

AMERICAN SAMOA

**FOREST ASSESSMENT AND
RESOURCE STRATEGY**



2011 – 2015

Forestry Program
Division of Community and Natural Resources
American Samoa Community College
Pago Pago, American Samoa 96799

June 2010

ACKNOWLEDGEMENTS

The American Samoa Community College Division of Community and Natural Resources Forestry Section would like to thank the many individuals who helped make this assessment and resource strategy possible. Technical support from Anne Marie LaRosa at the Institute of Pacific Islands Forestry was critical in helping us start and finish this process. Zhanfeng Liu and Lisa Fischer of the Forest Service and Dr. W. Arthur Whistler of Isle Botanica were instrumental in helping construct the revised vegetation map that was used in the analysis. We are very grateful to all the members of the American Samoa Forestry Advisory Council who provided important input at critical junctures in the process, and we are deeply indebted to all our colleagues in local partner agencies who gave so generously of their time and expertise in providing invaluable input to the development of the analysis and strategy components. Members of the Advisory Council are listed in Appendix A, and the local colleagues who assisted during the process are listed in Appendix B at the end of this document. We hope that our efforts to carry out these strategies in the coming years will help bring about our shared dream of conserving and enhancing American Samoa's precious forests for future generations of American Samoans.

TABLE OF CONTENTS

I. INTRODUCTION	1
METHODOLOGY FOR ASSESSMENT AND STRATEGY DEVELOPMENT	2
II. AMERICAN SAMOA FOREST RESOURCE ASSESSMENT	6
A. BACKGROUND	6
1. American Samoa’s Forests	6
2. Value of Forests	9
3. Land Tenure	9
4. American Samoa Forestry Programs	10
B. FOREST CONDITIONS AND TRENDS	11
1. Rapid Population Growth	11
2. Forest Conversion	12
3. Forest Health and Invasive Species	14
4. Natural Disturbances	16
5. Employment	16
C. EXISTING PLANS RELATED TO FOREST RESOURCES IN AMERICAN SAMOA	17
1. American Samoa Wildlife Action Plan	17
2. Community Wildfire Protection Plan	17
3. Forest Legacy Program Assessment of Need	177
4. American Samoa 5-year Plan for Forest Stewardship, 2005-2009	18
5. American Samoa Community Forestry Program 5-Year Plan, 2008-2012	18
6. Invasive Species Strategic Plan	19
D. REGIONAL PRIORITIES AND OPPORTUNITIES FOR COLLABORATION	19
E. CRITICAL FORESTRY ISSUES IDENTIFIED BY STAKEHOLDERS	20
F. SPATIAL DATASETS USED FOR OVERLAY ANALYSIS	20
G. CRITICAL ISSUES AND PRIORITY LANDSCAPE AREAS	24
Issue 1. Sustainability of Urban Forests	24
Issue 2. Protection of Coral Reefs	27
Issue 3. Conservation of Wetlands	29
Issue 4. Maintaining Fresh Water Quality	33
Issue 5. Conservation of Native Flora and Fauna	35
H. CONCLUSIONS AND DATA GAPS FROM THE CRITICAL ISSUES ANALYSIS	37
I. ASSESSMENT REFERENCES	40
III. AMERICAN SAMOA FOREST RESOURCE STRATEGY	42
A. LONG-TERM STRATEGIES	42
Issue 1 – Sustainability of urban forests	42
Issue 2 – Protection of Coral Reefs	44
Issue 3 – Conservation of wetlands	45
Issue 4 – Maintaining fresh water quality	47
Issue 5 – Conservation of native flora and fauna	48
B. INVESTING FINANCIAL AND HUMAN RESOURCES	50
C. TRANSLATING STRATEGIES INTO ACTIONS	52
1. Basis for program, agency, and partner coordination	52
2. Existing S&PF program planning requirements	52
D. MONITORING AND REPORTING	53
APPENDIX A: AMERICAN SAMOA FORESTRY ADVISORY COUNCIL	54
APPENDIX B: STAKEHOLDERS’ INVOLVEMENT IN SWARS DEVELOPMENT	55
APPENDIX C: RELATED STRATEGIC PLANS CONSULTED FOR SWARS	60
APPENDIX D: GLOSSARY OF ACRONYMS	61
APPENDIX E: STATE AND PRIVATE FORESTRY PERFORMANCE MEASURES	62

I. INTRODUCTION

The American Samoa Community College Division of Community and Natural Resources, the American Samoa Department of Public Safety Fire Department, and the United States Department of Agriculture Forest Service collaboratively administer federally funded forestry programs in American Samoa. Support for these programs is allocated through the Forest Service State and Private Forestry section as a combination of formula and competitive funding. To ensure the most efficient allocation of federal monies, the 2008 Farm Bill required each state and territory to complete an analysis of forest conditions and trends and use that analysis to produce a long term strategy for the investment of federal forestry program resources. Each state and territory was required to submit, by June 18 2010, a Statewide Assessment and Resource Strategy document that describes its key forest issues, priority landscapes, and long-term strategies in the context of the overarching national themes of conserving working forest landscapes, protecting forests from harm, and enhancing public benefits from trees and forests. This document presents American Samoa's Statewide Assessment and Resource Strategy. The first section describes the methodology and findings of the assessment and includes important information about American Samoa's geography, forests, and forestry programs. The second section details the long-term strategies developed on the basis of this assessment.



Pago Pago Harbor and Matafao Mountain. Photo by Mark Schmaedick.

METHODOLOGY FOR ASSESSMENT AND STRATEGY DEVELOPMENT

Development of the American Samoa Statewide Assessment and Resource Strategy (SWARS) was a collaborative and iterative process. The American Samoa Community College Division of Community and Natural Resources (ASCC CNR) solicited involvement from local stakeholders and experts throughout the process. Key participants were the Department of Public Safety Fire Department, Department of Marine and Wildlife Resources, Department of Commerce, National Park of American Samoa, American Samoa Environmental Protection Agency, USDA Natural Resources Conservation Service, American Samoa Department of Agriculture, National Oceanic and Atmospheric Administration, Department of Parks and Recreation, and the Office of Samoan Affairs, as well as private farmers and landholders and ASCC CNR staff. Large meetings were held with the American Samoa Forestry Advisory Council and other stakeholders on April 9, 2009 to introduce the SWARS process and obtain preliminary inputs and on January 28, 2010 to discuss the draft assessment and proposed strategies (Appendix B). (The American Samoa Forestry Advisory Council combines the Forest Stewardship Advisory Council and the Community Forestry Coordinating Committee.) Later drafts were reviewed with ASCC CNR staff on May 13, 2010 and the Forestry Advisory Council on May 20, 2010. Besides these larger meetings, numerous smaller meetings were held with individual agencies and stakeholders throughout the course of the SWARS effort (Appendix B). Staff of the American Samoa office of the Natural Resources Conservation Service participated in the SWARS development as members of the American Samoa Forestry Advisory Council, and the NRCS technical committee for American Samoa (located in Hawaii) has also been furnished a copy of the SWARS for review. Because almost all of the local NRCS working group (Soil and Water Conservation District) members are also members of the Forestry Advisory Council, it was not deemed useful to schedule separate meetings with SWCD.



Aoa Village, Tutuila Island. Photo by Mark Schmaedick.

Initial meetings with stakeholders and experts identified five critical issues for forestry in American Samoa. (Stakeholders involved in each step of the process are listed in Appendix B.) Spatial and non-spatial data was then obtained to inform each issue. Where spatial data was available, it was used in an overlay analysis conducted to identify priority forest landscapes in the territory. For each issue, spatial data affecting the issue was portrayed as a set of GIS layers. Each GIS layer was comprised of (0, 1) cell values depicting presence or absence of a key factor. For example, in the stream buffer layer, all cells falling within a stream buffer have value = 1 and those outside have value = 0. Most of the spatial data layers were relevant to more than one issue, so they appeared in the overlay analyses for multiple issues.

For each issue, after discussion of each layer informing the issue, each individual stakeholder was asked to assign a value 1-10 to each of the layers depending on its perceived importance to the issue. To ensure meaningful values were assigned, only stakeholders who have expertise on a specific issue were asked to rate the layers used in the analysis for that issue. The weights for the overlay analysis were then obtained by dividing the mean for each layer by the sum of all the layer means for that issue so that the weights for each issue add up to 100%. To delineate the priority landscapes for each issue, the overlay analysis was done by calculating a priority value for each cell by summing across the data layers each layer's value (0,1) for each cell, multiplied by the layer's weight. Possible output cell values thus ranged from 0% to 100%. The natural breaks classification method in ArcGIS 9.2 was used to classify the output cell values into low, medium, and high priority classes which were then mapped. Impervious surfaces and water were masked out in this analysis. The overlay analysis produced a map of high, medium, and low priority forest landscapes for each issue.

In addition to identifying critical issues and delineating priority landscapes, the assessment also describes the general conditions and trends in American Samoa's forest resources and threats to those resources and reviews relevant aspects of the territorial wildlife action plan, the community fire protection plan, and the Forest Legacy assessment of need. Based on this assessment, the resource strategy section presents a long-term plan to maximize program impacts in light of national and local program priorities by focusing resources on addressing those critical issues in the identified priority landscapes through collaborations with local and regional partners. The strategy was developed through a series of stakeholder meetings (Appendix B) while referencing existing forestry program strategic plans and related plans from other agencies. The process served to link local priorities to the national State and Private Forestry program themes and objectives.

State and Private Forestry National Themes and Objectives

1. Conserve Working Forest Landscapes

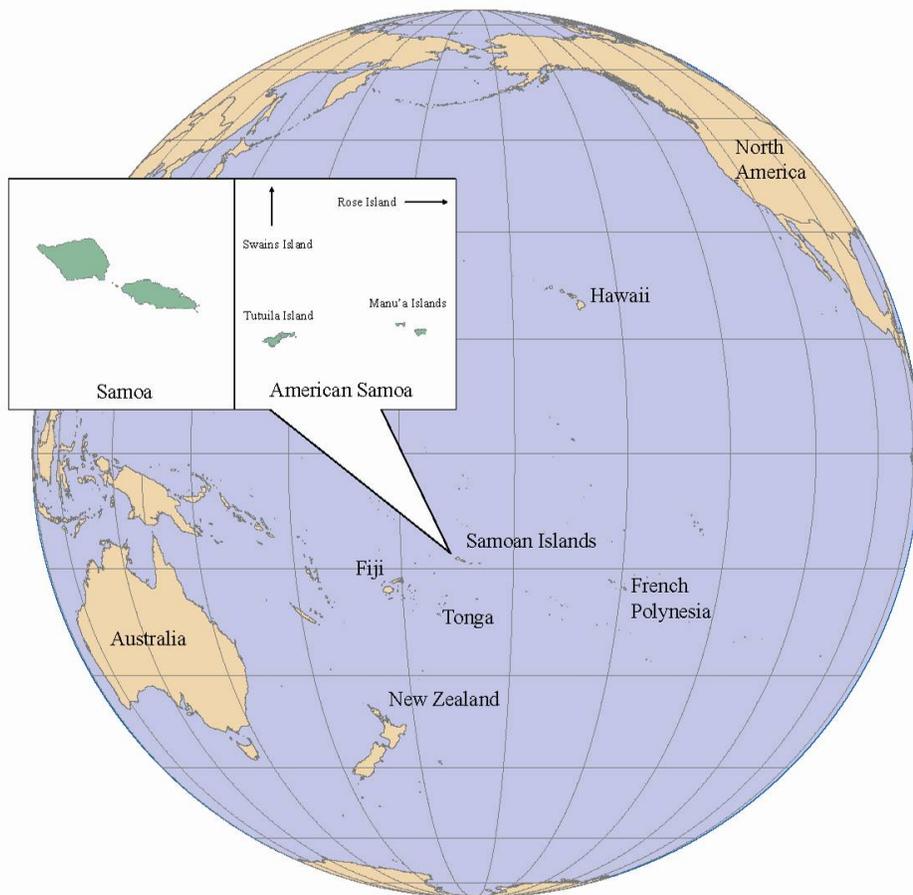
- 1.1. Identify and conserve high priority forest ecosystems and landscapes
- 1.2. Actively and sustainably manage forests

2. Protect Forests from Harm

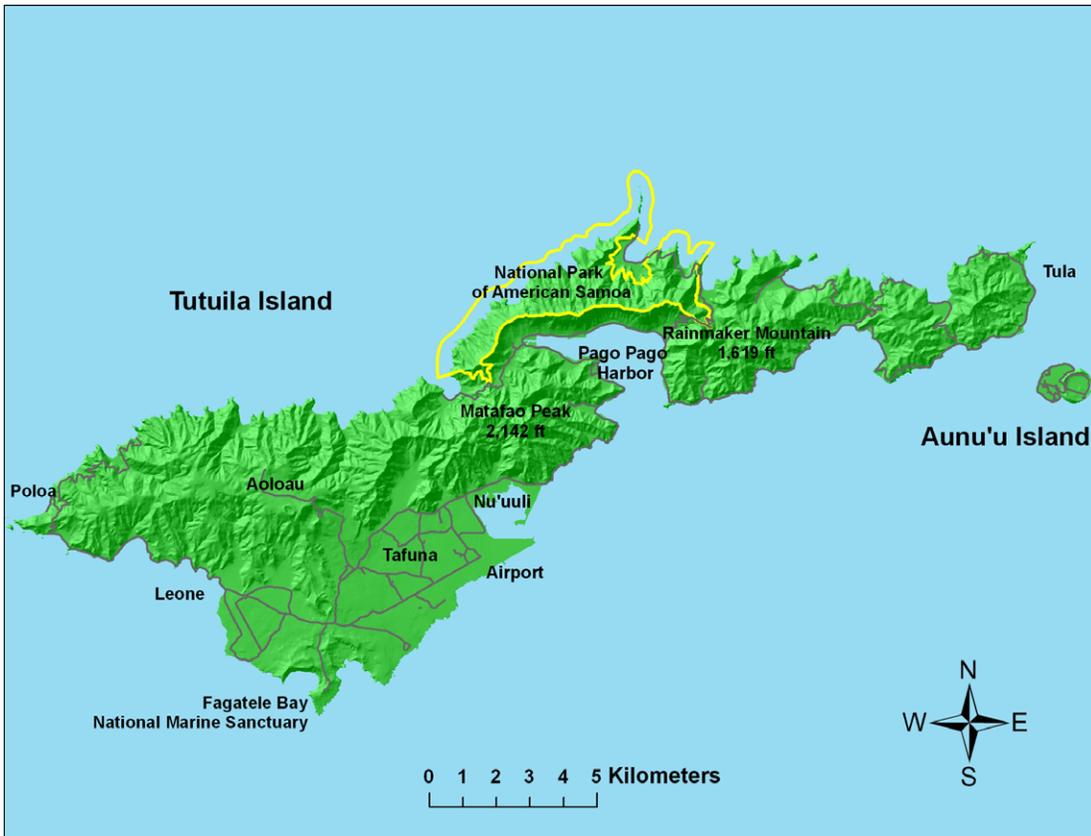
- 2.1. Restore fire-adapted lands and reduce risk of wildfire impacts
- 2.2. Identify, manage, and reduce threats to forest and ecosystem health

3. Enhance Public Benefits from Trees and Forests

- 3.1. Protect and enhance water quality and quantity
- 3.2. Improve air quality and conserve energy
- 3.3. Assist communities in planning for and reducing wildfire risks
- 3.4. Maintain and enhance the economic benefits and values of trees and forests
- 3.5. Protect, conserve, and enhance wildlife and fish habitat
- 3.6. Connect people to trees and forests, and engage them in environmental stewardship activities
- 3.7. Manage and restore trees and forests to mitigate and adapt to global climate change



American Samoa in the Pacific



Tutuila, Aunu'u, & the Manu'a Islands American Samoa



II. AMERICAN SAMOA FOREST RESOURCE ASSESSMENT

A. BACKGROUND

American Samoa, the only territory of the United States south of the Equator, is located in the Pacific Ocean about 2,500 miles south of Hawaii and 1,600 miles northeast of New Zealand. (See map on page 4.) The territory consists of seven islands: five inhabited high volcanic islands (Tutuila, Aunu'u, Ofu, Olosega, and Ta'u), one inhabited atoll (Swains), and one uninhabited atoll (Rose). Rose Atoll is a wildlife refuge managed by the U.S. Fish and Wildlife Service, so is not included in the assessment and resource strategy. Swains Island has been proposed as a potential Forestry Legacy Program site, but is not otherwise considered in this assessment and strategy due to its remote location and difficulty of access for forestry programs. The total land area of American Samoa is 76 square miles, with a population of 69,200. The majority of the population is on the south side of the largest island, Tutuila. The climate is hot, wet, and humid, with an annual rainfall of about 129 inches. The topography is rugged and steep with about 42% of the land having slopes of 45% and higher.

1. American Samoa's Forests

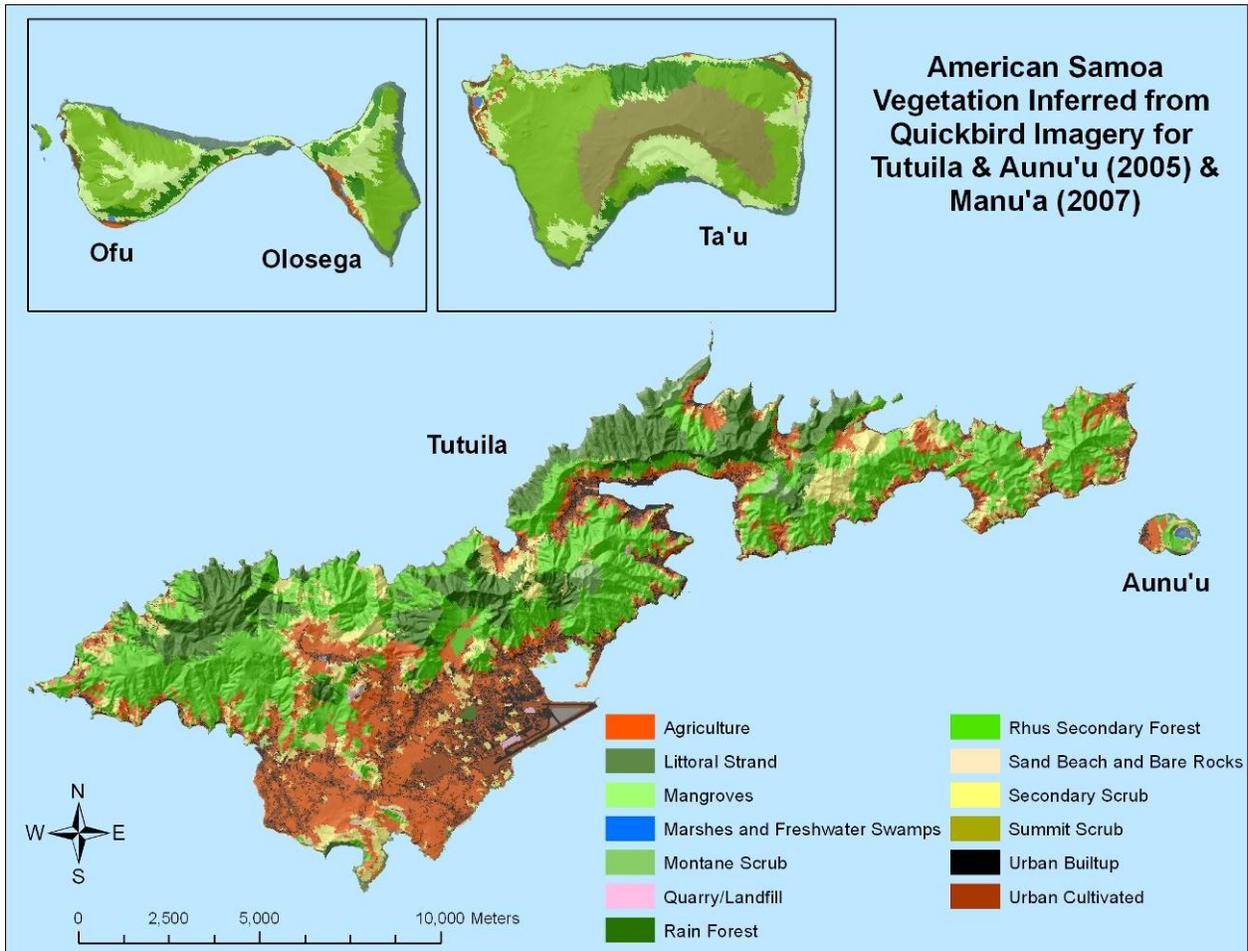
The natural vegetation of American Samoa is tropical rainforest, due to the warm climate and year-round rainfall. Unlike the temperate forests of North America, which are typically dominated by one to a few species, tropical rainforests are dominated by a combination of many species. In American Samoa, native forests extend from the seashore up to the highest mountain peaks. Topographical variation, along with human and natural disturbances, has influenced the growth and distribution of various rainforest types across American Samoa's landscapes.

Throughout American Samoa's undisturbed coastal areas occurs a narrow strip of vegetation referred to as littoral forest. The littoral forest is comprised of various coastal species whose presence and distribution are influenced by the surrounding sea. Littoral forests provide habitat for a number of wildlife species including flying foxes, seabirds, and nesting sea turtles.

On the south side of American Samoa's largest island, Tutuila, lies the Tafuna Plain. Within the Tafuna Plain occurs one of American Samoa's most threatened forest types, referred to as lowland lavaflow rainforest. The lavaflow rainforest sits directly above important aquifers from which the community receives the majority of its drinking water. Tree species in this forest type are adapted to rocky lavaflow areas with little soil and low water-holding capacity. The lavaflow rainforest is also one of American Samoa's tallest forests highlighted by its enormous giant banyan (*Ficus* spp.) and *tava* (*Pometia pinnata*) trees that tower over the plains.

Another threatened forest type in American Samoa is the mangrove forest. Out of the seven islands that comprise American Samoa, mangroves occur on only two, Tutuila and Aunu'u. Mangrove forests occur on these islands' coastal areas, particularly in sheltered lagoons and protected areas where freshwater enters the ocean at the mouths of streams. The largest mangrove forests are located on the south side of Tutuila Island in the lagoons of Leone and Nu'uuli villages. Mangroves serve as prime habitat for numerous fish, crustacean, and mollusk

species. Unlike the other forest types that are comprised of many species, the mangrove forests of American Samoa are dominated by just three species.



Freshwater wetlands, including marshes and swamps, are another important vegetation type in the territory. Marshes occur on all five of the territory's high islands and provide habitat for rare fauna and flora such as the locally rare Pacific black duck (*Anas superciliosa*) and the rare herb *Limnophila fragrans*. Several of the marsh areas are also used for wetland taro production. Swamps, inland wetlands dominated by woody species, are also important habitat for native plants and animals.

American Samoa's urban forests are defined as trees managed by people in and around residential and public areas such as gardens, parks, sports fields, and lawns. The majority of the urban forests are concentrated around the densely populated villages in the relatively flat areas of southwestern Tutuila Island. Urban forests are comprised of a combination of native and non-native trees planted and maintained for food, shade, beauty, wind breaks, building materials, medicine, shoreline protection, boundary markers, etc.



Papa Stream in native forest above Nu'uuli Village. Photo by Don Vargo.

American Samoa's highest peak (Mt. Lata, 3,166 ft) is on the second largest island of Ta'u. The topographical characteristics at the summit of Mt. Lata produce an area of high rainfall, cool temperatures, and strong winds. These factors have influenced the growth of a unique vegetation type referred to as summit scrub. Summit scrub is characterized by stunted trees covered with epiphytes, vines, and ferns, and occurs only on Ta'u Island. Summit scrub provides prime nesting habitat for the Tahiti petrel. Mt. Lata's remote location, high elevation, cool temperatures, and dense vegetation cause it to be rarely visited by humans. The summits of several of Tutuila Island's highest mountains have nutrient-poor, highly weathered soil derived from trachyte plug remnants of eroded ancient volcanoes. The montane scrub vegetation on these peaks is the only known home of some of American Samoa's rarest native plant species.

Most of the rainforest between the coastal areas and the mountain peaks is comprised of Rhus secondary forest growing in areas once disturbed by humans or natural causes, such as cyclones. Much rainforest remains, however, especially on the north side of Tutuila and in scattered patches on the Manu'a Islands.

2. Value of Forests

Forests provide American Samoa's residents with numerous ecological, cultural, and economic values. Ecologically, American Samoa's forests are important for providing food and habitat for native plants and animals. Some forest types are home to rare and endemic plants and animals. Forests also maintain the balance of American Samoa's water and nutrient cycles. Their ability to moderate water flow and absorb nutrients helps prevent flooding, erosion, and contamination which can potentially degrade important resources such as coral reefs, streams, aquifers, and wetlands. Other ecological benefits of forests include recharging aquifers, restoring soil fertility, and carbon sequestration.

Like the sea, forests have played an integral part in the shaping of Samoan identity and culture. For thousands of years Samoans have depended on the resources forests provide for sustaining life and livelihood. Resources such as medicine, food, clothing, canoes, fishing gear, and traditional building materials exemplify the integral role forests play in traditional Samoan daily life. Trees and forests also play an important cultural role, appearing frequently in Samoan legends, traditional ceremonies, and legends. For generations, Samoans have spoken of the forests in their proverbial sayings and chiefly language to symbolize important events and gatherings.

Although no timber industry exists in American Samoa, forests provide other resources of economic value. The tropical forest is a place of rich species diversity inhabited by a number of unique and rare native plants and animals. Such features generate income by attracting eco-tourists who come to appreciate the forests' natural beauty. Forests are also economically valued by fishermen. The mangroves are natural fish nurseries that replenish fish stocks that fishermen depend on for income. In addition, many of American Samoa's native tree species are harvested to create traditional handicrafts, oils, traditional clothing, and mats that can also generate income. Although modern appliances are used for most cooking, many families still cook at least a Sunday meal in a traditional Samoan earth oven, or *umu*, fired by fuel wood purchased or obtained locally. Much of traditional agricultural production comes from agroforestry systems. Cocoa, coconut, breadfruit, various fruit trees, and other trees are often interplanted with taro, yams, bananas, giant taro, and other crops. The nitrogen-fixing *Erythrina subumbrans* is commonly grown with taro to help maintain soil fertility.

3. Land Tenure

The land tenure system in American Samoa consists of five ownership types: communal lands owned by *aiga* (extended families) of a village, government lands owned by the American Samoa government, freehold lands and individually owned lands owned by private landowners, and church lands owned by religious denominations. Approximately 88.4% of the land is communal, 4.0% individually owned, 2.1% freehold, 2.1% church, and 3.4% government owned. Communal lands are managed under the traditional Samoan *matai* (chiefs) system. Under this system, lands are owned by different *aiga* within a village. Each *aiga* is headed by a *matai*. The *matai* holds authority over the land and makes decisions about activities pertaining to the land. Unlike other national parks, the National Park of American Samoa is not owned by the federal government, but was established on communal land under a 50-year lease agreement between the

United States National Park Service and the local *aiga* who retain ownership of the land. The terrestrial portions of the national park cover about 13.2% of the territory's land area. All lands except government owned lands and the national park are eligible for participation in USFS S&PF programs, comprising a total of 40,660 acres.



The near-shore fishery provides nutritious protein for many families. Photo by Zhanfeng Liu.

4. American Samoa Forestry Programs

The American Samoa Forestry Program is in the American Samoa Community College Division of Community and Natural Resources. This is an outcome of a unique agreement between ASCC and the United States Forest Service in 1986. The Forestry Program is one of the major programs within ASCC CNR and is funded through the U.S. Forest Service. The USFS funded programs at ASCC include Urban and Community Forestry, Cooperative Forest Health Protection-Invasive Plants, Forest Health Protection, Forest Stewardship, and the Forest Legacy Program. (The Conservation Education Program will be joined with the UCF Program in July 2010.)

The Forestry Program is presently headed by the ASCC CNR Extension Programs Coordinator who is serving as the Acting Forestry Program Manager while a new Program Manager is being recruited. The Forestry Program receives technical assistance and works closely with a Forestry Researcher, housed in the ASCC CNR Research Division. Technical

assistance for forest health is also provided by an entomologist and a plant pathologist, also housed in the ASCC CNR Research Division. The Forestry Researcher and Plant Pathologist positions are currently vacant but expected to be filled soon. An ASCC CNR GIS Specialist provides GIS/GPS support. The Forestry Program's 12 regular staff members, two AmeriCorps volunteers, and student interns conduct program outreach and delivery activities to clients, schools, farmers, villages, churches, and the community at large. There is a branch office on Ta'u Island with two agents to serve the Manu'a Islands communities. The program also receives technical assistance from the USFS S&PF Pacific Southwest Region and the Institute for Pacific Islands Forestry (S&PF) in Hawaii as well as program guidance from the American Samoa Territorial Forestry Advisory Council. The American Samoa Forestry Advisory Council combines the Forest Stewardship Advisory Council and the Community Forestry Coordinating Committee.

USFS funded fire programs are operated by the American Samoa Department of Public Safety Fire Division. The division is responsible for all fire suppression in the territory with back up from the airport fire and rescue if needed. It also implements fire prevention and education programs. There are three stations and substations on Tutuila Island and one on Ta'u Island. Total staffing is approximately 48, including firefighters and administrative staff.

Staff capacity building is a high priority for American Samoa forestry programs given the limited number of local skilled workers and high turnover rates of professional human resources (off-island contracts) for forest management and program operation. Therefore, there is a great need to provide training opportunities—both non-formal and formal—to build local staff capacity.

The Forestry Program collaborates with government agencies both at the local and federal levels, regional organizations, and non-governmental organizations in program planning, implementation, and evaluation. Moreover, the Forestry Program works with the interagency American Samoa Invasive Species Team (ASIST), community members, farmers, clients, students, and volunteers in preserving, protecting, enhancing, and managing the forests and related natural resources in American Samoa.

B. FOREST CONDITIONS AND TRENDS

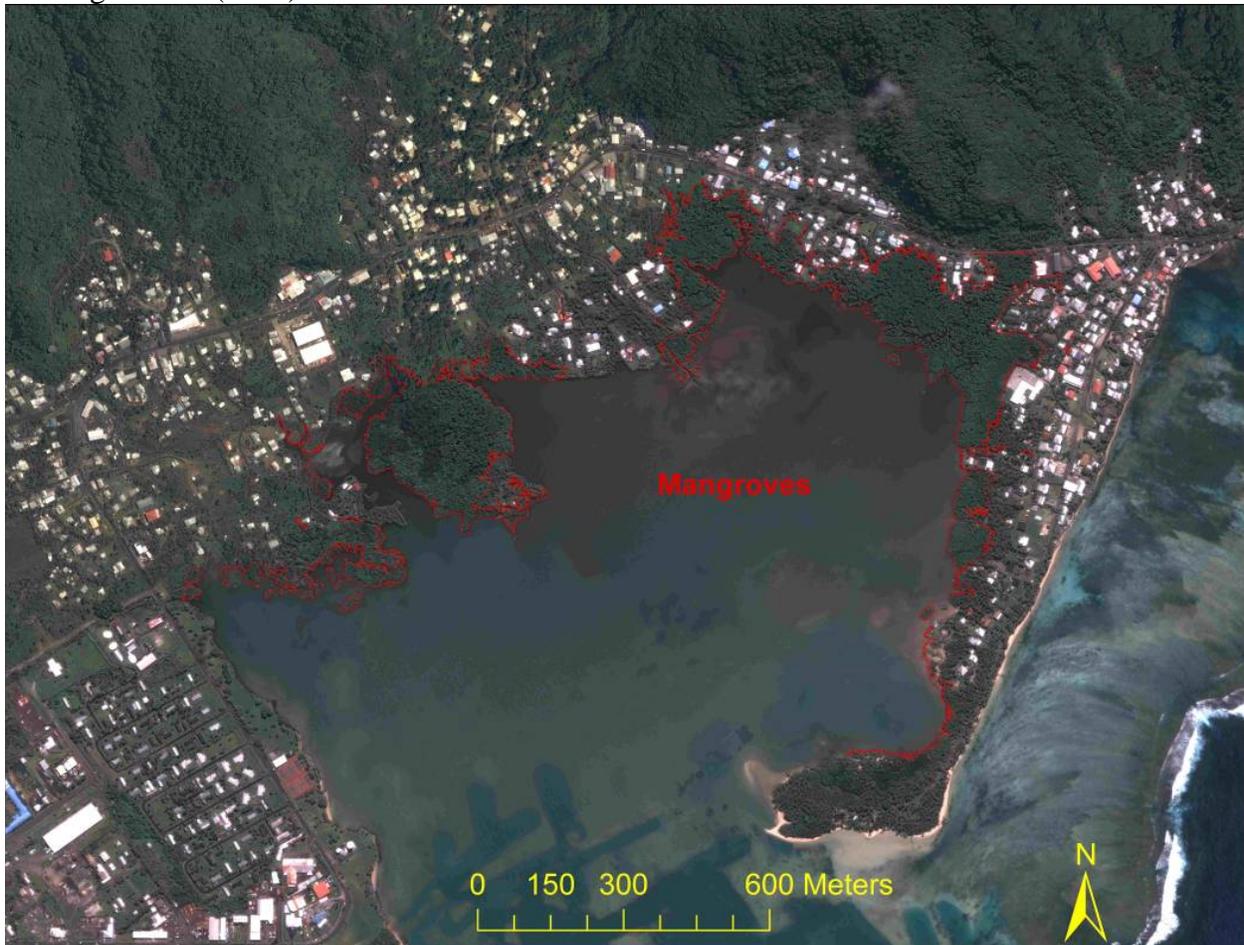
1. Rapid Population Growth

American Samoa is comprised of five volcanic islands and two remote atolls—one uninhabited and the other home to only a few individuals. Of the five high islands, 96% of the population resides on the main island of Tutuila. Many American Samoans from the neighboring islands of Ofu, Olosega, and Ta'u migrate to Tutuila for better employment opportunities and education. In addition, Tutuila attracts many immigrants who come seeking economic opportunities. The 2000 U.S. Census reported 36.1 percent of the population was foreign-born. More recent estimates suggest that most current residents were not born in the territory. The great majority of immigrants are Samoans from independent Samoa, but there are also many from Asia and neighboring Pacific island countries such as Fiji and Tonga. In 1990, American

Samoa's population was 46,773, and it had increased to 57,291 by the year 2000. By 2008, the mid-year population was estimated at 69,200 and it was projected that by the end of year 2010, Tutuila's local population will have increased to 80,000, a 42% increase over the past twenty years. While Tutuila's population is rapidly increasing, that of the Manu'a Islands is not.

2. Forest Conversion

In 2001, the Forest Inventory and Analysis (FIA) Program of the USFS Pacific Northwest Research Station, in collaboration with ASCC CNR, conducted an inventory of American Samoa's forests. To better understand the trends in American Samoa's forests, FIA used a land cover map completed in 1985 (Cole et al. 1988) to compare 1985 forested area to forested area inferred from then current Ikonos imagery. From that comparison, it was estimated that forest lands had declined by 3% over the 15 year period (Donnegan et al., 2001). The 2001 FIA report also estimated that 90.1% of the territory's land area was forested (including agroforest), and 7% urban at that time. The 2009 vegetation mapping effort by ASCC CNR and USFS in support of this SWARS used Quickbird imagery from 2005 (Tutuila and Aunu'u) and 2007 (Manu'a) and estimated 81% of land area was forested. (See map on page 7.) Unfortunately the different types of imagery and methods used do not permit a direct comparison with the Cole et al. (1988) and Donnegan et al. (2001) estimates.



Mangrove areas in Pala Lagoon, Nu'uuli. Quickbird 2005.

In order to sustain American Samoa's increasing population, important forest habitats have been cleared and replaced by agriculture and development. The combination of limited flat lands and high demand for lands suitable for growing crops, building roads, homes, and businesses have significantly increased pressure on the forest. The main island of Tutuila contains 34,082 acres of land, which is 70% of the total land area for American Samoa. Out of the 34,082 acres, only 18,626 acres have less than 45% slope, so areas for development and agriculture are limited. According to the 2009 vegetation map, approximately 5,960 acres of Tutuila's land was identified as agriculture and 2,084 acres as developed. Agriculture and development combined covers 24% of the island.

The mangrove forests of Tutuila and Aunu'u Islands have significantly declined over the past twenty years. Residents clear and fill in mangroves for building homes, businesses, and churches, and for dumping trash. Some of Tutuila's largest mangrove forests are located within heavily populated villages, increasing their vulnerability to encroachment and destructive activities. Although American Samoa's mangroves are protected under the Federal Coastal Zone Management Acts of 1972 and 1990, land ownership and prosecution issues make enforcement difficult. The 1985 Cole et al. (1988) land cover map identified 148 acres of mangrove forests on Tutuila and Aunu'u Islands. In 2002 and 2003, ASCC CNR conducted a comprehensive assessment of mangroves from which they identified 122 acres of mangroves remaining (Bardi and Mann 2003). According to the assessment, approximately 5 acres of mangroves were lost every year, and it was predicted that the mangroves would be completely gone within 25 years if the trend continued. The 2009 vegetation mapping estimated that only 89 acres of mangrove forest remain.

With a total land area of around 3,000 acres, the Tafuna Plain was originally almost entirely covered by lavaflow rainforest. Today, this forest has been reduced to a small patch completely surrounded by development and agriculture. The landscape in which this last remnant of lavaflow rainforest occurs is flat, highly populated, and centrally located, making it ideal for businesses and homes. According to the Donnegan et al. (2001) FIA report, only 40 acres of lowland lavaflow rainforest were identified with the majority of the Tafuna plains being converted to urban development and plantations. Today, those 40 acres has been reduced to 28 acres, a 30% decrease in a period of 9 years.

Many of American Samoa's forests are far from roads and grow on steep and rugged terrain. The difficulty of access and unsuitability of these forested landscapes for agriculture and development have helped some forests remain intact for many years. Although the steep and rugged slopes have protected some forests for a long time, farmers are increasingly encroaching into these areas as a result of suitable flat lands being occupied with urban development and agriculture. The majority of forest clearing on steep slopes is taking place near roads on the southern half of Tutuila Island. Tutuila's main road runs along the entire southern coast providing farmers with easy access to the hillsides. Most of the island's intact forests occur on the northern side where the main road reaches only to a few villages on the far western and eastern ends. These forested landscapes will certainly be threatened if roads are extended into the remote areas of the north.



Remnant lowland lavaflow rainforest in the Tafuna Plain. Quickbird 2005.

3. Forest Health and Invasive Species

Invasive species threaten all of American Samoa's forests—even those too remote or steep to be of interest to developers or farmers. Although no data could be found on the overall distribution and severity of invasives across American Samoa's landscapes, evidence of their negative impact can be seen on many mountain slopes where native trees are being replaced by a variety of invasive species. In addition, with increasing globalization come increased opportunities for the introduction of new potentially dangerous exotics.

Forest trees are affected by both exotic and native arthropod defoliators, such as *Thalassodes pilaria*, *Cleora samoana*, *Badamia exclamationis*, and *Adoretus versutus* and borers such as *Xylosandrus compactus*. Brown root rot caused by *Phellinus noxius* is also common in the rainforest and in the urban forest. While they may severely damage or kill individual trees, these pests are not considered serious threats to the critical functions of the forest in American Samoa where the forest is valued for purposes other than timber production. (See section above.)

In the urban forest, however, heavy defoliation by caterpillars, or loss of trees to brown root rot can be a significant problem. In general though, damage inflicted by strong winds, weed eaters, machetes, and poor pruning tends to be greater than that inflicted by insects or diseases. Often such mechanical injury facilitates subsequent insect or disease attack. Exotic invasive insects occasionally become a problem. Examples are the erythrina gall wasp (*Quadrastichus erythrinae*) attacking the native *Erythrina variegata orientalis* since its accidental introduction in 2005, and the Seychelles scale insect (*Icerya seychellensis*), which severely damaged breadfruits and many other tree species in the urban forest before it was brought under biological control.

Pigs were introduced to the Samoan islands by the earliest settlers and remain an important part of Samoan culture, prepared in traditional earth ovens for special occasions and for traditional Sunday meals. Feral pigs are abundant in many forested areas where they spread invasive plants, damage understory vegetation, and destroy riparian areas by their feeding and wallowing behavior. Pig densities have been reduced in some forested areas by snaring and hunting, but remain high in other areas.

Probably the greatest danger to the native rainforest is the spread of exotic invasive plants. Serious threats already established in American Samoa include the African tulip (*Spathodea campanulata*), Mexican rubber tree (*Castilla elastica*), albizia (*Falcataria moluccana*), red-bead tree (*Adenanthera pavonina*), strawberry guava (*Psidium cattleianum*), cinnamon (*Cinnamomum verum*) and false kava (*Piper auritum*).



Red-flowered African tulip trees are invading forested areas in western Tutuila. Photo by Simon Stowers.



Invasive *Falcataria moluccana* trees killed by girdling. Photo by Fuiava Kitona Fa'atamala.

4. Natural Disturbances

In the last 30 years American Samoa has been struck by six major tropical cyclones. More frequent, but less severe tropical storms and near misses from cyclones also bring strong winds, heavy rains, and high surf. These severe weather events can topple trees and defoliate large areas of forest. Landslides often occur on the steep mountain slopes. Subsequent growth of invasive plant species may prevent the natural succession of native trees. Flooding can also adversely affect trees, especially in the urban forest around low lying villages. Fire is not a part of the natural disturbance and succession processes in American Samoa's forests. Structure fires and brush fires do occur, but tend to be limited in duration and extent due to the frequent rainfall, high humidity and lack of a dry season.

5. Employment

American Samoa's labor force consists of three sectors: government (35%), private/other (36%), and two large tuna canneries (29%). In 2008, the two tuna canneries employed 4,861 people. Unfortunately, in 2009, one of them closed leaving over 2,000 people unemployed. It is unclear whether the remaining cannery will continue in American Samoa or move elsewhere where labor costs are lower. Loss of one or both canneries and associated businesses will

dramatically decrease local tax revenues making current levels of public sector employment unsustainable. Unemployment is a potentially serious threat to forests in American Samoa. With little land and no source of income, residents may be more inclined to clear upland forest to increase subsistence and commercial agricultural production.

C. EXISTING PLANS RELATED TO FOREST RESOURCES IN AMERICAN SAMOA

1. American Samoa Wildlife Action Plan

The Comprehensive Strategy for Wildlife Conservation in American Samoa was produced by the American Samoa Department of Marine and Wildlife Resources (DMWR) as a guide to resources in need of conservation due to decline in abundance, highly localized or restricted distributions, and vulnerability to threats. Its description of wildlife resources and plans for their conservation reveal many areas of shared interest with the forestry programs and opportunities for continued collaboration.

Some of these commonalities include the shared need to obtain accurate, detailed maps of vegetation and invasive plant distributions for delineating priority conservation sites, encouraging the use of native species in urban forests, and controlling key invasive species. To conserve forest resources and native wildlife, both ASCC CNR and DMWR implement conservation efforts through research, education, and public awareness programs in schools, villages, and churches and in local media. The resource strategy section of this document details long-term strategies by which the local forestry programs will contribute to addressing these shared concerns.

2. Community Wildfire Protection Plan

According to the American Samoa Community Wildfire Protection Plan, produced by the American Samoa Department of Public Safety, 2007 saw a total of 98 structure fires and 45 brush/wildfires. Most fires are caused by arson or human activities such as burning rubbish or clearing weeds. A wildland fire risk assessment in 2008 concluded that American Samoa as a whole fell into the high-risk range due to the ignitability of the many wood-sided structures, volume of fuels close to these structures, and fire history. The plan's principle recommendations in order of priority were reduction of fuels along roads, empty lots, and common areas; prevention education and outreach; and improvement of community egress and firefighter ingress. The plan does not include any spatial analysis, but recommends measures be taken to reduce fuel loads in the villages of Aoloaufou, Leone, and Tafuna. ASCC CNR and DPS have shared responsibilities for educating the public on fire prevention. The long-term strategies addressing wildfire protection are described in the strategy section of this report.

3. Forest Legacy Program Assessment of Need

The American Samoa Community College Division of Community and Natural Resources is the local lead agency for the Forestry Legacy Program. American Samoa's Forest Legacy Program Assessment of Need was produced by ASCC CNR in 2003. It stated that although large areas of native forest remained in the territory, population growth and

accompanying development of agriculture and urban infrastructure posed an imminent threat to the forests. Additional threats cited were poorly planned public works projects and invasive species. Although the American Samoa Coastal Management Act provides for designation of “Special Management Areas” where development is restricted, there are no laws to prevent deforestation and no endangered species act to protect habitat of rare and endangered plants and animals. Criteria for Forest Legacy eligibility were that the land must be forested and threatened by conversion, it must contain one or more of a set of important public values, and its preservation must help conserve large, contiguous blocks of forest land and/or create buffers for or facilitate management of other protected lands. Two Forest Legacy Areas were proposed: the Tafuna lowland lavaflow rainforest remnant on Tutuila Island and the entire area of Swains Island. As noted earlier, the Tafuna lowland lavaflow rainforest represents the last remnant of this type of forest in the archipelago. This area has been approved for Forest Legacy Program funding, and the program is currently in the process of clarifying documentation of title. Swains Island is privately owned. Acquisition of the island would protect important seabird roosting habitat and allow continued succession of remaining unmanaged coconut plantations to native forest. The forest consists of patches of littoral trees (*Hernandia sonora*, *Pisonia grandis*, *Neisosperma oppositifolia*, *Pandanus tectorius*, *Guettarda speciosa*, and *Tournefortia argentea*) interspersed among the coconut palms, which are the most abundant tree species. Acquisition of the island would also provide an opportunity to eradicate the non-native Polynesian rat and prevent incursion by other rat species, giving further protection to the seabirds. To date Forest Legacy Program funding for Swains Island has not been actively pursued. The resource strategy calls for completing the process of acquiring the Tafuna lowland forest before initiating the FLP process for Swains Island.

4. American Samoa 5-Year Plan for Forest Stewardship, 2005-2009

The most recent Forestry Stewardship Program plan identifies forest clearing for agriculture and development, damage from cyclones, and the spread of invasive plants as key concerns. Five strategies were described. The first was organization of a Forest Stewardship Committee, which was done. The committee is now combined with the Community Forestry Coordinating Committee as the American Samoa Forestry Advisory Council. The second strategy was to produce high quality planting materials and technical and planning assistance for forestry stewardship. The third strategy was to provide training for extension agents and program clients. The fourth was to identify areas suitable for timber stand improvement, wildlife habitat improvement, or watershed protection and encourage the landowners to implement these activities. The final FSP strategy was to promote practices to reduce erosion from hillside agriculture, identify and promote native trees that grow well in such areas, and to encourage the use of native trees in agroforestry lands adjacent to native forest. Most of the essential elements of these FSP strategies will continue as described in the resource strategies section below.

5. American Samoa Community Forestry Program 5-Year Plan, 2008-2012

The current Community Forestry Program 5-year plan describes key problems as high population growth in an area of limited arable land with high susceptibility to erosion and fragile ecosystems, frequent tropical cyclones, vulnerability to sea level rise, and a lack of knowledge of ecosystem concepts. Approaches to address these issues included promotion of aesthetically

pleasing, appropriate, and culturally important trees by community groups in public areas; protection of coastlines and stream banks from erosion; raising awareness of the value of community forests; and facilitating education of the public about conservation of natural resources. As described in the strategy section below, these approaches will continue in the coming years, with increased emphasis on use of native trees beneficial to wildlife and increasing awareness of, and improving community responses to invasive species.

6. Invasive Species Strategic Plan

An invasive species strategic plan is currently under development by ASCC CNR Forestry. The key components in the draft plan are professional staff capacity-building in weed management, GIS, media development, and grants management; prevention of invasions through training in identification and publicizing lists of high-risk species; control and monitoring efforts against key established species; and educating the public to increase awareness of the dangers of invasive species. Several of these components are included in the resource strategies discussed in this document and others will be added as the invasive species strategic plan is completed and the SWARS strategies are updated.

D. REGIONAL PRIORITIES AND OPPORTUNITIES FOR COLLABORATION

As an island territory, American Samoa shares no contiguous areas with other U.S. states or territories. Nevertheless, the territory shares many common forestry concerns with the other U.S. Pacific states, freely associated states, and territories, including the state of Hawaii, the Federated States of Micronesia, Guam, the Commonwealth of the Northern Mariana Islands, Palau, and the Republic of the Marshall Islands. These concerns include unique and fragile ecosystems with many endemic plants and animals, vibrant indigenous culture, diverse land tenure systems, important traditional subsistence agroforestry, high susceptibility to severe storms and the effects of global climate change, and often a lack of skilled personnel. The Pacific Islands Committee of the Western Forestry Leadership Coalition meets annually and promotes the unique mutual interests of the islands in the USFS and the broader U.S. forestry community. The Institute of Pacific Islands Forestry (S&PF), located in Hawaii, provides crucial technical assistance addressing the unique needs of the islands' forestry programs. ASCC CNR, along with the American Samoa Department of Agriculture, participate in the Secretariat of the Pacific Community's (SPC) annual meeting of heads of agriculture and forestry. SPC provides technical support in the areas of agriculture, forestry, natural resources, human development, and health to its 26 member countries and territories in the Pacific Basin region. Sharing ideas and expertise with regional partners in these Pacific organizations benefits all ASCC CNR forestry programs directly and indirectly.

E. CRITICAL FORESTRY ISSUES IDENTIFIED BY STAKEHOLDERS

As described in the methods section above, ASCC CNR consulted with local experts, stakeholders, and partners to identify critical issues related to the territory's forests and spatial and non-spatial datasets pertaining to those issues. The spatial datasets were then used in an overlay analysis to delineate priority landscape areas for each issue. Five critical issues were identified:

1. Sustainability of urban forests
2. Protection of coral reefs
3. Conservation of wetlands
4. Maintaining fresh water quality
5. Conservation of native flora and fauna

F. SPATIAL DATASETS USED FOR OVERLAY ANALYSIS

Where possible, factors influencing critical issues were depicted spatially as GIS layers to be incorporated in the overlay analysis for each issue. Most of these factors influenced multiple issues, so they appear in the analysis for more than one issue. The following 12 factors were used.

Agriculture. Areas of agriculture as depicted in the 2009 American Samoa vegetation map (p. 7) produced by ASCC CNR and USFS. Includes areas of taro, banana, coconut, breadfruit, vegetable crops, and cattle production.

Coastal Erosion. Areas subject to coastal erosion; depicted as a 30 foot buffer zone extending inland from the coastline.

Fire Prone Areas. Most fires occur in and around urban and disturbed areas. Areas at risk were portrayed by extracting urban cultivated areas from the 2009 ASCC CNR USFS vegetation map (p. 7).

High Value Conservation Areas. Shows critical habitats for native species that are rare or potentially threatened or which have special cultural value. Areas were delineated with assistance from American Samoa Department of Marine and Wildlife Resources experts and using existing vegetation and topographical maps. Includes sea bird and sea turtle nesting sites, fruit bat roosts, and Pacific black duck and native snail habitat. In addition to these areas, native forest—including the Littoral Strand, Mangroves, Montane Scrub, Rain Forest, and Summit Scrub vegetation types from the 2009 ASCC CNR USFS vegetation map (p.7) and areas wetlands mapped in the wetlands layer—are included in this data layer.

Invasive Species. No maps exist of territory-wide invasive species distributions. Instead, areas most at risk from invasive species are shown by extracting from the 2009 ASCC CNR USFS vegetation map (p.7) areas of urban cultivated vegetation and agriculture. These areas were deemed most susceptible to invasive species introduction and initial establishment. To these areas were added the entire areas of all villages known to contain

significant populations of key invasive species (*Adenantha pavonina*, *Castilla elastica*, *Cinnamomum verum*, *Falcataria moluccana*, *Psidium cattleianum*, and *Spathodea campanulata*).

Native Forests. Combines areas on the 2009 ASCC CNR USFS vegetation map (p. 7) classified as Littoral Strand, Mangroves, Montane Scrub, Rain Forest, Rhus Secondary Forest, and Summit Scrub.

Public Water Supplies. Maps all watersheds that contain an American Samoa Power Authority drinking water well.

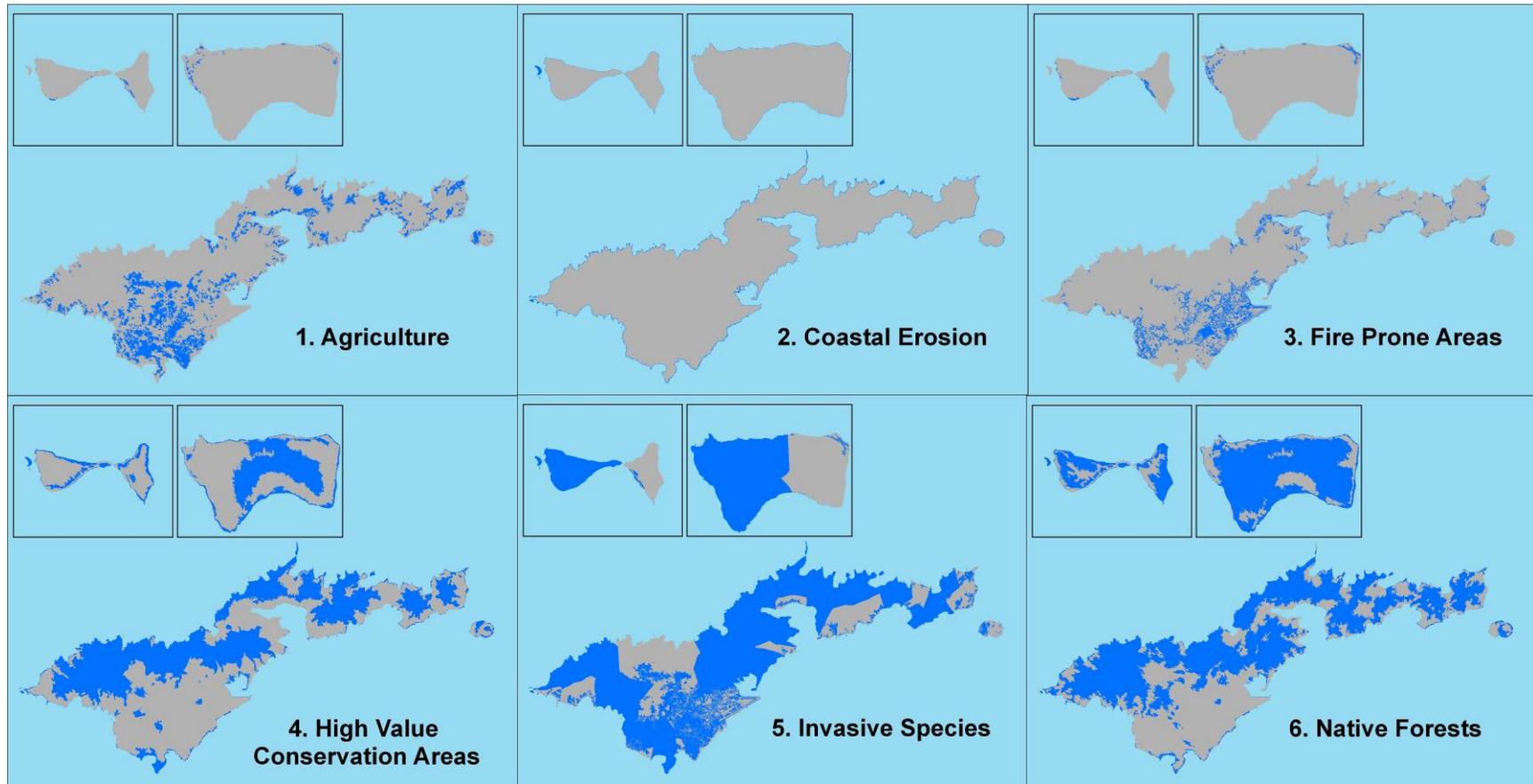
Rapid Development Areas. Shows areas of rapid urban development by depicting the villages with the highest numbers of projects per area submitted to the local Project Notification and Review System of the American Samoa Coastal Zone Management Program during 1984-2006.

Rapid Population Growth Areas. Depicts villages with the highest population growth per area in the interval between the 1990 and 2000 censuses. The shape file maps all villages with a growth rate >5 persons/ha.

Steep Slopes. All areas of 45% or greater slope.

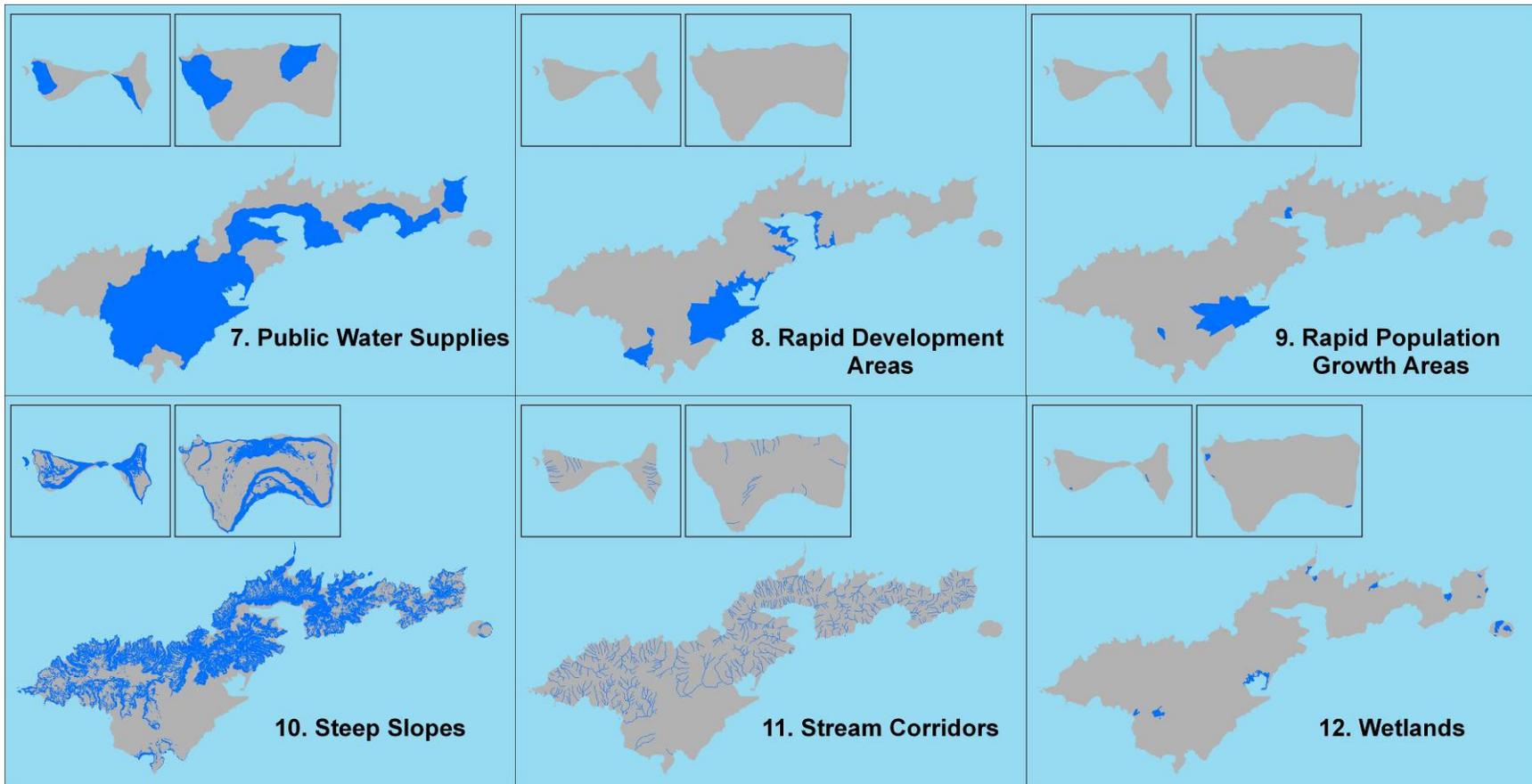
Stream Corridors. Includes all streams with buffer extending 50 feet on either side of the streams.

Wetlands. Maps all wetlands with a 50 foot buffer included around them.



Spatial datasets 1-6 used for overlay analysis for priority landscapes.

- 1. Agriculture.** Areas of agriculture as depicted in the 2009 American Samoa vegetation map (p. 7) produced by ASCC CNR and USFS. Includes areas of taro, banana, coconut, breadfruit, vegetable crops, and cattle production.
- 2. Coastal Erosion.** Areas subject to coastal erosion; depicted as a 30 foot buffer zone extending inland from the coastline.
- 3. Fire Prone Areas.** Most fires occur in and around urban and disturbed areas. Areas at risk were portrayed by extracting urban cultivated areas from the 2009 ASCC CNR USFS vegetation map (p. 7).
- 4. High Value Conservation Areas.** Shows critical habitats for native species that are rare or potentially threatened or which have special cultural value. Areas were delineated with assistance from American Samoa Department of Marine and Wildlife Resources experts and using existing vegetation and topographical maps. Includes sea bird and sea turtle nesting sites, fruit bat roosts, and Pacific black duck and native snail habitat. In addition to these areas, native forest—including the Littoral Strand, Mangroves, Montane Scrub, Rain Forest, and Summit Scrub vegetation types from the 2009 ASCC CNR USFS vegetation map (p. 7) and areas of wetlands mapped in the wetlands layer—are included in this data layer.
- 5. Invasive Species.** No maps exist of territory-wide invasive species distributions. Instead areas most at risk from invasive species are shown by extracting from the 2009 ASCC CNR USFS vegetation map (p. 7) areas of urban cultivated vegetation and agriculture. These areas were deemed most susceptible to invasive species introduction and initial establishment. To these areas were added the entire areas of all villages known to contain significant populations of key invasive species (*Adenanthera pavonina*, *Castilla elastica*, *Cinnamomum verum*, *Falcataria moluccana*, *Psidium cattleianum*, and *Spathodea campanulata*).
- 6. Native Forests.** Combines areas on the 2009 ASCC CNR USFS vegetation map (p. 7) classified as Littoral Strand, Mangroves, Montane Scrub, Rain Forest, Rhus Secondary Forest, and Summit Scrub.



Spatial datasets 7-12 used for overlay analysis for priority landscapes.

7. Public Water Supplies. Maps all watersheds that contain an American Samoa Power Authority drinking water well.

8. Rapid Development Areas. Shows areas of rapid urban development by depicting the villages with the highest numbers of projects per area submitted to the local Project Notification and Review System of the American Samoa Coastal Zone Management Program during 1984-2006.

9. Rapid Population Growth Areas. Depicts villages with the highest population growth per area in the interval between the 1990 and 2000 censuses. The shape file maps all villages with a growth rate >5 persons/ha.

10. Steep Slopes. All areas of 45% or greater slope.

11. Stream Corridors. Includes all streams with buffer extending 50 feet on either side of the streams.

12. Wetlands. Maps all wetlands with a 50 foot buffer included around them.

G. CRITICAL ISSUES AND PRIORITY LANDSCAPE AREAS

Issue 1. Sustainability of Urban Forests

American Samoa's urban forests are comprised of native and non-native species planted and managed around residential, church, and commercial property and public areas including sports fields, parks, and government lands. American Samoa contains approximately 3,106 acres of urban forests with the majority concentrated in and around villages on the southwest lowland plains of the main island Tutuila. Urban forests provide numerous benefits such as food, shade, income, beauty, protection from strong winds, medicine, and habitat for birds and other wildlife. Many challenges face urban forests as the population continues to increase and landscapes change. The focus must be to conserve and sustain the urban forest while at the same time enhancing public benefits derived from this precious resource.



Lions Park, in the Tafuna Plain area. Photo by Neil Gurr.

Threats to Urban Forests

Because of the aesthetic value of the urban forest and the importance of individual trees in the urban landscape, damage or tree death from pests and diseases is perceived to be more important here than in other local forest settings. Exotic plants imported for the urban landscape

can become invasive threats themselves as well as serving as pathways for the introduction of exotic plant-feeding arthropods and plant pathogens.

American Samoa's combination of increasing population and development also threatens Tutuila's urban forests. As the population increases, the availability of flat lands suitable for development declines. Scarcity of these landscapes has resulted in urban forests being replaced with development projects such as homes, businesses, churches, and roads.

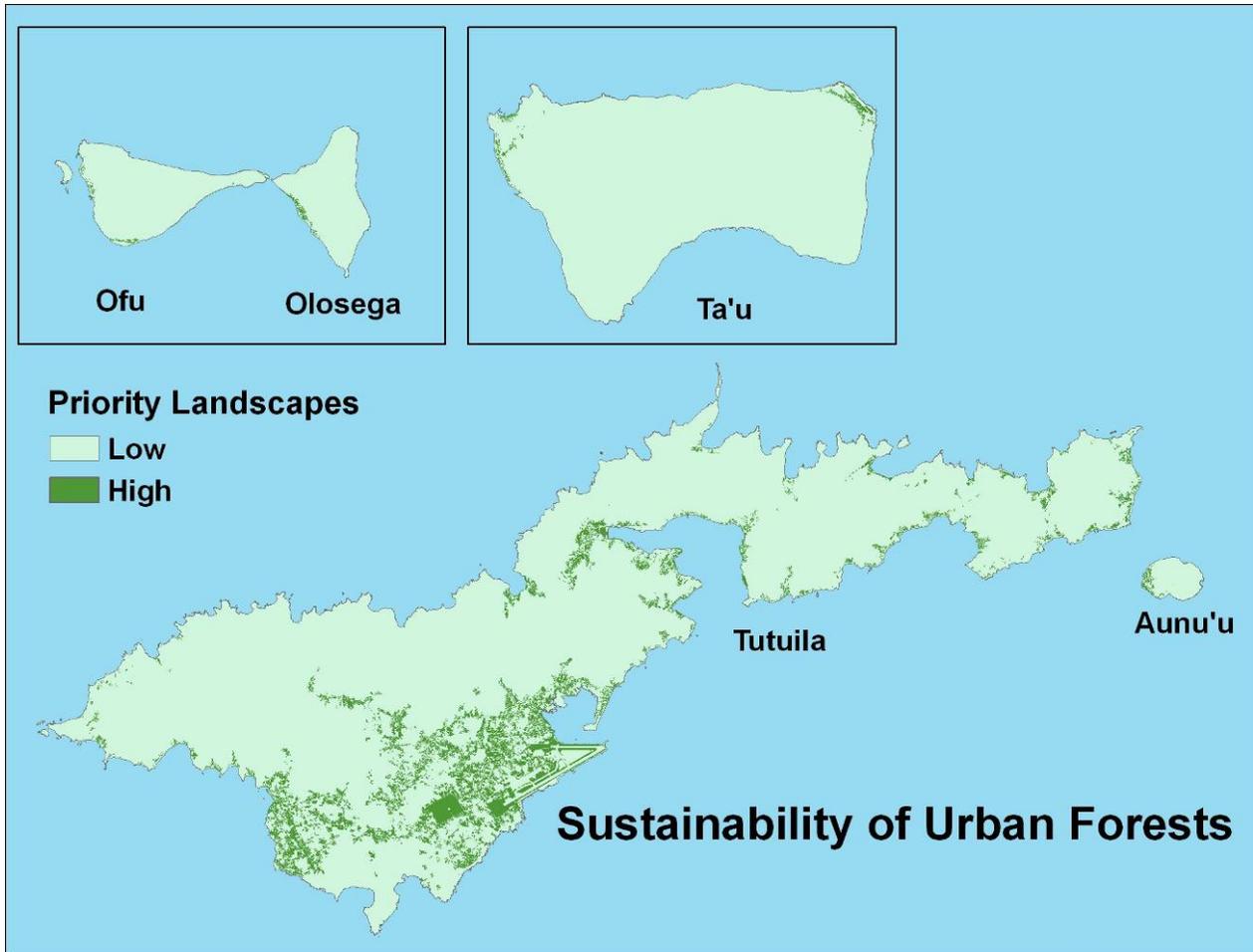
Fire, although currently not a major threat to most of American Samoa's forests, can potentially be devastating to urban forests. Although American Samoa's climate is wet and humid, with year round rains, the months of June through September sometimes bring periods of dryness. Instances of fires occur when residents clear lands and burn piles of debris (branches, weeds, and trash). In some cases, farmers use fire to clear areas of thick grass and for girdling and killing large trees. When such activities overlap with dry conditions, urban forests are at risk of being destroyed.



Tropical almond, *Terminalia catappa*, is a popular native ornamental tree in villages, but is frequently heavily damaged by various caterpillar species including *Badamia exclamationis*. Photos by Mark Schmaedick.

Priority Landscapes for Urban Forest Sustainability

The priority landscapes for sustainability of urban forests include villages, commercial and privately owned residential zones, government office grounds, schools, parks, sports fields, and churches. Because American Samoa’s urban forests cover only approximately 3,106 acres, and all are critically important, all urban forested landscapes were designated as high priority. The largest of these areas are in the Tafuna and Leone Plains and the Pago Pago-Fagatogo area. Smaller areas occur in and around all the villages—mostly located along the coastlines.



Priority acreage for urban forest sustainability.

Priority	Total
High	3,106
Low	44,562
Total	47,668

Issue 2. Protection of Coral Reefs

American Samoa contains over 250 species of coral that sustain unique and diverse near-shore marine communities. These communities include a diversity of marine life including fish, turtles, seabirds, and countless invertebrates. For generations coral reefs have provided the residents of American Samoa with numerous ecological, cultural, and economic benefits such as food, income, protection from high surf, and natural beauty. Yet this valuable resource is increasingly under threat due to human activity and global climate change. Helping protect American Samoa's coral reefs through the implementation of appropriate terrestrial management practices is essential if current and future residents are to continue to benefit from this resource.

Threats to Coral Reefs

Global climate change comprises one of the greatest threats to American Samoa's coral reefs. Rising water temperatures can result in corals becoming heat-stressed. Under these conditions, corals become susceptible to diseases and may die over large areas in a phenomenon referred to as coral bleaching. In 2002 and 2003, detection of once rare coral diseases was becoming more frequent on American Samoa's reefs. In addition to raising sea temperatures, climate change is increasing the levels of dissolved carbon dioxide in the sea. High levels of dissolved carbon dioxide result in high acidity and reduced coral growth and accelerated erosion of the reef.

Coral reefs may also become stressed and susceptible to diseases when they are exposed to high levels of sediment and nutrients. In American Samoa, increased amounts of sediment and



Muddy runoff from streams after heavy rains settles on near-shore coral reefs. Photo by Don Vargo.

nutrients may be deposited onto coral reefs as a result of forests being cleared for development and agriculture, especially on steep slopes and along stream corridors. As forests are cleared, the exposed soil becomes vulnerable to erosion and run-off, eventually ending up in streams which flow onto coral reefs. An increase in impervious surfaces in developed built-up areas also increases runoff. In addition, improper agricultural practices such as misuse of fertilizers and poor farming techniques have contributed to coral reefs being exposed to high levels of nutrients. These effects are intensified by American Samoa’s topography and climate, characterized by steep slopes and year-round, often heavy, rainfall.

Layer weights for coral reef protection overlay analysis.

Data Layer	Weight*
Rapid Development Areas	17
Stream Corridors	16
Agriculture	15
Rapid Population Growth Areas	15
Native Forests	11
Steep Slopes	11
Coastal Erosion	11
Fire Prone Areas	4

*Displayed weights may not sum to 100 due to rounding.

Priority acreage for coral reef protection.

Priority	Forest Acres	Non-Forest Acres	Total
High	2,564	612	3,176
Medium	17,342	1,461	18,803
Low	18,974	4,819	23,793
Total	38,880	6,892	45,772

Priority Landscapes for Coral Reef Protection

Eight spatial datasets were selected and weighted by the stakeholders for use in the overlay analysis to delineate priority areas for this issue. Offshore islets were not included in the coral reef analysis. Although quantity and type vary, coral occurs all around the islands. Because of this fact, and the fact that currents can carry sediment and nutrients to some extent laterally along shorelines, all terrestrial areas were deemed potentially important to the health of coral

reefs. The high priority landscapes identified from the geospatial analysis include areas of rapid development and population growth in the Tafuna Plain and the harbor area, and Nu'uuli, Vailoatai, Taputimu, and Malaeloa Villages, along with portions of stream corridors throughout the territory.



Issue 3. Conservation of Wetlands

American Samoa's wetlands—comprised of mangroves, marshes and swamps—provide residents with numerous cultural, ecological, and economic benefits. Wetlands are important for growing traditional food crops, mitigating flood waters, improving water quality, providing income, recharging ground water, and providing food and habitat for important native plants and animals. Culturally, the connection between wetlands and the animals that inhabit them have been symbolized in traditional Samoan proverbs and songs that have been passed down through the generations. Wetlands also serve as important agricultural areas for the cultivation of traditional taro crops—an agricultural system known to be one of the most productive in the world. In addition, wetlands provide food and habitat for numerous fish, mollusks, crustaceans,

birds, and plants, including rare native species. Conservation and enhancement of wetlands is crucial to preserving Samoan culture, as well as improving the health of American Samoa's residents and environment. With only approximately 450 acres of wetlands left, immediate protective management plans must be implemented if future generations are to continue to enjoy the many benefits this valuable resource provides.



Traditional taro cultivation in Olosega Village wetland, Olosega Island. Photo by Mark Schmaedick.

Threats to Wetlands

Like coral reefs, American Samoa's wetlands are threatened by excessive sedimentation and nutrient enrichment. Wetlands become degraded when sediment and nutrient levels exceed the wetlands' natural ability to absorb pollutants. Activities such as improper farming practices and clearing of forests on slopes and along stream corridors have exposed wetlands to higher amounts of sediment and nutrients than they normally would receive.

American Samoa's wetlands have been destroyed and degraded by activities such as clearing vegetation and filling. On the main Island of Tutuila, the rapid rise in population has resulted in the majority of suitable flat lands being converted for agriculture and development. With limited flat land remaining, residents clear and fill in wetlands to extend the land for building homes, roads, and commercial buildings. It has been estimated that 48% of American

Samoa’s original wetlands have already been degraded or eliminated. As a result, villages on Tutuila are beginning to experience regular flooding after heavy rains.

Priority Landscapes for Wetland Conservation

Because wetlands are affected most directly by activities on their associated catchment areas, only wetland areas and their associated catchments were included in the landscape priority assessment. Watersheds containing wetlands include Leone, Nu’uuli, Vatia, Masefau, Fagaitua, Aoa, Tula, Alao, Aunu’u, Ofu, Olosega, Tufu, and Ta’u. Seven data layers were selected and weighted by stakeholders for the wetlands conservation issue. Wetlands themselves were designated as high priority landscapes, and the overlay analysis was used to calculate priority levels for the remaining areas within the wetland catchments. Landscapes identified as high priority in the overlay analysis totaled 525 acres and include the wetlands themselves and surrounding areas of steep slopes, stream corridors, or rapid population and development. Forested land comprises 33% of these high priority landscapes.

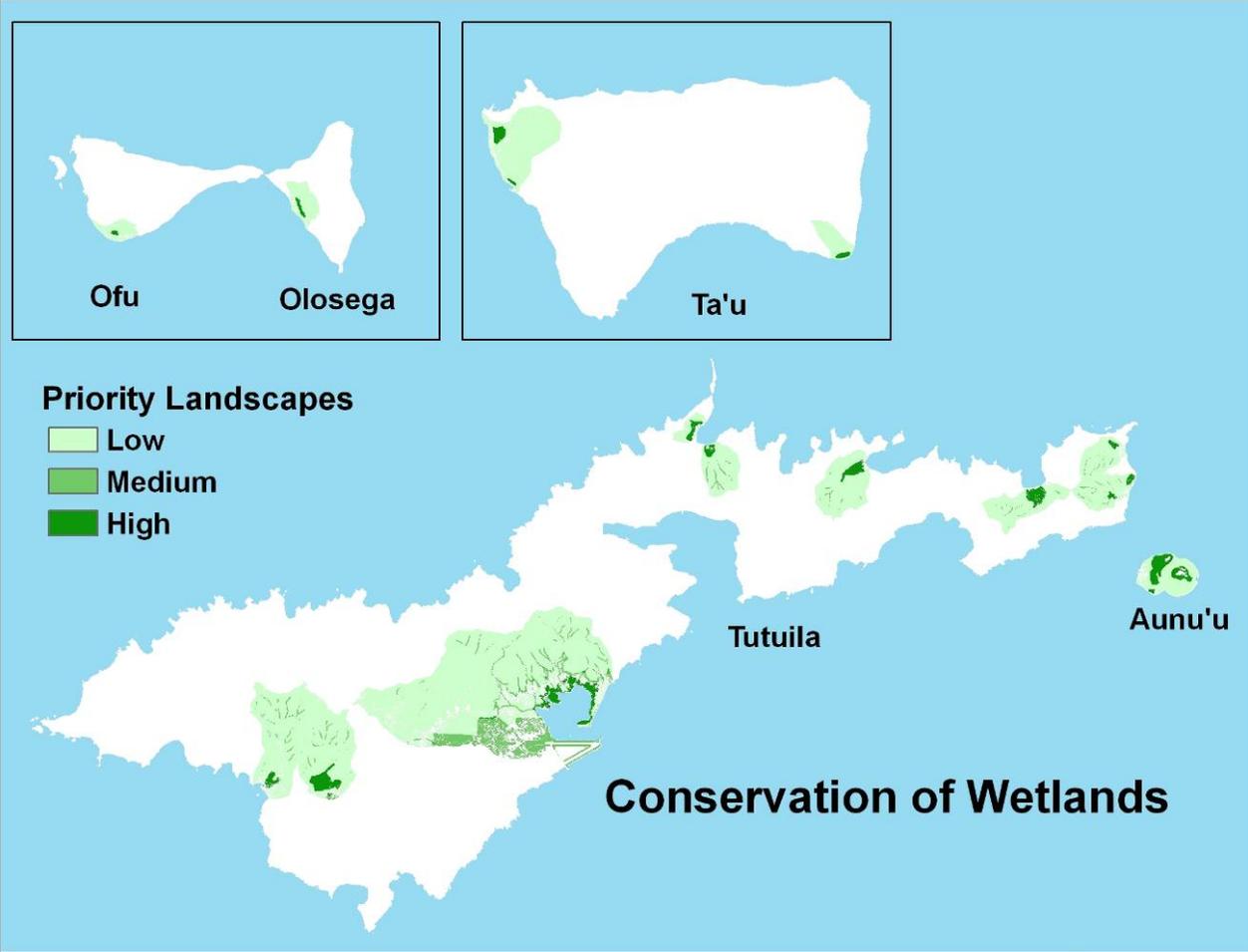
Layer weights for wetland conservation overlay analysis.

Data Layer	Weight*
Rapid Development Areas	19
Stream Corridors	19
Rapid Population Growth Areas	18
Native Forests	14
Agriculture	14
Steep Slopes	12
Fire Prone Areas	4

*Displayed weights may not sum to 100 due to rounding.

Priority acreage for wetland conservation.

Priority	Forest Acres	Non-Forest Acres	Total
High	174	351	525
Medium	663	3,527	4,190
Low	947	3,037	3,984
Total	1,784	6,915	8,699



Mangroves in Pala Lagoon, Nu'uuli Village, Tutuila Island. Photo by Neil Gurr.

Issue 4. Maintaining Fresh Water Quality

American Samoa's fresh water supply comes from both surface water and ground water. The surface water consists of perennial and intermittent streams fed from surface runoff and ground water discharge, while the ground water is comprised of aquifers recharged by percolation from areas at the surface. Streams are important for recreation, bathing, fishing, cooking, recharging aquifers, and sometimes drinking (when boiled). Streams and riparian zones also provide food and habitat for many of American Samoa's native fish and invertebrates. Ground water provides the main source of drinking water in the territory. It is extracted from underground aquifers by the American Samoa Power Authority's submersible and vertical shaft water pumps and treated with liquid chlorine to kill microorganisms. Approximately 80% of American Samoa's drinking water comes from aquifers below the Malaeimi Valley and Tafuna Plain which are recharged from the Nu'uuli and Tafuna Plain watersheds. American Samoa's fresh water quality faces many challenges as the population continues to increase. It is imperative that management solutions are implemented to maintain, enhance, and protect American Samoa's fresh water to the level of quality that current and future generations expect and enjoy.

Threats to Fresh Water Quality

Threats to American Samoa's stream waters include sedimentation and nutrient enrichment. Forests along stream corridors and on steep slopes help moderate the flow of water into streams. As forests in these areas are cleared for agriculture and development, the water flow into streams increases, washing large amounts of exposed unstable soil—including agricultural fertilizers and pollutants—into streams. High levels of sediment and nutrients can be harmful to users of stream water, including fish and other wildlife that inhabit streams. These effects are intensified by American Samoa's rugged topography and high frequency and intensity of rainfall year-round.

Layer weights for fresh water quality overlay analysis.

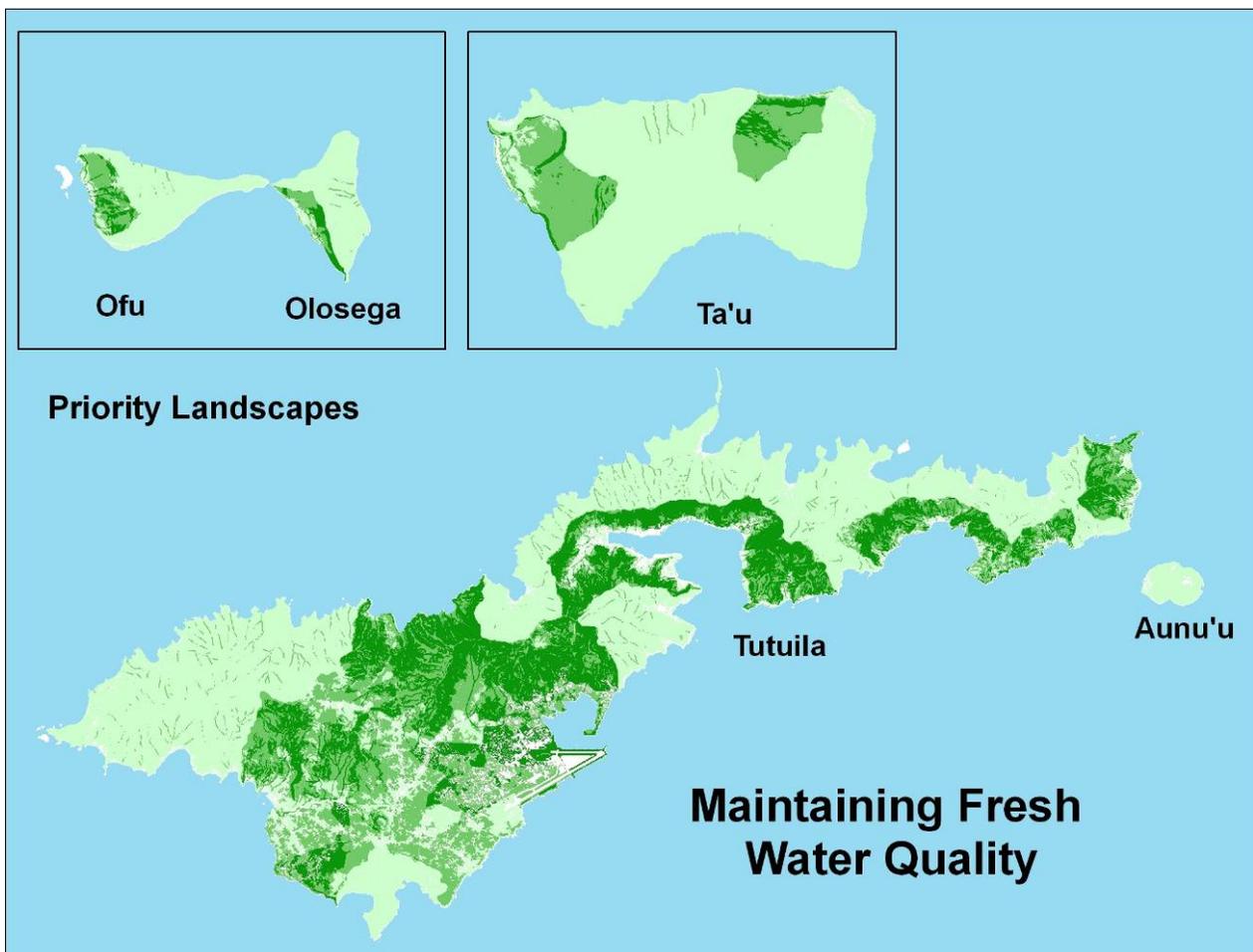
Data Layer	Weight*
Watersheds Containing ASPA Wells	25
Rapid Population Growth Areas	15
Rapid Development Areas	14
Stream Corridors	13
Native Forests	12
Steep Slopes	12
Agriculture	8
Fire Prone Areas	1

*Displayed weights may not sum to 100 due to rounding.

Priority acreage for fresh water quality.

Priority	Forest Acres	Non-Forest Acres	Total
High	6,788	1,487	8,275
Medium	6,918	3,187	10,105
Low	25,174	2,218	27,392
Total	38,880	6,892	45,772

The majority of American Samoa's drinking water supply is retrieved from aquifers below the Tafuna Plain. The Tafuna Plain is an area of high population, urban development, and agriculture. The aquifers are made up of highly permeable volcanic soil and bedrock, which provide poor filtration of impurities. These factors increase the likelihood of drinking water becoming contaminated with pollutants released from piggeries, agricultural fertilizers and pesticides, and septic tanks. Previous studies have shown the presence of fecal coliform bacteria in the aquifers after heavy rains.



Priority Landscapes for Maintaining Fresh Water Quality

Stakeholders identified and assigned weights to eight data layers for the overlay analysis. Offshore islets were not included in the fresh water quality analysis. High priority watersheds identified from the analysis include Leone, Aasu, Tafuna Plain, Nu'uuli, Pago Pago Harbor, Lauli'i-Aumi, Fagaitua, Amouli, Alao, Tula, and portions of Ofu, Olosega, Ta'u, and Letula-Lepula. Within these watersheds, landscapes that pose the greatest threat of sediment and nutrient deposition into freshwater systems were delineated as high priority areas. These areas include landscapes with high population growth, rapid development, steep slopes, stream corridors, and agriculture. Native forests were deemed important because of their role in absorbing excess nutrients and sediment, recharging aquifers, stabilizing soil, and moderating water flow.

Issue 5. Conservation of Native Flora and Fauna

Among American Samoa's true *measina*, or treasures, are its forests and the unique plants and animals that inhabit them. The native flora and fauna that comprise these forests have always been an integral part of Samoan traditions and culture. The variety of resources they provide—including medicine, food, traditional building materials, natural beauty, and recreation—have benefited Samoans for generations. Fortunately, American Samoa still possesses some of the most pristine and intact forests in the South Pacific. Scientists are attracted to American Samoa to study its unique flora and fauna, some of which are found nowhere else in the world. The endemic Samoan swallowtail butterfly (*Papilio godeffroyi*), a species once found on all the larger Samoan islands, now appears restricted to American Samoa. Numerous land snail species are endemic to the archipelago or to one or more islands of American Samoa. As scientists continue to study American Samoa's flora and fauna, more new discoveries are being made. American Samoa's rugged and steep landscapes may have protected its *measina* for generations. However, some species have not been so fortunate. Many challenges face American Samoa's native flora and fauna as the population increases and landscapes are transformed.

Threats to the Native Flora and Fauna

Much of the north side of Tutuila Island is still covered in native forest; however, invasive species such as albizia (*Falcataria mollucana*), red-bead tree (*Adenantha pavonina*), African tulip (*Spathodea campanulata*), strawberry guava (*Psidium cattleianum*), cinnamon (*Cinnamomum verum*), and Mexican rubber tree (*Castilla elastica*) are beginning to invade and pose a serious threat to native vegetation in these areas. *Falcataria mollucana* is one of American Samoa's worst invasives due to its rapid dispersal, quick growth, and ability to outgrow and shade out native species. Evidence of its invasiveness can be seen on ridges and slopes in the central part of Tutuila, and already pockets are beginning to spring up on the western side of the island.

Unlike the native forests on the north side of Tutuila, most of the native forests in the south are greatly diminished due to clearing for agriculture and development. At one time, the lowland lavaflow rainforest covered most of the Tafuna Plain; today only 28 acres of this forest remain in all of American Samoa. This drastic decrease is mainly due to its presence on flat land

which is of high value for development. Many native animals depend on tree species within this forest type for food and shelter. The giant banyan trees in this forest produce fruit eaten by Pacific pigeon, Samoan starling, purple-capped fruit doves, and many-colored fruit doves. The many-colored fruit dove, in particular, is one of American Samoa’s rarest birds and depends almost entirely on the banyan trees for food. Banyan trees also provide primary roosts for flying foxes.

The Manu’a Islands also contain a significant amount of intact forest. With population and development decreasing in Manu’a, however, these forests are currently less threatened than those on Tutuila. Nevertheless, hurricanes and invasive species still pose a threat on these islands as they do on Tutuila. If current and future residents are to continue to enjoy the beauty and benefits of American Samoa’s native flora and fauna, it is crucial that steps be taken to preserve them.

Priority Landscapes for Conservation of Native Flora and Fauna

All areas of Native Forests were assigned high priority for this issue. The remaining spatial datasets important to native flora and fauna conservation were identified and weighted by stakeholders. High priority landscapes determined from their native vegetation were concentrated in the northern portions of Tutuila Island, the summit and littoral areas of Ta’u, the steep slopes and littoral areas of Ofu and Olosega, and upland and littoral areas of Aunu’u Island. There were also patches of high priority landscapes in the Leone-Tafuna-Nu’uuli areas associated with fruit bat roosts, mangroves, swamp land, the lowland lavaflow rain forest and the Fagatele Bay area. The offshore islets of Taputapu, Nu’usetoga, and Nu’utele were also identified as high priority areas.

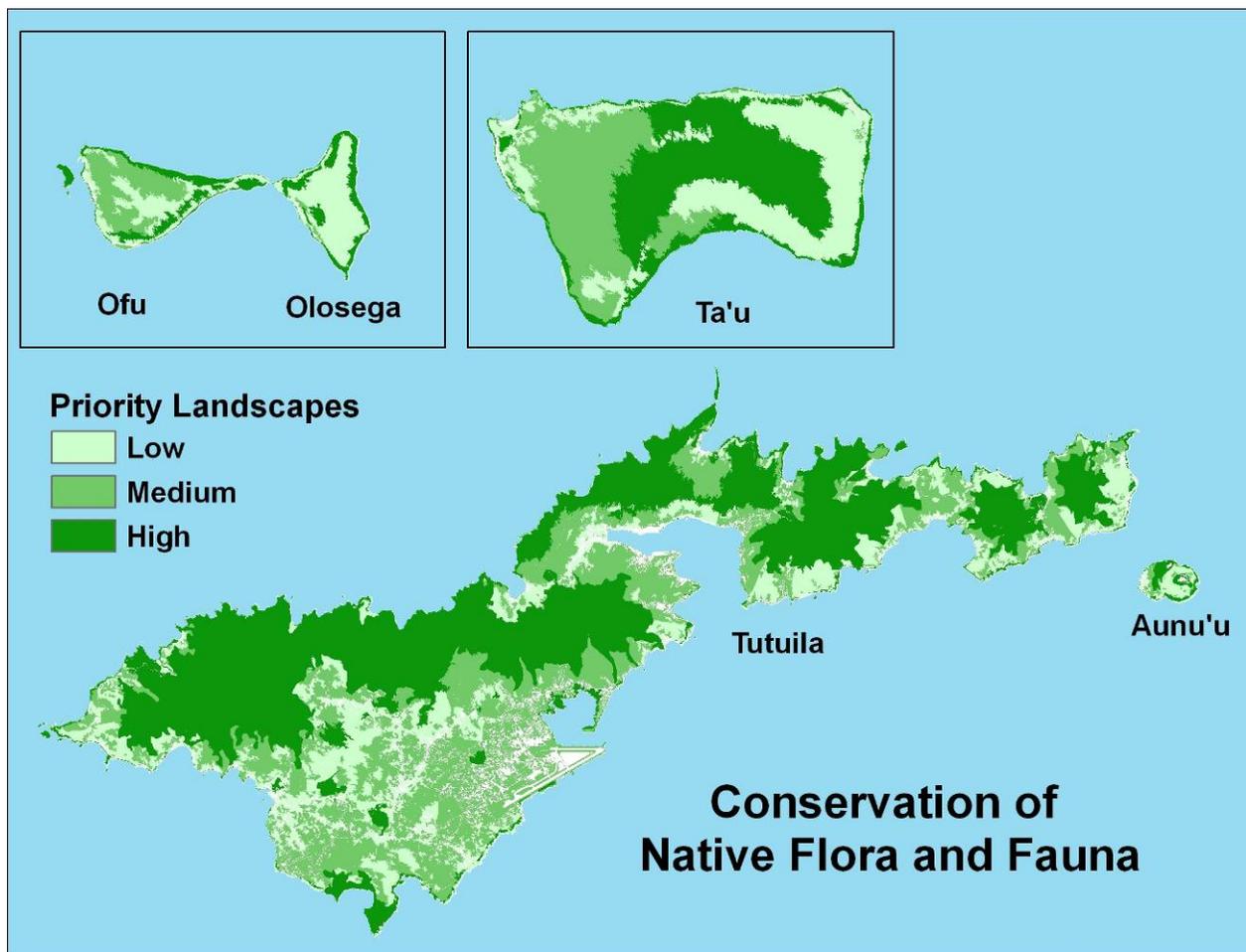
Layer weights for conservation of flora and fauna overlay analysis.

Data Layer	Weight*
Invasive Species	21
Native Forests	21
Rapid Population Growth Areas	17
Rapid Development Areas	16
Agriculture	15
Coastal Erosion	9

*Displayed weights may not sum to 100 due to rounding.

Priority acreage for conservation of flora and fauna.

Priority	Forest Acres	Non-Forest Acres	Total
High	19,803	774	20,577
Medium	8,964	5,382	14,346
Low	10,435	646	11,081
Total	39,202	6,802	46,004



H. CONCLUSIONS AND DATA GAPS FROM THE CRITICAL ISSUES ANALYSIS

While there seems to be broad consensus among stakeholders about the critical issues for American Samoa’s forests, a paucity of spatial and non-spatial data makes it difficult to draw firm conclusions about the status of the resources and threats and to map priority landscapes for each issue. Even where data is available, integrating the available data for each issue into a weighted overlay analysis can seem arbitrary and subjective. The resulting priority landscape

maps will be useful in program planning and evaluation, but must be used only in conjunction with other information sources and interpretation by local experts. More effort is needed to develop critical datasets to support forestry program decision-making and tools to monitor and map program outcomes. Examples of important gaps for American Samoa are maps of invasive species distributions, better indicators of forest conversion over time, and more complete maps of groundwater and recharge areas distributions. Also valuable would be knowledge of appropriate margins for delineation of riparian zones, areas susceptible to coastal erosion, and suitable buffers around wetlands and areas prone to fire or exotic species invasion. In addition to the difficulties arising from lack of data, the process of assigning weights to the data layers that were used for each issue was difficult. Participants had a hard time quantitatively expressing the relative importance to each issue of factors that affect the issue in vastly different ways. The American Samoa 2010 SWARS is merely a first step in the effort to improve program planning and evaluation by better describing the territory's forest resources and the threats to those resources. Future iterations will undoubtedly benefit from the availability of better data, including time series, and better methods for putting that data together to provide an accurate assessment of forestry needs.

Despite these difficulties, the analysis did bring out some important points for program managers and evaluators. The first points apply to issues 2, 3, and 4: Protection of Coral Reefs, Conservation of Wetlands, and Maintaining Fresh Water Quality. All three of these issues may be best addressed on a watershed basis. The resources and threats are linked to each other primarily within watersheds and the effects of programs implemented in a watershed to protect these resources and mitigate threats will be manifested within those watersheds. There are two other reasons why planning programs around watersheds makes sense. The first is that the boundaries between traditional Samoan communities, the villages, often coincide with watershed boundaries. The second is that other local agencies are increasingly focusing their program planning and evaluation efforts at the watershed level. By addressing these three issues at the level of the watershed, the forestry programs will improve their ability to implement programs at the community level, increase opportunities for synergy with partner agencies, and improve both the likelihood of achieving significant real impacts on these issues and the likelihood of being able to measure those impacts.



Land cleared, farmed and left fallow can provide a foothold for invasive plants. Photo by Mark Schmaedick.

The second point also applies primarily to issues 2, 3, and 4. The need to mitigate runoff of excess sediments, nutrients, and other pollutants was a recurring theme throughout the discussion and analysis for these three issues. The forestry programs must invest in strategies to reduce such runoff. In doing so, they will find willing partners in other local agencies who have similar mandates such as the American Samoa Environmental Protection Agency, the American Samoa Department of Agriculture, and the Soil and Water Conservation District.

Other important points apply to issues 1 and 4: Sustainability of Urban Forests and Conservation of Native Flora and Fauna. Invasive species and forest conversion are the major threats in both cases. The urban forests, found in and around all villages, but most concentrated on the south side of Tutuila Island, are not only a victim of invasive species but also a potential source of exotic pests when exotic plants are introduced to these areas. Forestry programs in the urban forest must provide technical assistance in sound tree health management while also encouraging use of native plants and maintaining a close watch for newly introduced pests and invasive plants. In the native forests, primarily on the northern parts of Tutuila Island and on the Manu'a Islands, invasive plants have become a serious threat to the native plants and animals. Controlling these invasive plants will be a major undertaking and a natural collaborator in that effort is the National Park of American Samoa.

Slowing the rate of forest conversion is a daunting challenge in the face of a rising human population and rapid development. To date the areas most at risk of conversion have been on the south portions of Tutuila Island. Forestry programs can promote maintenance of urban forest in these areas and attempt to preserve remaining native vegetation—e.g., the Tafuna lowland lavaflow rainforest remnant proposed for purchase under the Forest Legacy Program.

The preceding sections have described the state of American Samoa's forests and the critical forest-related issues facing the territory. The following sections will detail a long-term strategy to invest local and federal resources in effective partnerships to address those issues.

I. ASSESSMENT REFERENCES

- American Samoa Department of Commerce 2009. American Samoa Statistical Yearbook 2008. Department of Commerce, Pago Pago.
- American Samoa Resource Conservation and Development Council. 2009. American Samoa Resource Conservation and Development Council 2008-2010 Area Plan (revised). American Samoa RC&D, Pago Pago.
- Areta, A. A. R., Malele, A. M. P., and Gurr, N. E. 2008. American Samoa Forestry Stewardship Program spatial analysis project. American Samoa Community College, Pago Pago.
- ASCC CNR Forestry Section 2004. The five-year plan for Forest Stewardship Program, American Samoa, 2005-2009.
- ASCC CNR Forestry Section 2009. American Samoa Community College Community and Natural Resources Forestry Program Invasive Species Strategic plan (DRAFT).
- Bardi, E. and Mann, S. S. 2004. Mangrove inventory and assessment project in American Samoa. Phase 1: Mangrove delineation and preliminary rapid assessment. Technical report No. 40. American Samoa Community College, Division of Community and Natural Resources, Pago Pago.
- Brooks, F. 2002. Brown root rot disease in American Samoa's tropical rain forests. *Pacific science* 56: 377-387.
- Brooks, F. 2006. List of plant diseases in American Samoa 2006. American Samoa Community College Land Grant technical report No. 44. American Samoa Community College, Pago Pago.
- Cole, T. G., Whitesell, C. D., Whistler, W. A., McKay, N., and Ambacher, A. H. 1988. Vegetation survey and forest inventory, American Samoa. USDA Forest Service Pacific Southwest Forest and Range Experiment Station Resource Bulletin PSW-25. Berkeley, California.
- Craig, P. (Editor) 2009. Natural history guide to American Samoa, 3rd ed. National Park of American Samoa, Department of Marine and Wildlife Resources, & American Samoa Community College, Pago Pago, American Samoa.
<http://www.nps.gov/npsa/naturescience/nathistguide.htm>.
- Craig, P., DiDonato, G., Fenner, D., Hawkins, C. 2005. The state of coral reef ecosystems of American Samoa. Pp. 312-337 In: J. Waddell (ed.), The state of coral reef ecosystems of the United States and Pacific Freely Associated States: 2005. NOAA technical memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, Maryland.
- Department of Marine and Wildlife Resources. 2006. A comprehensive strategy for wildlife conservation in American Samoa (RCB Utzurrum, JO Seamon, & K Scheltz Saili, authors). DMWR, Pago Pago.
- Donnegan, J. A., Mann, S. S., Butler, S. L., Hiserote, B. A. 2004. American Samoa's forest resources, 2001. Resource Bulletin PNW-RB-244. Portland, Oregon, USDA Forest Service, Pacific Northwest Research Station.

- Eyre, P. R. 1994. Ground-water quality reconnaissance, Tutuila, American Samoa. 1989. U. S. Geological Survey Water-Resources Investigations report 94-4142.
- Gilman, E. H., Van Lavieren, J., Ellison, V., Jungblut, L., Wilson, L., Areki, F., Brighthouse, G., Bungitak, J. Dus, E., Henry, M., Sauni, I., Jr., Kilman, M., Matthews, E., Teariki-Ruatu, N., Tukia, S., Yuknavage, K. 2006. Pacific island mangroves in a changing climate and rising sea. UNEP Regional Seas reports and studies No. 179. United Nations Environment Programme, Regional Seas Programme, Nairobi, Kenya.
- Izuka, S. K., Perreault, J. A., and Presley, T. K. 2007. Areas contributing recharge to wells in the Tafuna-Leone Plain, Tutuila, American Samoa. U.S. Geological Survey Scientific Investigations report 2007-5167, version 1.0.
- Leibowitz, A. H. 1989. Defining status: a comprehensive analysis of United States territorial relations. Kluwer Academic, Norwell, MA.
- Mann, S. S. 2003. Forest legacy for the territory of American Samoa: an assessment of need. American Samoa Community College, Pago Pago.
- Misa, M. M., Maugalei, T., and Talauega, C. 2008. The five-year plan 2008-2012, American Samoa Community Forestry Program.
- National Weather Service. 2010. Applied Climate Information System NOWDATA. http://www.weather.gov/climate/climate_prediction.php?wfo=samoa
- O'Brien, C., Misa, M., and Savali, S. M. S. 2008. Community wildfire protection plan, American Samoa. American Samoa Department of Public Safety and American Samoa Community College, Pago Pago.
- Secretariat of the Pacific Community. 2008. Territory of American Samoa Department of Agriculture Strategic Plan 2009-2014. SPC, Suva, Fiji.
- Tye, A. 2009. Guidelines for invasive species management in the Pacific: a Pacific strategy for managing pests, weeds and other invasive species. Secretariat of the Pacific Regional Environment Program, Apia, Samoa.
- U. S. Army Corps of Engineers. 1990. Vaipito Stream flood damage reduction, Island of Tutuila, American Samoa. Feasibility phase summary report. Corps of Engineers, Honolulu District, Hawaii.
- Whistler, W. A. 2002. The Samoan Rainforest. Isle Botanica, Honolulu, Hawaii.

III. AMERICAN SAMOA FOREST RESOURCE STRATEGY

A. LONG-TERM STRATEGIES

With the assistance of diverse stakeholders, long-term strategies were developed for investment of forestry program resources to address the five key issues identified in the statewide assessment. For all the issues, the strategies incorporate elements from existing strategic plans, including the American Samoa Wildlife Action Plan, the American Samoa Community Wildfire Protection Plan, the American Samoa Forest Stewardship Program 5-year plan (2005-2009), the American Samoa Community Forestry Program 5-year plan (2008-2012), and the ASCC CNR Invasive Species Strategic Plan. As needs change, and more and better data become available, these strategies and the assessment they are derived from will be updated. Strategies for issues 2, 3, and 4 will likely have the greatest impact and can be most efficiently planned, implemented, and evaluated if they can be focused at the watershed level, ideally combining efforts with other agencies in priority watersheds.

Issue 1 – Sustainability of Urban Forests

1. Issue 1 Description and Desired Future Conditions

In American Samoa the urban forest is comprised of trees growing in villages and other residential, commercial, and government areas. This urban forest provides shade, food, protection from wind and waves, wildlife habitat, traditional construction materials, and natural beauty. A healthy, well-planned and skillfully managed urban forest provides all these benefits safely and economically.

2. Issue 1 Priority Landscapes

The priority landscapes are all the areas of urban forest in the territory, including villages, commercial and privately owned residential zones, government office grounds, schools, and churches.

3. Issue 1 Strategies

1. Work with villages, families, government agencies, schools, and the college to increase native trees in urban and coastal zones.
2. Promote agroforestry in urban zones to prevent clearing upslope.
3. Demonstrate shoreline stabilization using native plants.
4. Improve planning and maintenance of urban forests through arboriculture education.
5. Help communities monitor health of their urban forests and provide technical assistance to address tree health problems.
6. Educate community members about the dangers of potentially invasive exotics and train them to recognize and report or annihilate new occurrences of invasive exotics.
7. Develop and present urban forestry educational programs for schools, the college, villages, government agencies, and church groups.
8. Develop and present fire prevention educational programs for schools, the college, villages, government agencies, and church groups.
9. Work with communities to reduce fuel loads and improve ingress and egress in critical areas.

4. Issue 1 Stakeholders and Partners

Villages, churches, commercial establishments, NGO's, government offices, schools, families, Samoan Affairs, NRCS, ASDOA, Forestry Advisory Council.

5. Issue 1. Performance Outcomes (in addition to required S&PF measures in Appendix E)

- Increased native trees and other plants improve urban environments and stabilize coastal zones.
- Community members properly maintain healthy urban forest with technical assistance from forestry program.
- Reduced introductions and establishment of exotic invasives
- Reduced incidence and severity of wildfires

6. Issue 1. Monitoring and Calibration

Urban forestry programs must work with community partners and respond to the communities' needs which may change over time. Because little is known about best practices for using Samoan native plants in urban environments and for shoreline stabilization, plans will have to be modified as more is learned about what does and doesn't work.

7. Issue 1 Funding and Timelines

Strategy	National Themes ¹	Funding ²	Timeline				
			2011	2012	2013	2014	2015
1. Work with villages, families, government agencies, schools and the college to increase native trees in urban and coastal zones	1.1, 1.2, 3.1, 3.4, 3.5, 3.6	FSP, UCF	X	X	X	X	X
2. Promote agroforestry in urban zones to prevent clearing upslope	1.2, 3.1, 3.4, 3.5, 3.6, 3.7	FSP, UCF		X	X	X	
3. Demonstrate shoreline stabilization using native plants	1.2, 3.5, 3.6, 3.7	FSP, UCF		X	X	X	X
4. Improve planning and maintenance of urban forests through arboriculture education	1.2, 3.1, 3.4, 3.5, 3.6, 3.7	FSP, UCF			X	X	
5. Help communities monitor health of their urban forests and provide technical assistance to address tree problems	1.1, 1.2, 2.2, 3.4, 3.5, 3.6,	CFHP, FSP, UCF	X	X	X	X	X
6. Educate community members about the dangers of potentially invasive exotics and train them to recognize and report or destroy invasives	1.1, 1.2, 2.2, 3.4, 3.5, 3.6	CFHP, FSP, UCF	X	X	X	X	X
7. Develop and present urban forestry educational programs to schools, the college, villages, government agencies, and church groups	1.1, 1.2, 2.2, 3.4, 3.5, 3.6	CFHP, FSP, UCF	X	X	X	X	X
8. Develop and present fire prevention educational programs to schools, the college, villages, government agencies, and church groups	1.1, 2.1, 2.2, 3.3	FMP, FSP, UCF	X	X	X	X	X
9. Work with communities to reduce fuel loads and improve ingress and egress in critical areas	1.1, 2.1, 2.2, 3.3	FMP, FSP, UCF	X	X	X	X	X

¹For national S&PF themes see table on page 3.

²CFHP = Cooperative Forest Health Protection/Invasive Plants Program; FMP = Fire Management Programs; FSP = Forest Stewardship Program; UCF = Urban and Community Forestry Program.

Issue 2 – Protection of Coral Reefs

1. Issue 2 Description and Desired Future Conditions

The coral reefs that surround the islands of American Samoa are important sources of seafood, protection from waves, and natural beauty. The reefs are threatened by activities on land that contribute to sediment deposition and excessive nutrients in the sea water. These problems are intensified with increased clearing of steep lands and riparian zones and production of high input crops such as vegetables. Soil conservation practices on agroforestry land, including use of contour hedgerows and appropriate vegetative cover and trees, can help reduce sediment runoff. Better crop selection and soil fertility management practices can reduce nutrient throughput. Forestry and agriculture extension agents need a toolkit of proven best management practices that agroforesters can apply on the land they farm.

2. Issue 2 Priority Landscapes

High priority landscapes include areas of rapid population growth and development in the Tafuna Plain, Pago Pago harbor area, Nu'uuli, Vailoatai, Taputimu, and Malaeloa Villages. Outside these areas, sections of many of the stream corridors are high priority landscapes for coral reef protection.

3. Issue 2 Strategies

1. Identify and promote best management practices to conserve soil and reduce nutrient runoff in agroforestry areas, on steep slopes, riparian zones, and coastal shorelines.
 - 1.1. Work with NRCS, IPIF (S&PF), and other collaborators to identify a set of best management practices and tree and other species suitable for conserving soil and nutrients on steep slopes, riparian areas, and coastal shorelines in American Samoa.
 - 1.2. Establish, maintain, and publicize plots demonstrating best management practices and use of local species for soil conservation.
 - 1.3. Work with NRCS and OSA to assist FSP and UCF clients integrate soil conservation best management practices into their forest and urban forest land management plans.
 - 1.4. Develop and disseminate brochures detailing best management practices and appropriate native species for soil conservation.
 - 1.5. Develop and broadcast TV spots promoting best practices and use of native species for soil conservation on forest lands.
 - 1.6. Collect seeds and grow native species appropriate for soil conservation on forest lands.
 - 1.7. Propagate and disseminate non-fertile vetiver grass for planting according to agreed guidelines for its appropriate use.

4. Issue 2 stakeholders and partners

DMWR Community-Based Fisheries Management Program, watershed councils, NOAA, DOC CRAG, NRCS, ASDOA, NGO's, Office of Samoan Affairs, village councils, communities, families, farmers' cooperatives, and individual farmers, Forestry Advisory Council.

5. Issue 2 Performance Outcomes (in addition to required S&PF measures in Appendix E)

- Best management practices recognized and implemented by members of community, especially in high priority areas. Native trees and vetiver grass integrated into agroforestry systems by community members.

- Reduced sedimentation and nutrient loading on coral reefs resulting in improved health of coral ecosystem

6. Issue 2 Monitoring and Calibration

It appears that sedimentation and nutrient loading in the coral reefs is not being monitored regularly by any agency, and the forestry program lacks the expertise and equipment to do so. Monitoring trends over time can be difficult due to the wide ranges that occur in local streams with changes in flow due to rainfall. Changes in the reef that result from these processes can take a long time to appear. The program will therefore evaluate its successes and shortcomings by measuring adoption of best management practices by clients after establishing a baseline of existing management practices. As the program proceeds, practices will need to be modified according to client needs and according to what is learned about what works and what doesn't work. Best management practices will change over time. Plans will also need to be adjusted for the inevitable changes in program resources that occur over time.

7. Issue 2 Funding and Timelines

Strategy	National Themes ¹	Funding ²	Timeline				
			2011	2012	2013	2014	2015
1.1 Identify best management practices to reduce soil and nutrient runoff	1.1, 1.2, 3.1, 3.4, 3.5, 3.7	FSP, UCF	X				
1.2 Best management practices demonstration plots	1.1, 1.2, 3.1, 3.4, 3.5, 3.7	FSP, UCF		X	X	X	X
1.3 Work with NRCS and OSA to assist FSP, UCF clients integrate best management practices	1.1, 1.2, 3.1, 3.4, 3.5, 3.7	FSP, UCF		X	X	X	X
1.4 Develop and disseminate brochures on best management practices and native trees	1.2, 3.1, 3.4, 3.5, 3.6, 3.7	FSP, UCF		X	X	X	X
1.5 Develop and broadcast TV spots highlighting best management practices	1.1, 1.2, 3.1, 3.4, 3.5, 3.7	FSP, UCF			X	X	
1.6 Collect seeds and grow seedlings of native species for best management practices programs	1.1, 1.2, 3.1, 3.4, 3.5, 3.7	FSP, UCF	X	X	X	X	X
1.7 Propagate and disseminate non-fertile vetiver grass	1.1, 1.2, 3.1, 3.4, 3.5, 3.7	FSP, UCF	X	X	X	X	X

¹For national S&PF themes see table on page 3.

²FSP = Forest Stewardship Program; UCF = Urban and Community Forestry Program.

Issue 3 – Conservation of Wetlands

1. Issue 3 Description and Desired Future Conditions

American Samoa's wetlands, including coastal mangroves and freshwater marshes and swamps, are important for flood control, groundwater replenishment, shoreline protection, and conservation of plants and animals. They are threatened by filling for development and by sedimentation and nutrient overload from agroforestry. It is important to conserve remaining wetlands and restore degraded ones.

2. Issue 3 Priority Landscapes

Watersheds with high priority areas include Leone, Nu'uuli, Vatia, Masefau, Aoa, Alao, Tula, Anu'u, Ofu, Olosega, Ta'u, and Tufu.

3. Issue 3 Strategies

1. (Same as Issue 2, Strategy 1) Identify and promote best management practices to conserve soil and reduce nutrient runoff in agroforestry areas, on steep slopes, riparian zones, and coastal shorelines.
2. Conduct collaborative research on mangrove reintroduction and restoration methodologies.
 - 2.1. Work with collaborators to plan and implement mangrove reintroduction and restoration trials.
3. Conduct socio-economic study of community values/perceptions/motivations/incentives around wetlands.
 - 3.1. Work with collaborator to plan and implement wetland socio-economic study.

4. Issue 3 Stakeholders and Partners

Local wetlands working group, DOC, NGO's, NRCS, ASDOA, DMWR, watershed councils, forestry advisory council, Office of Samoan Affairs, villages, families, individual farmers, researchers, Forestry Advisory Council.

5. Issue 3 Performance Outcomes (in addition to required S&PF measures in Appendix E)

- Better understanding of mangrove reintroduction and restoration leads to reintroduction and restoration success. Better understanding of community perceptions about wetlands leads to more effective participatory wetland conservation efforts.
- Best management practices recognized and implemented by members of community, especially in high priority areas. Native trees and vetiver grass integrated into agroforestry systems by community members.
- Reduced sedimentation and nutrient loading into wetlands results in improved function and longevity of wetland ecosystems.

6. Issue 3. Monitoring and Calibration

Changes in wetlands due to excessive sedimentation and nutrient loading can take a long time to become visibly evident. The program will instead monitor implementation of best management practices by clients to assess success of the program. Plans will need to be adjusted as client needs change, more is learned about the suitability of various practices in the local environment, and program resources change over time.

7. Issue 3 Funding and Timelines

Strategy	National Themes ¹	Funding ²	Timeline				
			2011	2012	2013	2014	2015
1. (See 1.1-1.7 under Issue 2)	(See 1.1-1.7 Issue 2)	FSP, UCF	X	X	X	X	X
2.1 Plan and implement mangrove reintroduction and restoration trials	1.1, 1.2, 3.5, 3.7	MS, UCF	X	X	X	X	
3.1 Plan and implement wetland socio-economic study	1.1, 1.2, 3.1, 3.4, 3.5, 3.6, 3.7	MS, UCF		X	X		

¹For national S&PF themes see table on page 3.

²FSP = Forest Stewardship Program; MS = McIntire-Stennis Program; UCF = Urban and Community Forestry Program.

Issue 4 – Maintaining Fresh Water Quality

1. Issue 4 Description and Desired Future Conditions

Most of the drinking water for American Samoa comes from underground aquifers that are recharged from rainwater percolating down from forested and unforested lands above. Alternative village water systems are supplied by upland streams. Freshwater streams also support fish, mollusks, and crustaceans, some of which are used for food. Water quality and quantity in aquifers and streams can be adversely affected by activities on the land which cause sedimentation and nutrient loading and reduce percolation in recharge areas by increasing the areas covered by impervious surfaces. Urban landscapes can be managed to reduce the need for impervious surfaces and agroforestry practices adopted to minimize runoff of soil and nutrients.

2. Issue 4 Priority Landscapes

The high priority landscapes are in the Leone, Aasu, Tafuna, Nu'uuli, Pago Pago Harbor, Lauli'i-Aumi, Fagaitua, Amouli, Alao, and Tula watersheds and portions of Ofu, Olosega, Ta'u, and Letula-Lepula watersheds.

3. Issue 4 Strategies

1. (Same as Issue 2, Strategy 1) Identify and promote best management practices to conserve soil and reduce nutrient runoff in agroforestry areas, on steep slopes, and riparian zones.
2. Educate the public about the importance of preserving native forest and about landscaping alternatives to reduce the rate of conversion to impervious surfaces.
 - 2.1. Develop educational programs for schools, the college, villages, governmental agencies, and churches.
 - 2.2. Present educational programs to schools, the college, villages, governmental agencies, and churches.

4. Issue 4 Stakeholders and Partners

ASEPA, ASDOA, ASPA, NGO's, NRCS, DMWR, ASDOE, watershed councils, Office of Samoan Affairs, villages, families, individual farmers, Forestry Advisory Council.

5. Issue 4 Performance Outcomes (in addition to required S&PF measures in Appendix E)

- Best management practices recognized and implemented by members of community, especially in high priority areas. Native trees and nonfertile vetiver grass integrated into agroforestry systems by community members.
- Reduced sedimentation and nutrient loading into streams and aquifers results in improved water quality for drinking, bathing, and stream ecosystems.

6. Issue 4 Monitoring and Calibration

Plans will need to be adapted according to community needs and successes or failures of early efforts. The quantity of work that can be accomplished will depend on program staffing levels, which inevitably change with time. Will need to monitor adoption of best management practices.

7. Issue 4 Funding and Timelines

Strategy	National Themes ¹	Funding ²	Timeline				
			2011	2012	2013	2014	2015
1. (See 1.1-1.7 under Issue 2)	(See 1.1-1.7 Issue 2)	FSP, UCF	X	X	X	X	X
2.1 Develop educational programs for schools, the college, villages, agencies, and churches	1.1, 1.2, 3.1, 3.2, 3.5, 3.6	FSP, UCF	X	X			
2.2 Deliver educational programs to schools, the college, villages, agencies, and churches	1.1, 1.2, 3.1, 3.2, 3.5, 3.6	FSP, UCF		X	X	X	

¹For national S&PF themes see table on page 3.

²FSP = Forest Stewardship Program; UCF = Urban and Community Forestry Program

Issue 5 – Conservation of Native Flora and Fauna

1. Issue 4 Description and Desired Future Conditions

Although much of the north side of Tutuila and the Manu‘a Islands remains under native forest, many areas on the south side of Tutuila—especially the Leone-Tafuna Plains and Pago Pago harbor area—have been cleared for development and agriculture. This conversion threatens native plants and animals which play important roles in traditional medicine and culture as well as the islands’ ecology and natural beauty. Key native forest types must be preserved in areas large enough to support healthy populations of these plants and animals. In addition to land clearing, invasive species pose a serious threat to native flora and fauna.

2. Issue 5 Priority Landscapes

The largest priority areas for this issue are in the native forests on the north side of Tutuila, upland and littoral areas of Aunu‘u, areas of rain forest and littoral strand on Ofu and Olosega, summit scrub, and rain forest on central Ta‘u and littoral forest along the shorelines, along with several widely spaced smaller patches in the Tafuna – Leone Plains.

3. Issue 5 Strategies

1. Plant native trees in urban forest and coastal zones.

1.1. Work with villages, families, government agencies, and schools to increase native trees in their areas to provide shelter and food for native wildlife.

2. Reforestation with native trees.

- 2.1. Conduct research to select appropriate tree species and techniques for reforesting areas of abandoned agricultural lands and other secondary scrub.
- 2.2. Conduct demonstration project reforesting an area of secondary scrub.
- 2.3. Promote community reforestation efforts.
3. Education
 - 3.1. Develop and present educational programs on the importance of preserving native plants and animals to schools, the college, churches, villages, and government agencies.
 - 3.2. Restore the ASCC medicinal garden and nature trail.
4. Purchase and manage the last remnant of Tafuna lowland lavaflow rainforest and begin process to acquire Swains Island under Forest Legacy Program.
5. Continue to collaborate with American Samoa Invasive Species Team interagency working group.
6. Control invasive plant species.
 - 6.1. Identify top target invasive plant species for control efforts and map their distributions in American Samoa.
 - 6.2. Identify top priority areas in which to control invasive species.
 - 6.3. Complete invasive species strategic plan.
 - 6.4. Work with collaborators to plan and implement control programs for target invasive species.
 - 6.5. Reforest areas cleared of invasive species with appropriate natives.
7. Identify top exotic arthropod and disease threats to native trees of American Samoa and develop strategy for early detection and rapid response.

4. Issue 5 Stakeholders and Partners

DMWR, NPAS, NRCS, researchers, ASDOE, NGO's, Samoan Affairs, villages, families, Forestry Advisory Council.

5. Issue 5. Performance Outcomes (in addition to required S&PF measures in Appendix E)

- Increased native trees and plants in villages and protecting shorelines.
- Disturbed areas restored with native flora using proven effective methods.
- ASCC medicinal garden and nature trail enhanced as educational resource for community.
- Reduced invasive plant populations allow reestablishment of native vegetation.
- Tafuna lowland lavaflow rainforest flora and fauna preserved and enhanced as an educational resource for the community. Swains Island acquisition process initiated.
- Forestry staff complete National Plant Diagnostic Network First Detector training and able to detect and respond appropriately to incursion of top exotic arthropod and disease threats to native trees.

6. Issue 5. Monitoring and Calibration

Reforestation of disturbed areas has been a challenge in American Samoa. Reforestation projects will have to adapt based on outcomes of research and trials of different methods. The projects under this issue can require high personnel inputs. Plans will have to be cut back if personnel or funding doesn't permit implementation of all the strategies outlined here.

7. Issue 5 Funding and Timelines

Strategy	National Themes ¹	Funding ²	Timeline				
			2011	2012	2013	2014	2015
1.1 Work with village, families, agencies, schools to increase native trees in urban and coastal zones	1.1, 1.2, 3.1, 3.4, 3.5, 3.6	FSP, UCF	X	X	X	X	X
2.1 Conduct research to identify appropriate tree species and techniques for reforesting areas of abandoned agriculture and secondary scrub	1.2, 3.1, 3.4, 3.5, 3.7	FSP, MS, UCF	X	X	X	X	X
2.2 Conduct demonstration project reforesting an area of secondary scrub	1.2, 3.1, 3.4, 3.5, 3.6, 3.7	FSP, UCF				X	X
2.3 Promote community reforestation efforts	1.2, 3.1, 3.4, 3.5, 3.6, 3.7	FSP, UCF					X
3.1 Develop and present educational programs on importance of preserving native plants and animals	1.2, 3.1, 3.5, 3.6	FSP, UCF	X	X	X	X	X
3.2 Restore ASCC medicinal plant garden and nature trail	3.4, 3.5, 3.6	FSP, UCF		X			
4. Purchase and manage last remnant of Tafuna lowland lavaflow rainforest and begin process to acquire Swains Island under Forest Legacy Progr.	1.1, 1.2, 3.1, 3.5, 3.6, 3.7	FLP, UCF		X	X	X	X
5. Continue to collaborate with American Samoa Invasive Species Team	1.1, 1.2, 2.2, 3.5, 3.6	CFHP	X				
6.1 Identify top target invasive plant species for control efforts and map their distributions	2.2, 3.5	CFHP		X	X		
6.2 Identify top priority areas in which to control invasive species	2.2, 3.5	CFHP		X	X		
6.3. Complete invasive species strategic plan	1.1, 1.2, 2.2	CFHP	X				
6.4. Work with collaborators to plan and implement control programs for target invasive species	1.1, 1.2, 2.2, 3.4, 3.5	CFHP, UCF	X	X	X	X	X
6.5 Reforest areas cleared of invasive species with appropriate natives	1.1, 1.2, 2.2, 3.1, 3.4, 3.5, 3.7	CFHP, FSP, UCF		X	X	X	X
7. Identify top exotic arthropod and disease threats to native trees and develop strategy for early detection and rapid response	1.2, 2.2,	CFHP, FSP, UCF		X	X	X	X

¹For national S&PF themes see table on page 3.

²CFHP = Cooperative Forest Health Protection/Invasive Plants Program; FSP = Forest Stewardship Program; MS = McIntire-Stennis Program; UCF = Urban and Community Forestry Program.

B. INVESTING FINANCIAL AND HUMAN RESOURCES

One of the greatest challenges faced by the forestry programs is recruitment and retention of skilled technical and management professionals. This challenge must be addressed at all levels by boosting opportunities and incentives for the best local students to study forestry and natural resources, increasing the incentives for qualified professionals to take forestry positions in American Samoa, and by creating greater opportunities for professional development for all

forestry staff. These efforts will require continued development and promotion of the college's natural resources instructional programs and creating new linkages and strengthening existing linkages with off-island institutions to create educational opportunities for students and professional development opportunities for staff.

More specifically, an Associate of Science (AS) degree program in forestry must be developed and offered at the American Samoa Community College (ASCC). The establishment of such a program will allow both students and staff to pursue AS degrees in forestry. Upon completion of the AS degree program, students and staff can return to work or continue to pursue undergraduate and graduate degrees at educational institutions in Hawaii, the U.S. mainland, and elsewhere in the Pacific region. Staff members can also take refresher courses at ASCC to acquire basic knowledge in forestry, botany, chemistry, ecology, plant pathology, entomology, soil science, computer applications, math, writing, and other areas. Scholarship opportunities should be available to both students and staff to pursue Associate and Bachelor degrees in forestry and natural resources.

Opportunities such as the Professional Internships in Pacific Island Ecosystem Management program must be continued for staff capacity building in specific areas such as administration, covering office management, people skills, budgeting, grant writing, program implementation, evaluation, and reporting. Specialized and certification training programs on topics such as GPS/GIS, computer modeling, pesticides safety, arboriculture, greenhouse management, forest inventory analysis, map reading, forest management, land survey, landscaping, invasive species management, forest health protection, trail development, plant propagation, watershed management, FSP and UCF management plan development, ordinance development, agro-forestry, weed management, coastal stabilization, tree stand improvement, wildlife habitat restoration, fire protection, greenhouse construction, energy conservation, wetlands restoration, climate change mitigation, and others must be developed and implemented.

Exchange programs where staff members from American Samoa can work in other Pacific islands or USFS regional offices for a certain period of time to develop management skills and gain experience in management or specific content areas must be developed. Staff participation in workshops, conferences, and meetings in the Pacific region and U.S. mainland on various areas of forestry must be continued to build staff capacity. USFS Region 5 managers must visit American Samoa on a quarterly basis to monitor operations, conduct workshops, and serve as mentors to newly hired and veteran staff. Orientation programs at the regional office or in American Samoa for new program managers and foresters must be developed. Specialized trainers and professionals from the USFS Region 5, S&PF, other federal agencies, the Secretariat of the Pacific Community, the Pacific Invasive Initiative, and other regional government agencies and non-government organizations should continue to conduct workshops in American Samoa on specific topics for local staff capacity building.

C. TRANSLATING STRATEGIES INTO ACTIONS

1. Basis for program, agency, and partner coordination

This statewide assessment and resource strategy document will provide the basic guidance for the American Samoa forestry programs over the next five years. Although the strategies will be modified from year-to-year as necessary, the entire SWARS analysis process will not be repeated every year. The strategies described here will serve as the basis for the contents of the core and competitive State and Private Forestry annual grant proposals. Near the end of each calendar year, the program managers will review their progress in consultation with key stakeholders and outline an action plan and draft grant proposals for the coming year. The consolidated Forestry Program Advisory Council will be apprised of progress on all programs and provided an opportunity to review the annual action plans and grant proposals. When grant funding decisions are received after submission of the proposals, the program managers will create their programs' work plans to be implemented through the year. The ASCC CNR Dean and Director, in consultation with the forestry program manager, will determine the competitive proposals to be submitted each year, and both the forestry program manager (territorial forester) and the CNR Dean will review the final versions of all proposals (including Forest Legacy and Fire) before they are submitted.

2. Existing S&PF program planning requirements

a) Fire Management Program Plans

The American Samoa Community Wildfire Protection Plan cites reduction of large fuel loads around the wildland-urban interface, the need to improve community egress and firefighter ingress during fire response, and fire prevention education as critical needs for American Samoa. The areas of Aoloaufou, Leone, and Tafuna villages are being targeted for fuel load reduction and improvement of egress and access by reducing vegetation along roadsides and empty lots, in common areas and areas near homes. Green waste pick-up and creation of fuel breaks will also occur in these areas. The Department of Public Safety Fire Division will partner with ASCC CNR to educate the public in fire prevention, focusing on proper, safe burning of rubbish, yard and farm wastes. Educational materials, including TV and radio spots, posters, and handouts, will be developed and distributed.

b) Forest Health Programs

- i. *Plans.* The SWARS strategies incorporate forest health activities and will provide the basis for core and competitive annual forest health proposals. S&PF forest health programs require participation of an entomologist, plant pathologist, or invasive species specialist to provide technical support to all programs.
- ii. *Requirements.* The ASCC Division of Community and Natural Resources entomologist provides entomological support to the forest health programs. The programs receive pathology support from the CNR plant pathologist and invasive species/weeds management support from the CNR forestry researcher.

Because the most important forest health problems in the territory involve invasive plants, the forestry researcher has provided invasive plants expertise and worked most closely with the forest health programs. The forestry researcher also manages the McIntire-Stennis forestry research program. Currently the plant pathologist and forestry researcher positions are vacant, but the college is actively recruiting to fill these positions.

c) Forest Legacy Program

The FLP assessment of needs identified the Tafuna lowland lavaflow rainforest remnant and Swains Island as FLP areas of interest. Funds have been allocated for purchase of the Tafuna forest remnant, but several matters, including documentation of title, remain to be resolved before the purchase can be completed. Due to the focus on the Tafuna forest, the Swains Island area of interest has not been pursued to date.

d) Forest Stewardship Program

- i. *Territorial Forest Stewardship Coordinating Committee.* The FSP coordinating committee is combined with the UCF advisory council as the American Samoa Forestry Program Advisory Council. Members are listed in Appendix A. The Council provides advisory assistance for all ASCC CNR forestry programs by reviewing grant proposals and progress reports.
- ii. *Plans.* The annual FSP grant proposal and annual action plan will be based on the strategies outlined in this document, incorporating recent additional stakeholder input and advice from the Forestry Program Advisory Council.

e) Urban and Community Forestry Program

- i. *Territorial Urban and Community Forestry Advisory Council.* The UCF Advisory Council is combined with the FSP Coordinating Committee as the American Samoa Forestry Program Advisory Council. Members are listed in Appendix A. The Council provides advisory assistance for all ASCC CNR forestry programs, reviewing all grant proposals and progress reports.
- ii. *UCF staffing/partnership.* The UCF Program Manager, Partnership Coordinator, and Community Outreach Coordinator are combined in the U&CF Coordinator position which is shared by two ASCC CNR professional staff.
- iii. *Plans.* The annual UCF grant proposal and annual action plan will be based on the SWARS strategies and incorporate up-to-date stakeholder input and Forestry Program Advisory Council advice.

D. MONITORING AND REPORTING

1. *Monitoring outcomes and revising plans.* Monitoring and procedures for revising plans as needed are discussed under each issue in the resource strategy. (See also current performance measures in Appendix E.)

2. *Partners reporting.* The Fire Management Program will submit copies of all progress reports, strategic plans, work plans, and grant proposals to the territorial forester as they are submitted to S&PF.

APPENDIX A
AMERICAN SAMOA FORESTRY ADVISORY COUNCIL MEMBERS
(The American Samoa Forestry Advisory Council combines the Forest Stewardship Advisory Council and the Community Forestry Coordinating Committee.)

Imo Tiapula (Chair)	Farmer, Client, Private Landowner*
Tapa'au Dr. Daniel Mageo Aga	ASCC CNR Dean & Director (NIFA Cooperative Extension Service)
Ben Tau	American Samoa Department of Parks and Recreation
Junior Tuiasosopo	Dept of Public Safety – Fire
James McGuire	Farmer, Client, Private Landowner*, Legal Practitioner
Ed Kuki Avegalio	Farmer, Client, Private Landowner*
Simona Lauti	American Samoa Soil & Water Conservation District
Faletogo Taliloa	Office of Samoan Affairs
Tilani Ilaoa	American Samoa Women's Business Center, Native American Samoan Advisory Council (forest products industry, NGO)
Dr. Leo Leituala	American Samoa Department of Agriculture
Nikolao Mageo	Farmer, Client, Private Landowner*
Apulu Veronika Mortenson	American Samoa Department of Commerce
Dr. Peter Craig	National Park of American Samoa
Brian Peck	Natural Resources Conservation Service (RC&D)
Pulemagafa Siaifoi Fa'aumu	American Samoa Department of Marine and Wildlife Resources
John Womack	Natural Resources Conservation Service
A'eau Pito Malele	Forest Stewardship Program Coordinator
Tony Maugalei	Urban and Community Forestry Program Coordinator
Masela Talatau	Urban and Community Forestry Program Assistant Coordinator and Le-Tausagi officer (NGO environmental organization)
Neil Gurr	ASCC-CNR GIS Specialist
Aufa'i Apulu Ropeti Areta	ASCC-CNR Extension Program Coordinator and Acting Forestry Program Manager (NIFA Cooperative Extension Service)

*Private Landowner here includes those occupying/using communal lands within the traditional land tenure system.

APPENDIX B STAKEHOLDERS' INVOLVEMENT IN SWARS DEVELOPMENT

The national guidelines for statewide assessments and the 2008 farm bill require that states and territories involve stakeholders and partners in the development of their assessments. As part of this process, on April 9, 2009, ASCC CNR forestry program leaders, with the assistance of Anne-Marie La Rosa, of the Institute for Pacific Islands Forestry, facilitated a group meeting to introduce stakeholders and partners to the State-Wide Assessment and Resource Strategy process. Below is the list of the meeting participants.

Masela Talatau	ASCC CNR
Logona Misa	ASCC CNR
Ritofu Lotovale	ASCC CNR
Simon Stowers	ASCC CNR
Matapo'o Pito Malele	ASCC CNR
Toepo Leiataua	ASCC CNR
Eric Pese	ASCC CNR
Poe Aga	ASCC CNR
Pasia Setu	ASCC CNR
Neil Gurr	ASCC CNR
Mark Schmaedick	ASCC CNR
Fuiavailili Fa'atamala	ASCC CNR
Tapa'au Dr. Daniel Aga	ASCC CNR
Aufa'i Apulu Ropeti Areta	ASCC CNR
Helen Lago	ASCC CNR
Minareta Thompson	ASCC CNR
William Sili	ASEPA
Pulemagafa Siaifoi Fa'aumu	DMWR
Apulu Veronika Mortenson	DOC
Imo Tiapula	Forestry Council Chairperson/Land Owner*
Nikolao Pula	Forestry Council Member/Land Owner*
Tilani Ilaoa	NASAC/Land Owner*
Peter Craig	NPAS
John Womack	NRCS
Athena Pratt	NRCS
Faletogo Taliloa	OSA/Land Owner*
Ben Tau	Dept. of Parks & Recreation
Brian Peck	RC&D
Teofilo Mageo	Land Owner*

* Private Landowner here includes those occupying/using communal lands within the traditional land tenure system.

ASCC CNR – American Samoa Community College Division of Community and Natural Resources, ASEPA – American Samoa Environmental Protection Agency, DMWR – Department of Marine and Wildlife Resources, DOA – American Samoa Department of Agriculture, DOC – American Samoa Department of Commerce, NASAC – Native American Samoan Advisory Council, NOAA – National Oceanic and Atmospheric Administration, NPAS – National Park of American Samoa, NRCS – Natural Resources Conservation Service, OSA – Office of Samoan Affairs, RC&D – Resource Conservation and Development Program (NRCS).

To facilitate effective dialogue and obtain more detailed inputs, ASCC CNR staff conducted meetings with individuals or small groups of stakeholders during the months of October and November, 2009. These meetings helped to identify American Samoa's top forest related issues for the SWARS and to obtain important documents and non-spatial and spatial data pertaining to the issues selected. Participants in these meetings included the following.

Don Vargo	ASCC CNR
Elena Vaouli	ASEPA
Phil Wiles	ASEPA
Bernard Matatumua	ASEPA
Selaina Vaitautolu	DMWR
Lainie Berry	DMWR
Stephen Turnbull	DMWR
Cindy Holte	DMWR
Pulemagafa Siaifoi Fa'aumu	DMWR
Peter Gurr	DOA
Solialofi Tuaumu	DOC
Fatima Sauafea Leau	NOAA
Peter Craig	NPAS
Tavita Togia	NPAS
Sarah Tanuvasa	NRCS
John Womack	NRCS
Brian Peck	RC&D

ASCC CNR – American Samoa Community College Division of Community and Natural Resources, ASEPA – American Samoa Environmental Protection Agency, DMWR – Department of Marine and Wildlife Resources, DOA – American Samoa Department of Agriculture, DOC – American Samoa Department of Commerce, NOAA – National Oceanic and Atmospheric Administration, NPAS – National Park of American Samoa, NRCS – Natural Resources Conservation Service, RC&D – Resource Conservation and Development Program (NRCS).

On January 28, 2010, the ASCC Forestry Program, with the assistance of Anne-Marie La Rosa of the Institute for Pacific Islands Forestry, facilitated another stakeholder/partner session to present the preliminary assessment results on priority issues and geospatial analysis of landscapes identified as high priority for focusing program resources. The stakeholders provided feedback to improve the analysis and discussed long-term program strategies to address the issues that were identified.

Simon Stowers	ASCC CNR
Minareta Thompson	ASCC CNR
Ritofu Lotovale	ASCC CNR
John Ah-Sue	ASCC CNR
Manu'a Oloaluga	ASCC CNR
Matapo'o Pito Malele	ASCC CNR
Toepo F. Leiataua	ASCC CNR
Poe Aga	ASCC CNR
Pasia Setu	ASCC CNR
Neil Gurr	ASCC CNR
Mark Schmaedick	ASCC CNR
Kitiona Fa'atamala	ASCC CNR
Logona Misa	ASCC CNR
Marsela Talatau	ASCC CNR
Jerry Lefono	ASCC CNR
Tapa'au Daniel Mago Aga	ASCC CNR
Aufa'i Apulu Ropeti Areta	ASCC CNR
Tony Maugalei	ASCC CNR
Pulemagafa Siaifoi Fa'aumu	DMWR
Edward C. Eary	DOA
Mathew Vaipuna	DOA
Solialofi Tuamu	DOC
Imo Tiapula	Forestry Council Chairperson
Nikolao Mageo	Forestry Council Member
Jim McGuire	Forestry Council Member
Dorothy Elia	NASAC
Fatima Sauafea Leau	NOAA
Visa Vaivai	NPAS
Mathew Tuinei	NPAS
Andrew Masaniai	NPAS
Tamafaiga Sagapolutele	NPAS
Tavita Togia	NPAS
Sarah Tanuvasa	NRCS
John Womack	NRCS
Brian Peck	RC&D

ASCC CNR – American Samoa Community College Division of Community and Natural Resources, DMWR – Department of Marine and Wildlife Resources, DOA – American Samoa Department of Agriculture, DOC – American Samoa Department of Commerce, NASAC – Native American Samoan Advisory Council, NPAS – National Park of American Samoa, NRCS – Natural Resources Conservation Service, RC&D – Resource Conservation and Development Program (NRCS).

On May 13, 2010 the ASCC CNR Acting Forestry Program Manager and GIS Specialist met with the ASCC CNR Forestry Program staff to review the strategies outlined in the draft SWARS. The strategies were revised according to staff input and discussions held during this meeting. Participants in this meeting included the following individuals.

Aufa'i Apulu Ropeti Areta	Acting Forestry Program Manager
Eric Pese	FSP RNGR Coordinator
Fuiavailili Fa'atamala	CFHP-IP Co-Coordinator
Jerry Lefono	Forestry Technician
John Ah-Sue	FSP RNGR Assistant Coordinator
Logona Misa	CE Coordinator
Masela Talatau	UCF Assistant Coordinator
Matapo'o Pito Malele	FSP Coordinator
Minareta Thompson	ASCC CNR Special Projects Assistant
Neil Gurr	ASCC CNR GIS Specialist
Pasia Setu	Forestry Technician
Poe Aga	Forestry Technician
Ritofu Lotovale	CFHP-IP Co-Coordinator
Simon Stowers	FSP Assistant Coordinator
Toepo Leiataua	CFHP-IP Assistant Coordinator
Tony Maugalei	UCF Coordinator

On May 20, 2010 a meeting was held with the Forestry Acting Program Manager, the ASCC CNR GIS Specialist, and the American Samoa Forestry Advisory Council to review the latest draft of the SWARS Resource strategies section. Advice from the Council members was incorporated into the SWARS strategies. Attendees included the following.

Minareta Thompson	ASCC CNR
Mark Schmaedick	ASCC CNR
Imo Tiapula	Forestry Council Chairperson
Nikolao Mageo	Forestry Council Member
James McGuire	Forestry Council Member
Ed Kuki Avegalio	Forestry Council Member
Aufa'i Apulu Ropeti Areta	Forestry Council Member – Acting Forestry Program Manager
Neil Gurr	Forestry Council Member – ASCC CNR GIS Specialist
Pulemagafa Siaifoi Fa'aumu	Forestry Council Member – DMWR
A'eau Pito Malele	Forestry Council Member – FSP
Tilani Ilaoa	Forestry Council Member – NASAC
John Womack	Forestry Council Member – NRCS
Faletogo Taliloa	Forestry Council Member – OSA
Masela Talatau	Forestry Council Member – UCF
Tony Maugalei	Forestry Council Member – UCF
Tavita Togia	NPAS (representing FC member Peter Craig of NPAS)

ASCC CNR – American Samoa Community College Division of Community and Natural Resources, DMWR – Department of Marine and Wildlife Resources, FSP – Forestry Stewardship Program, NASAC – Native American Samoan Advisory Council, NPAS – National Park of American Samoa, NRCS – Natural Resources Conservation Service, OSA – Office of Samoan Affairs, UCF – Urban and Community Forestry Program.

On May 24, 2010 the draft SWARS was submitted to the Institute for Pacific Islands Forestry (S&PF) and the NRCS State Technical Committee in Hawaii for their review.

On May 28, 2010 another meeting was held with the Forestry Advisory Council for a final review of the draft SWARS before submission to USFS.

APPENDIX C
RELATED STRATEGIC PLANS CONSULTED FOR SWARS

American Samoa Resource Conservation and Development Council. 2009. **American Samoa Resource Conservation and Development Council 2008-2010 Area Plan** (revised). American Samoa RC&D, Pago Pago.

ASCC CNR Forestry Section. 2003. **The five-year plan for Forest Stewardship Program, American Samoa, 2005-2009**. American Samoa Community College Division of Community and Natural Resources, Pago Pago.

Department of Marine and Wildlife Resources. 2006. **A comprehensive strategy for wildlife conservation in American Samoa** (Utzurum, R. C. B., Seamon, J. O. and Scheltz Sali, K., authors). DMWR, Pago Pago.

Mann, S. S. 2003. **Forest legacy for the territory of American Samoa: an assessment of need**. American Samoa Community College, Pago Pago.

Misa, M. M. 2008. **American Samoa Community Forestry Program five-year plan 2008-2012**. American Samoa Community College Division of Community and Natural Resources, Pago Pago.

O'Brien, C., Misa, M., and Savali, S. M. S. 2008. **Community wildfire protection plan, American Samoa**. American Samoa Department of Public Safety and American Samoa Community College, Pago Pago.

Secretariat of the Pacific Community. 2008. **Territory of American Samoa Department of Agriculture Strategic Plan 2009-2014**. SPC, Suva, Fiji.

Tye, A. 2009. **Guidelines for invasive species management in the Pacific: a Pacific strategy for managing pests, weeds and other invasive species**. Secretariat of the Pacific Regional Environment Program, Apia, Samoa.

APPENDIX D
GLOSSARY OF ACRONYMS

ASCC CNR	American Samoa Community College Division of Community and Natural Resources
ASDOE	American Samoa Department of Education
ASEPA	American Samoa Environmental Protection Agency
ASIST	American Samoa Invasive Species Team
ASPA	American Samoa Power Authority
CE	Conservation Education
CFHP-IP	Cooperative Forest Health Protection – Invasive Plants
CRAG	American Samoa Governor’s Coral Reef Advisory Group
DMWR	American Samoa Department of Marine and Wildlife Resources
DOA	American Samoa Department of Agriculture
DOC	American Samoa Department of Commerce
DPS	American Samoa Department of Public Safety
FIA	Forest Inventory and Analysis
FLP	Forest Legacy Program
FLP AON	Forest Legacy Program Assessment of Need
FSP	Forestry Stewardship Program
GIS	Geographic Information System
GPS	Global Positioning System
IPIF	Institute for Pacific Islands Forestry
NASAC	Native American Samoan Advisory Council
NGO	Non-governmental organization
NIFA	National Institute of Food and Agriculture
NOAA	National Oceanic and Atmospheric Administration
NPAS	National Park of American Samoa
NRCS	Natural Resources Conservation Service
OSA	Office of Samoan Affairs
PII	Pacific Invasives Initiative
RC&D	American Samoa Resource Conservation and Development Council (NRCS)
RNGR	Reforestation, Nurseries, and Genetic Resources (FSP)
S&PF	U.S. Forest Service State and Private Forestry
SPC	Secretariat of the Pacific Community
SPREP	South Pacific Regional Environmental Programme
SWARS	Statewide Assessment and Resource Strategy
SWCD	Soil and Water Conservation District
UCF	Urban and Community Forestry Program
USDA	United States Department of Agriculture
USFS	United States Forest Service

APPENDIX E
STATE AND PRIVATE FORESTRY PERFORMANCE MEASURES

1. Fire Management Programs

- Number of acres treated to reduce hazardous fuels
- Increased number of trained firefighters
- Additional fire suppression equipment obtained/upgraded
- Number of communities with improved egress/ingress for fire events
- Number of vegetation fire breaks established and maintained

2. Forest Health Programs

- Number and location of acres treated
- Number and location of acres surveyed or inventoried

3. Forest Legacy Program

- Number of conservation easements or purchases
- Number of acres protected

4. Forest Stewardship Program

- Number of acres covered by current FSP management plans (cumulative)
- Total number of eligible NIPF acres in spatially defined important forest resource areas
- Number of acres in important forest resource areas covered by current forest stewardship management plans (cumulative)
- Total number of acres in important forest resource areas being managed sustainably, as defined by a current Forest Stewardship Program management plan (cumulative/as confirmed through a monitoring program)
- Number of new or revised forest stewardship management plans completed
- Number of landowners receiving Forest Stewardship Program technical assistance
- Number of landowners participating in Forest Stewardship Program educational programs

5. Urban and Community Forestry

- Urban forester or certified arborist on staff to serve all of American Samoa
- Urban forest ordinance for all of American Samoa or individual islands
- Urban forest management plan for American Samoa
- Community forestry coordinating committee (combined with FSP advisory committee as forestry advisory council)
- Number of volunteer hours