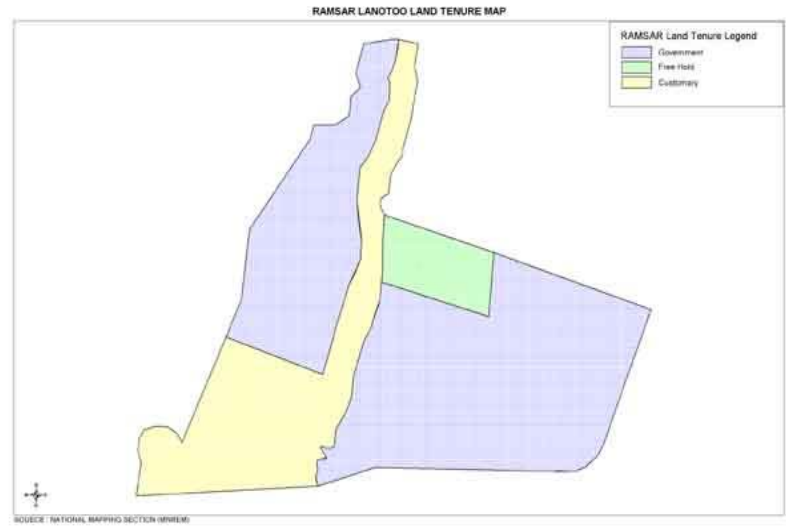


National Parks Ecology Map

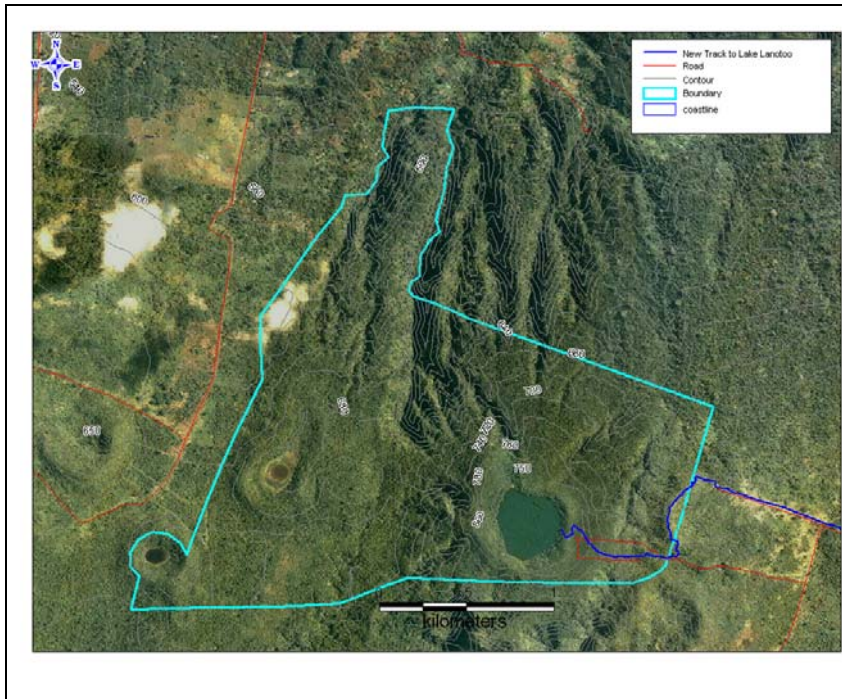
Lake Lanotoo National Parks Forest Type Map



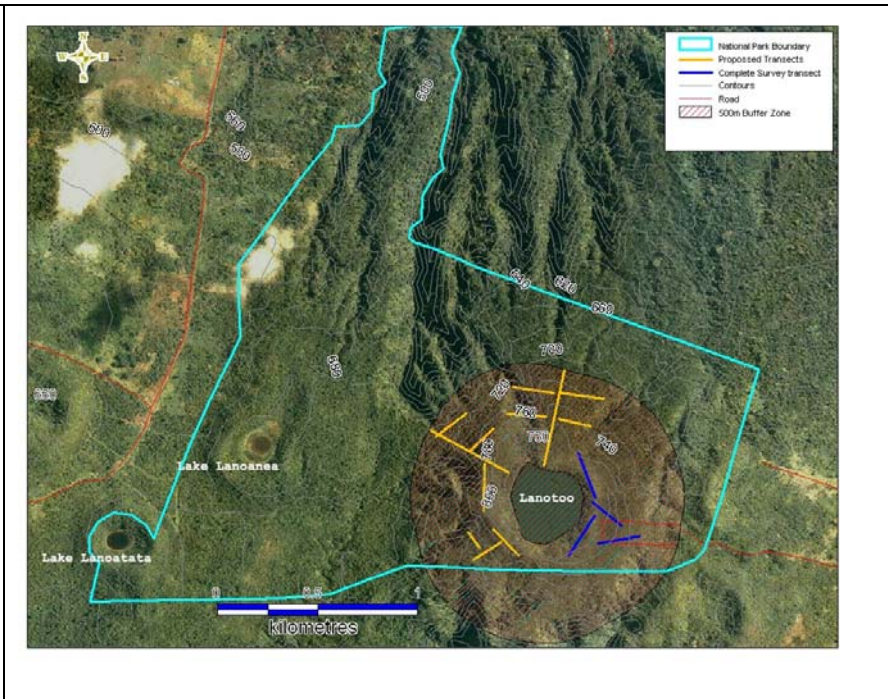
Lake Lanotoo National Parks Land capability Map



Lake Lanotoo National Parks Land tenure map



Lake Lanotoo national Park with Contours and the New Track



500m buffer zone and proposed transects

Reference:

Cedric S. A. Whistler. T.S.Tuailenafua; 1997. The Conservation of Biological Diversity in the Upland Ecosystem of Samoa. Apia.

Geoff. P. R. Hay; 1991. The Conservation of the Biological Diversity in the Coastal Lowlands of Western Samoa. Department of Conservation. New Zealand.

Karin S. K, S. E. Miller. 1998. Samoan Insects and related arthropods: Checklist and Bibliography. Honolulu, Hawaii

Kear and Woods. 1959: The Geology and Hydrology of Western Samoa

Tu'u'u I. T, 1993. State of the Environment Report. Western Samoa.

Website Ref:

<http://www2.bishopmuseum.org>



**APPENDIX 5: RAMSAR LAKE LANOTO'O STAKEHOLDER LIST:**

**A. Government Organisations**

1. Ministry of Natural Resources, Environment & Meteorology
2. Ministry of Agriculture
3. Ministry of Works, Transport & Infrastructure???
4. Samoa Tourism Authority
5. Samoa Land Cooperation
6. Samoa Water Authority

**B. Non Government Organisations**

1. Tourism Association

**C. Private Businesses**

1. Green Turtle
2. Janes Tour

**D. Land & Cattle Farm Owners**

## APPENDIX 6: PROJECT BUDGET

### Transfer from Ramsar SGP - Lodge in on 9 September 2006

#### Opening Balance at MNREM:

Date	Supplier	Item	Budget line
14-Oct-05	Inalani's Catering	morning tea supplied fo	TRAVEL, INCL. ACCOMODATION & LIVING
2-Nov-05	Tech Centre	6 inks for office use	RUNNING COSTS
3-Nov-05	Sailimalo Pati	Transit allowance NZE	TRAVEL, INCL. ACCOMODATION & LIVING
3-Nov-05	Sailimalo Pati	Clothing Allowance coi	TRAVEL, INCL. ACCOMODATION & LIVING
3-Nov-05	Sailimalo Pati	Incidental allowance fo	TRAVEL, INCL. ACCOMODATION & LIVING
3-Nov-05	Sailimalo Pati	Visa for Uganda/Kenya	TRAVEL, INCL. ACCOMODATION & LIVING
3-Nov-05	Sailimalo Pati	Transit Dubai USD 453	TRAVEL, INCL. ACCOMODATION & LIVING
5-Nov-05	Inalani's Catering	refreshments for RAMS	TRAVEL, INCL. ACCOMODATION & LIVING
11-Nov-05	Afa Seumanu	PA sustum for hire for	PERSONNEL
17-Nov-05	Theresa Vaai	visa (NZ)	TRAVEL, INCL. ACCOMODATION & LIVING
17-Nov-05	Theresa Vaai	visa (Aust)	TRAVEL, INCL. ACCOMODATION & LIVING
17-Nov-05	Theresa Vaai	Transit (NZ) NZD 26€	TRAVEL, INCL. ACCOMODATION & LIVING
17-Nov-05	Theresa Vaai	clothing allowance	TRAVEL, INCL. ACCOMODATION & LIVING
17-Nov-05	Tepa Suaesi	visa (NZ)	TRAVEL, INCL. ACCOMODATION & LIVING
17-Nov-05	Tepa Suaesi	visa (Aust)	TRAVEL, INCL. ACCOMODATION & LIVING
17-Nov-05	Tepa Suaesi	Transit (NZ) NZD 26€	TRAVEL, INCL. ACCOMODATION & LIVING
6-Dec-05	Juliana's Car Rental	payment for petrol hire	TRAVEL, INCL. ACCOMODATION & LIVING
9-Dec-05	Inalani's Catering	supply of refreshment f	TRAVEL, INCL. ACCOMODATION & LIVING
20-Dec-05	Juliana's Car Rental	payment for hire of veh	TRAVEL, INCL. ACCOMODATION & LIVING
27-Jan-06	Inalani's Catering	refreshment for RAMS.	TRAVEL, INCL. ACCOMODATION & LIVING
31-Jan-06	Inalani's Catering	refreshment for RAMS.	TRAVEL, INCL. ACCOMODATION & LIVING
<b>Transfer from WWF - Lodged in on 31 January 2006</b>			
2-Feb-06	Inalani's Catering	refreshment for RAMS.	TRAVEL, INCL. ACCOMODATION & LIVING
22-Feb-06	Tech Centre	inks supplied for office	RUNNING COSTS
12-Mar-06	Ink Patch	payment in pin boards-	RUNNING COSTS
21-Mar-06	Samoa Electronics	materials supplied	EQUIPMENT, REPORT PRODUCTIONS
1-Apr-06	G M Bakery Ltd	refreshments supplied f	TRAVEL, INCL. ACCOMODATION & LIVING
1-Apr-06	Tech Centre	payment for colour/blac	RUNNING COSTS
1-Apr-06	Inalani's Catering	payment for refreshmer	TRAVEL, INCL. ACCOMODATION & LIVING
1-Apr-06	Inalani's Catering	morning tea supplied fo	TRAVEL, INCL. ACCOMODATION & LIVING
15-Apr-06	SMI	Payment of materials st	EQUIPMENT, REPORT PRODUCTIONS
15-Apr-06	Ray's Corner	food supplied for surve	TRAVEL, INCL. ACCOMODATION & LIVING
15-Apr-06	Agriculture Store Cc	payment of good ssuppl	EQUIPMENT, REPORT PRODUCTIONS
21-Mar-06	Samoa Electronics	materials supplied	EQUIPMENT, REPORT PRODUCTIONS
24-Apr-06	Strickland Brothers	supply of materials for	EQUIPMENT, REPORT PRODUCTIONS
30-Apr-06	Agriculture Store Cc	supplies for surey at La	EQUIPMENT, REPORT PRODUCTIONS
30-Apr-06	Apia Rentals	12834 Toyota Double C	TRAVEL, INCL. ACCOMODATION & LIVING
30-Apr-06	SMI	products needed to cary	EQUIPMENT, REPORT PRODUCTIONS
1-May-06	Maria's Health Care	products needed for pro	EQUIPMENT, REPORT PRODUCTIONS
4-May-06	Samoa Electronics	1 S3153-NiMH Rechar	EQUIPMENT, REPORT PRODUCTIONS
4-May-06	Chang Holdings Co	petrol for ecological sui	TRAVEL, INCL. ACCOMODATION & LIVING
5-May-06	Malama Momoemau	pmt transit (NZD888) N	TRAVEL, INCL. ACCOMODATION & LIVING
5-May-06	Susau Siolo	pmt transit (NZD888) N	TRAVEL, INCL. ACCOMODATION & LIVING
5-May-06	Susau Siolo	visa to NZ to attend me	TRAVEL, INCL. ACCOMODATION & LIVING
5-May-06	Susau Siolo	visa to Australia to atte	TRAVEL, INCL. ACCOMODATION & LIVING
5-May-06	Susau Siolo	Incidental allowance to	TRAVEL, INCL. ACCOMODATION & LIVING
5-May-06	Malama Momoemau	visa to NZ to attend me	TRAVEL, INCL. ACCOMODATION & LIVING
5-May-06	Malama Momoemau	visa to Australia to atte	TRAVEL, INCL. ACCOMODATION & LIVING

5-May-06 Malama Momoemau Incidental allowance to TRAVEL, INCL. ACCOMODATION & LIVING  
9-May-06 Maxkar Ltd stationeries supplied RUNNING COSTS  
18-May-06 Inalani's Catering refreshment supplied fo TRAVEL, INCL. ACCOMODATION & LIVING  
31-May-06 Country Signs 8 yards banner for BiodEQUIPMENT, REPORT PRODUCTIONS

**Total MNREM Expenses:**

**Remaining Projedct Balance at MNREM:**

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**32000 CHF**  
**\$ 66,225.17**

<b>Amount</b>	<b>Balance</b>
\$ 241.88	\$ 65,983.29
\$ 690.00	\$ 65,293.29
\$ 1,027.75	\$ 64,265.54
\$ 600.00	\$ 63,665.54
\$ 560.00	\$ 63,105.54
\$ 156.00	\$ 62,949.54
\$ 1,271.66	\$ 61,677.88
\$ 148.50	\$ 61,529.38
\$ 1,000.00	\$ 60,529.38
\$ 160.00	\$ 60,369.38
\$ 142.00	\$ 60,227.38
\$ 512.70	\$ 59,714.68
\$ 400.00	\$ 59,314.68
\$ 160.00	\$ 59,154.68
\$ 142.00	\$ 59,012.68
\$ 512.70	\$ 58,499.98
\$ 150.00	\$ 58,349.98
\$ 103.50	\$ 58,246.48
\$ 420.00	\$ 57,826.48
\$ 293.63	\$ 57,532.85
\$ 321.75	\$ 57,211.10
<b>4,500 EU</b>	<b>\$ 71,713.19</b>
\$ 372.38	\$ 71,340.81
\$ 553.00	\$ 70,787.81
\$ 1,244.00	\$ 69,543.81
\$ 234.60	\$ 69,309.21
\$ 628.87	\$ 68,680.34
\$ 421.00	\$ 68,259.34
\$ 55.12	\$ 68,204.22
\$ 114.75	\$ 68,089.47
\$ 717.50	\$ 67,371.97
\$ 287.45	\$ 67,084.52
\$ 819.00	\$ 66,265.52
\$ 234.60	\$ 66,030.92
\$ 143.00	\$ 65,887.92
\$ 1,060.00	\$ 64,827.92
\$ 675.00	\$ 64,152.92
\$ 369.00	\$ 63,783.92
\$ 165.05	\$ 63,618.87
\$ 105.40	\$ 63,513.47
\$ 145.01	\$ 63,368.46
\$ 1,608.53	\$ 61,759.93
\$ 1,608.53	\$ 60,151.40
\$ 160.00	\$ 59,991.40
\$ 142.00	\$ 59,849.40
\$ 30.00	\$ 59,819.40
\$ 160.00	\$ 59,659.40
\$ 142.00	\$ 59,517.40

\$	30.00	\$	59,487.40
\$	70.00	\$	59,417.40
\$	114.75	\$	59,302.65
\$	550.00	\$	58,752.65

**\$ 21,974.61**

**\$ 58,752.65**

## APPENDIX 7: PROJECT KEY ACTIVITIES UPDATE & PROPOSED WORKPLAN FOR JULY – DECEMBER 2006

CURRENT UPDATE OF WORK IMPLEMENTED FOR 2005-2006 (SEP. 2005 – MAY 2006)														
KEY ACTIVITIES	MONTHS												UPDATE	
	1	2	3	4	5	6	7	8	9	10	11	12		
1. Carry out ecological surveys, resources use inventories and relevant mapping exercises of the site.														<ul style="list-style-type: none"> <li>Completed report of existing data including data of the most recent survey (Forestry Inventory 2003-2005)</li> <li>Current flora and fauna surveys to be completed by September (including analysis and reports)</li> </ul>
2. Carry out surveys and mapping of land use patterns and tenure systems and recommend appropriate resource management human approaches.														<ul style="list-style-type: none"> <li>Completed maps of landuse, tenure, ecology, land capability, forest types.</li> <li>Recommendations yet to be made.</li> </ul>
3. Establish criteria and assess priority areas for rehabilitation.														<ul style="list-style-type: none"> <li>Current ongoing surveys confirms the national lowland and upland surveys of the '90s in which the main degradation is the spread of invasive plants – trees (Paraserianthes falcataria, African Tulip, Rubber Trees, &amp; Albizia chinensis) &amp; weed species (Coster Curse) – on areas close to the existing trail, open an disturbed areas.</li> <li>Criteria for rehabilitation yet to be established.</li> </ul>
4. Consultations with local people and other government agencies/departments re management plan.														<ul style="list-style-type: none"> <li>Yet to take place</li> </ul>
5. Preparation of management plan.														<ul style="list-style-type: none"> <li>Yet to take place</li> </ul>
6. Preparation and distribution of awareness raising materials and the promotion of appropriate public awareness, media and educational activities.														<ul style="list-style-type: none"> <li>Displays and information dissemination in the Environment Week 2005 &amp; World Biodiversity Day 2006</li> </ul>
7. Promotion of alternative income generating activities														<ul style="list-style-type: none"> <li>Yet to take place</li> </ul>
8. Consultations with technical experts to develop simple and practical monitoring approaches.														<ul style="list-style-type: none"> <li>Yet to take place</li> </ul>

PROPOSED WORKPLAN FOR JULY – DECEMBER 2006						
KEY ACTIVITIES	JUL	AUG	SEPT	OCT	NOV	DEC
1. Complete ecological surveys, resources use inventories and relevant mapping exercises of the site.	■	■				
2. Carry out surveys and mapping of land use patterns and tenure systems and recommend appropriate resource management human approaches.		■	■			
3. Establish criteria and assess priority areas for rehabilitation.			■			
4. Consultations with local people and other government agencies/departments re management plan.	■	■	■	■		
5. Preparation of management plan.			■	■		
6. Preparation and distribution of awareness raising materials and the promotion of appropriate public awareness, media and educational activities.	■	■	■			
7. Promotion of alternative income generating activities			■	■	■	
8. Consultations with technical experts to develop simple and practical monitoring approaches.			■	■	■	■

