TERRITORY
of
AMERICAN SAMOA

State of the Environment Report

2002

PREFACE

For centuries before industrialization, Samoans have made use of the islands' natural resources. The lush rainforests and diverse coral reefs of the Territory are part of Samoa's culture and heritage. Today, our modern lifestyle does not depend on these forests and reefs. Yet, these resources still have great value. They provide us with recreation and respite from the modern world, as well as food, traditional medicine, and materials. Our resources are now threatened as population grows and the impacts of modern economic and social pressures intensify. Remember that we are still a part of the natural world and will reap the consequences of our careless treatment of it.

The *2002 State of the Environment Report* is a brief "environmental report card" on the resources of the Territory. This report is designed to provide American Samoan residents and policy makers with a foundation on which to build their understanding of environmental management issues. It is presented in a readable, non-technical format to help citizens assess the Territory's progress towards meeting its environmental goals and challenges.

This report is not all-inclusive. There are environmental issues that may be of interest and concern to the public in addition to those featured here. We urge policy makers and government departments to examine all of the environmental issues contained in the report, as well as others that may be of personal interest. For brevity and accuracy, we have focused on areas that are currently being researched and provide a meaningful overview of environmental conditions.

This document should be considered a foundation for discussion, concern, further research, and action. While the report notes a few positive trends, most trends are downward. As a people, we must recognize that we are responsible for the condition of our environment. Ideally, this report will encourage you, the reader, to cooperate with your family, village, and community to reduce the harm that we do to the beautiful islands of American Samoa. Ultimately, effective change will only come from the Samoan people, not from the government. Only through a combined community effort can we enhance and conserve our natural resources.

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AMERICAN SAMOA
STATE OF THE ENVIRONMENT REPORT 2002

MARINE RESOURCES

TERRESTRIAL RESOURCES

AIR & WATER RESOURCES

ENVIRONMENTAL ISSUES

INTRODUCTION

The 2002 State of the Environment Report is divided into four sections: Marine Resources, Terrestrial Resources, Air and Water Resources, and Environmental Issues facing American Samoa. At the beginning of each topic is a box containing a "letter grade" followed by an upward (⬆) or downward (⬇) facing arrow indicating the topic's trend.

The letter grades (A, B, C, or D) are used to provide the reader with the status of the resource or issue. The reader is encouraged to read the entire text for a greater understanding of the letter grade and to pursue further research of each topic. The grades can be interpreted as follows:

A — *The resource has been little, if at all, affected by human and/or natural actions and continues to exist in an undamaged state.*

B — *The resource has been affected by human and/or natural actions, however appears to be in good condition and continues to function.*

C — *The resource has been seriously affected by human and/or natural actions and is in danger of being permanently affected or depleted unless effective conservation measures are implemented.*

D — *The resource has been severely damaged by human and/or natural causes or has been depleted almost beyond recovery. The Territory is in imminent danger of losing this resource. Recovery and conservation measures should be implemented immediately.*

Following each letter grade is an arrow, which indicates the resource or issue trend (whether it is "improving" or "decreasing" in amount or quality). For an explanation of the causes the trends, please refer to the topic text. For additional information on the state of any resource or current trend, please contact the appropriate government agency.

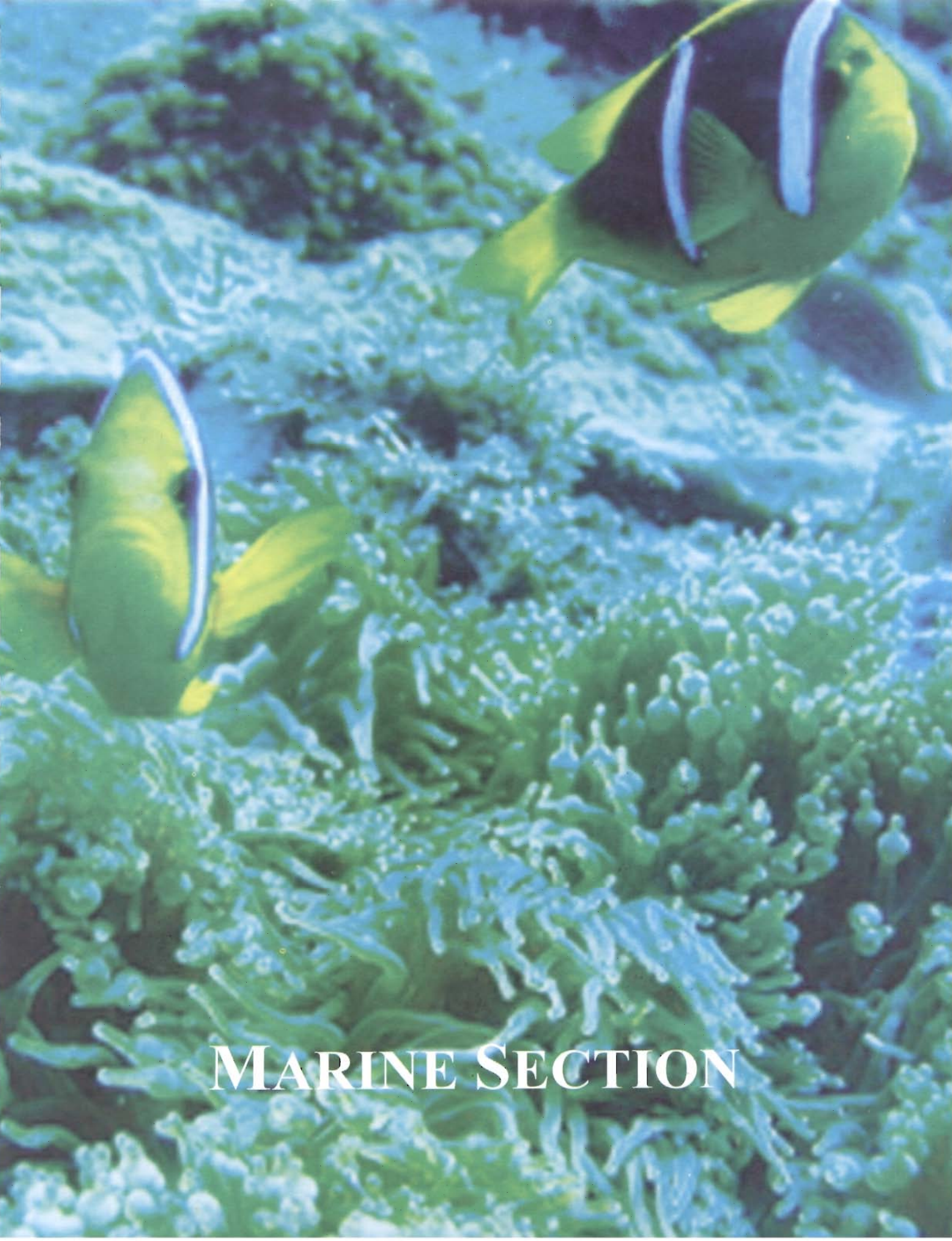
⬆ — *The resource is experiencing an upward trend, indicating that it is either improving in quality and/or increasing in quantity. In the Environmental Issues Section, an upward arrow indicates an improvement in the issue.*

⬇ — *The resource is experiencing a downward trend, indicating that it is either declining in quality and/or decreasing in quantity. In the Environmental Issues Section, a downward arrow indicates that the issue is getting worse.*

STATE OF THE ENVIRONMENT 2002
OVERVIEW

Below are the topics of the State of the Environment Report along with their status (letter grade) and trend (arrow). For a more in-depth review, please refer to the appropriate page in the report. Although a few resources are improving, it should be noted that the majority of the resources are being severely impacted by human activities and that environmental issues are getting worse, not better. Regardless of the letter grade or trend, the best time to act and conserve these resources or address these issues is now.

RESOURCE OR TOPIC	STATUS	TREND	UPDATE
Marine Resources			
Coral Reefs	C	⬆	Reefs are slowly recovering from a series of natural disasters.
Marine Protected Areas	C	⬆	Enforcement inadequate. Village conservation expanding.
Pago Pago Watershed	D	⬆	Water quality is improving, but serious threats continue.
Reef Fisheries	C	⬇	SCUBA fishing ban may improve reef fish populations
Ocean Fisheries	C	⬇	Overfishing remains a threat. Catches are decreasing.
Giant Clams	C	⬇	Enforcement continues to be a problem with overfishing.
Sea Turtles	C	⬇	Laws protecting turtle habitats need to be enforced.
Whales	C	⬇	Unexpectedly slow recovery from early fishing pressures.
Terrestrial Resources			
Rainforest	B	⬇	Although much forest remains, serious threats exist.
Vertebrate Wildlife	B	⬇	Several species becoming rare, fruit bats making a comeback
Wetlands	D	⬇	Seriously threatened by development and filling.
Introduced Species	B	⬇	Numerous introduced species continue to plague islands
Air & Water Resources			
Air Quality	A	⬇	Generally excellent. Cannery odors present in harbor.
Water Quality	C	⬇	Threatened by development, lack of enforcement.
Drinking Water	B	⬇	Water generally good. Numerous potential threats exist.
Environmental Issues			
Population Trends	D	⬇	Rate of population increase cause for serious alarm.
Climate Change & Global Warming Effects	C	⬇	Impacts of climate change might be heavily felt in American Samoa.
Solid Waste & Landfill	C	⬇	Solid waste increasing. Need for waste reduction measures
Hazardous Materials	C	⬇	Amounts climbing as population and development grows.
Plant Diseases	B	⬇	Territory recovering from taro blight. Many potential threats.



MARINE SECTION

CORAL REEFS

Status	Trend
C	⬆

American Samoa's coral reefs bound all of the seven islands of the Territory, along with some associated offshore banks. This highly diverse coral reef ecosystem has provided resources to Samoans for thousands of years, however our reefs are now in danger. In the past 25 years, this once abundant ecosystem suffered a series of catastrophic natural disasters. These included:

1978-79	crown of thorns starfish *(alamea)* invasion: an extraordinary population explosion of these coral eating animals.
1986	Hurricane Tusi
1990	Hurricane Ofa
1991	Hurricane Val
1994	coral bleaching probably caused by an El Nino warm water event
1998	reef flat bleaching and die-off caused by El Nino low tide event

Recently, another coral bleaching event has occurred in the Territory. In spite of the natural disasters, surveys of territorial coral reefs indicate coral recruitment is high and many areas are recovering. However, in some areas, chronic human impacts have impeded recovery of our coral reefs and constitute major threats to these ecosystems. These impacts include: poor water quality, particularly in Pago Pago Harbor and other embayments with large associated villages, destructive fishing practices (dynamiting and use of poisons) and overfishing (most significantly by the night SCUBA near shore fishery). In the last two years, however, bans on both live rock harvest and spear fishing with SCUBA gear have been implemented. Additionally, land-based activities severely impact coral reefs through erosion and sedimentation.

The Coral Reef Advisory Task Force was established by Governor Tauese Sunia to provide management expertise from all agencies whose mandates include coral reef issues. The Task Force identified the following actions designed to protect our coral reef resources:

- Establish a network of marine protected areas;
- Monitor the total harvest of coral reef resources;
- Implement a step-wise recovery plan for Pago Harbor;
- Fully assess all land-based developments for their potential impacts to coastal waters.

For more information on the state of coral reefs in American Samoa and the recommendations listed above, please refer to the "5-Year Plan for Coral Reef Management in American Samoa" by the American Samoa Coral Reef Task Force, 1999.

Status	Trend
C	⬆

MARINE PROTECTED AREAS

The United States Coral Reef Initiative has adopted the position that all US States and Territories designate at least 20% of their coral reefs as fully protected "no-take" areas, the strictest definition of a marine reserve or protected area. "No-take" areas are places where no fishing, either subsistence or commercial, is permitted. This recommendation is based on the assessments of the health of coral reefs worldwide and in US waters. Coral reef health has been declining for decades and up to 10% worldwide are destroyed beyond recovery. At least 50% of remaining reefs are seriously threatened from a variety of causes. Other types of protection describe limits on types of fishing, extraction, and access to the marine resources necessary to protect threatened species. The Government of American Samoa supports the 20% "no-take" position, and the Coral Reef Advisory Group is developing a strategy to achieve that goal.

There are examples of "no take" areas acting as nurseries for nearby reefs. No-take areas help decrease losses from heavy fishing, and may provide a natural hatchery source for organisms such as corals and giant clams. Other protection levels can also help to restore marine populations. Closing an area to a specific type of fishing may reduce pressure enough for the target species to recover. This closure could be site and/or time specific (during spawning, for example). For these and other reasons, protected areas benefit more than the limits of the area boundary. American Samoa has several types of marine protected areas, or MPAs, as described in the table below.

Protection varies among sites. Approximately 5% of the reefs have official status as protected areas, and of these, only Rose Atoll is a "no take" preserve, which accounts for less than 1% overall.

MPA Site	Management	Location & Size	Type of Protection
Fagatele Bay National Marine Sanctuary	American Samoa Department of Commerce and the National Oceanic and Atmospheric Administration	Fagatele Bay, 0.25m²	Fully protects all invertebrates, including corals, prohibits some fishing
National Park of American Samoa	National Park Service	North side of Tutuila - Vatia to Fagasa out to 60 ft depth; Ofu south shore from airport to east end; Tau south shore	No commercial fishing permitted, no take of coral
Rose Atoll Wildlife Refuge	Depart. of Marine and Wildlife Resources and the US Fish and Wildlife Service	Rose Atoll lagoon and outer reef to 100m	Fully protected from any extraction, no anchoring or visitors allowed
Ofu Territorial Park	Depart. of Marine and Wildlife Resources (DMWR)	Reef in front of Ofu airport to western corner of island	Subsistence fishing only permitted

Recommendations for Marine Protected Areas include:

- Secure funding and hire full-time enforcement officers. Enforcement has been weak or non-existent for all sites and is inadequate. There are no full-time dedicated enforcement officers at any MPA. The DMWR and the NOAA provide some enforcement for the National Marine Sanctuary and Rose Atoll. The National Park and Ofu Territorial Park have no on-site enforcement presence.
- Create additional MPAs in American Samoa. Workshops in 2002 discussed strategies for the creation of no-take zones and the expansion of the successful DMWR community based fisheries management program.

Status	Trend
D	⬆

PAGO PAGO WATERSHED

The natural resources within Pago Pago harbor have been greatly affected by humans. There are stories of the past abundance of fish and coral, and the clarity of the water within the harbor, as well as the presence of hammerhead sharks and turtles. Even the name of one of the harbor villages, Fagatogo (Bay of Mangroves) is an indication of natural features of the watershed that have been lost. The most striking feature of the Pago Pago watershed is the naturally deep harbor protected by steep valley walls. This protected harbor is what originally attracted the United States military to American Samoa. For the last century, Pago Pago harbor has been the location of the majority of light industrial and military infrastructure in the Territory. The harbor was used as a coaling and repair station for the U.S. Navy. The military presence evolved over time, but lost significance as World War II progressed. Military activity in the harbor is now minimal; however there may be sites where military materials were abandoned and now pollute the watershed.

For more than thirty years, tuna canneries have operated in the villages of Anua and Atuu on the northern shore of the inner harbor. Since 1990, high strength waste from the canneries has been disposed of at sea, and since 1992 treated waste water has been pumped to an outfall in the outer harbor. Water quality in the harbor has improved dramatically since the segregation and removal of wastes was implemented. A large amount of boat traffic associated with the military and cannery operations necessitated a shipyard for painting and repair that continues to operate as Southwest Marine in the village of Satala on the northern shore of the inner harbor. Due to more effective monitoring and prosecution of pollution from boats by the US Coast Guard, the number of fuel and oil spills in the harbor has decreased. As well, a joint effort of NOAA and USEPA successfully removed nine longline fishing vessels that were grounded on the reef within the harbor during the last hurricane.

The Pago Pago watershed includes densely placed homes and businesses clustered near the water's edge. Many small plantations and pig pens extend up the steep slopes of the watershed. These are operated mostly for family consumption, and are found mixed with residential areas. At present, the greatest threats to near-shore water quality and to the coral reefs in the harbor are found in run off that contains nutrient pollution from poorly constructed human and pig waste disposal systems, litter, and increased turbidity from accelerated erosion.

A study conducted in 1990 analyzed fish tissue from Pago Pago Harbor and evaluated the human health risk from consumption of contaminated fish. This screening indicated that fish tissue contained elevated levels of lead, mercury and arsenic and that high concentrations could potentially cause serious health effects in residents who regularly consume fish from the harbor.

Status	Trend
D	⬆

PAGO PAGO WATERSHED

The study resulted in a health advisory issued by the American Samoa Government in October 1991 that warned residents not to eat any fish caught in the inner harbor. A subsequent study in 1994 indicated that there was contamination of fish and shellfish with heavy metals around the island of Tutuila. However, the results of this study were somewhat ambiguous and did not allow prediction of risk to humans. ASEPA will complete a Tier II Fish Toxicity Study and will provide a risk assessment for the consumption of fish and shellfish throughout the Territory. All organisms for the Tier II study have been collected and analyzed. The risk assessment is expected to be complete by the end of 2002.

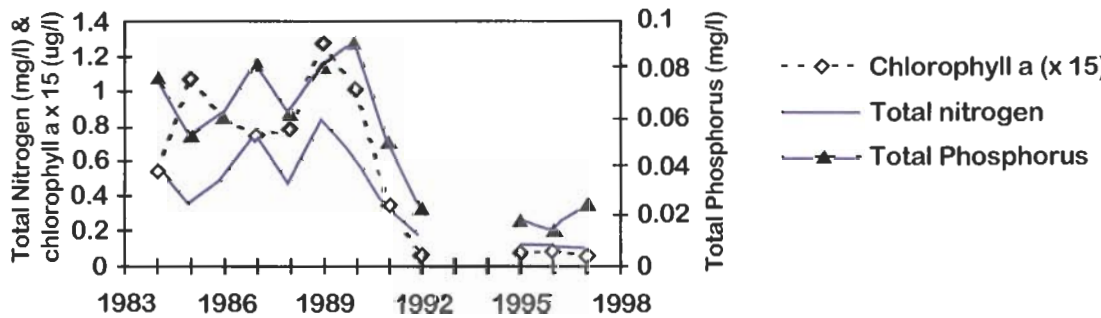
Another project that is underway at ASEPA is the "Pago Pago Harbor Water Quality Monitoring Strategy" (PPGH Strategy). The PPGH Strategy will institute a regular monitoring and reporting program for four major components of the marine environment that serve as direct or indirect indicators of water quality. Strategy components include the water column, biota, coral reef habitat, and sediments. Lead is included among the contaminants that will be monitored within each strategy component. In addition to the regular monitoring program, several baseline studies will be completed as part of the PPGH Strategy.

Recommendations include:

- Revise and re-publicize the public health advisory for the consumption of fish in Inner Pago Pago Harbor, based on results of the Tier II Toxicity Study.

Improvements in water quality in inner Pago Pago Harbor after canneries were required to dispose of wastes beyond inner harbor in 1991

(Source: ASEPA 2001)



REEF FISHERIES

Status	Trend
C	⬇

Coral reef fishes are harvested for food throughout the South Pacific. In American Samoa, over 100 species are caught in reef fisheries, but biological information about these species and their responses to over-exploitation is sparse. Grouper, parrotfish, snapper, soldierfish and surgeonfish are the most commonly caught in American Samoa waters.

The artisanal fishery consists mainly of nighttime spear fishing by free diving and daytime and nighttime reef gleaning. Fish are captured by gill nets, throw nets, rod-and-reels, hand lines, and by spear fishing. Destructive fishing practices are used infrequently (such as dynamite fishing, use of chlorine bleach, and traditional plant poisons such as *ava niugini.*

Studies carried out at the Department of Marine and Wildlife Resources (DMWR) suggest that fishing pressure is depleting reef fish populations. The decrease in mean and maximum size of species, the absence of very old fish and a possible decrease in catch-per-unit-of-effort (CPUE) may be a true reflection of fishing pressure. Causes for reduced reef fish catches may include fishing for selected species, commercialization of the fishery and habitat degradation.

An increase in fishing efficiency was brought about in 1995, with the emergence of SCUBA-assisted commercial fishing on the reefs. CPUE for SCUBA diving was twice that of free diving for all species combined. Concern for the effects of SCUBA fishing lead to the AS governor's Executive Order banning SCUBA fishing in 2001. The following year DMWR adopted a regulation banning SCUBA fishing, with stronger fines and forfeiture of equipment for infractions. DMWR has initiated a monitoring program for fish species that were targeted by SCUBA fishing.

The human population in American Samoa is increasing rapidly; thus the demand on nearshore resources seems likely to increase. At the same time, land use, construction practices and other activities such as household waste disposal are expected to continue to affect portions of the narrow fringing reefs found on most of the Territory's islands.

A community-based fisheries management program is being implemented at DMWR. DMWR provides assistance, recommendations and support to interested village communities to put into action individual village management plans that give them the responsibility to manage their marine resources. Recommendations to improve reef fish stocks in American Samoa include:

- Establish a network of community-based marine protected areas
- Set aside 20% of the Territories coral reefs as marine reserves (as required by Presidential Order), including areas critical to fish spawning and nursery grounds
- Implement and enforcing size limits for key fisheries species
- Assess all land-based developments for their potential impacts to coastal waters
- Gain full public support through issues-specific educational campaigns

OCEAN FISHERIES

Status	Trend
C	⬇

Open ocean pelagic fisheries are a valuable resource of American Samoa. The American Samoa Exclusive Economic Zone (EEZ) has modest amounts of tunas, billfish, and *masimasi* (dolphinfish) when compared to other areas. Traditional fishing has been modernized by trolling boats and longline fishing by *alia* catamarans that target albacore. Catch has increased in recent years, although catch per unit effort (CPUE) may be decreasing. The Department of Marine and Wildlife Resources (DMWR) monitors the fish catch with cooperation and funding of the National Marine Fisheries Service. DMWR monitors fishing boats and interviews crews. This information is used to estimate total catch by species and CPUE. This is used to monitor the industry and health of fish stocks.

Figure 1 shows quarterly Catch per Unit Effort (CPUE) of albacore for the longliner fleet. The CPUE is an average of the number of fish caught using 1,000 hooks. Most of the *alias* use less than 1,000 hooks while fishing. CPUE over the past 6 years is relatively unchanged, although catch is down for the second quarter of each year.

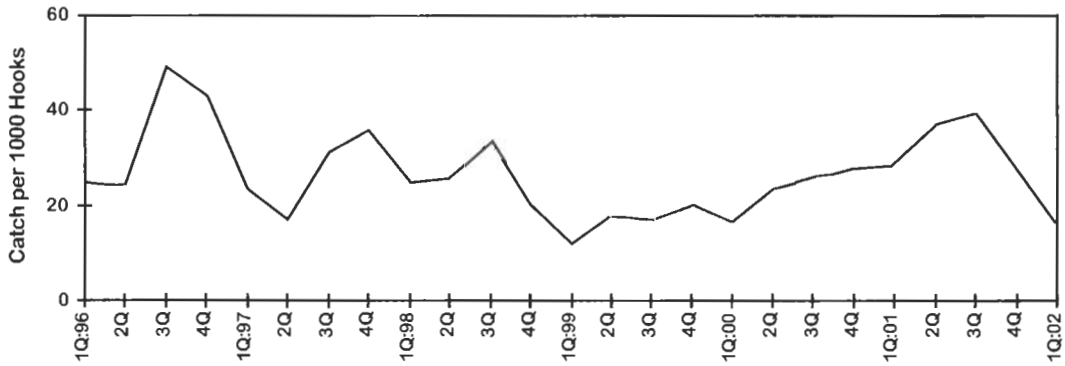


Figure 7. American Samoa Longline Albacore Catch per 1000 Hooks by Quarter

While the albacore fish stocks do not appear to be in trouble, it is possible to use up such fish stocks. DMWR will to continue to monitor the fisheries and learn more of the biology of the albacore in order to manage this fishery resource for the future.

Bottomfish are found on the outer shelf and deep slopes of the islands in the Territory. Fishery development programs increased the catch temporarily, between 1983 and 1988. Over-fishing, increased longline fishing, and other factors have resulted in decreased bottomfish catches. However, the DMWR catch and fish biology data indicate that this resource is healthy, although more information on aging and reproduction is needed. Bottomfish are considered to be slow growing and long-lived. The fish age when they first begin to spawn is older than most reef fish. As a result, over-fishing can easily deplete bottomfish stocks before they can recover naturally. Recovery from over-fishing can sometimes take more than 50 years. Recommendations include:

- Close observation of bottomfish catch size and composition
- Perform biological surveys to gain information about ages and maturation.

GIANT CLAMS

Status	Trend
C	⬇

Two native species of giant clams, or *faisua*, are found in our local waters, *Tridacna maxima and T. squamosa.* A third species, *T. hippopus*, is locally extinct. They very slowly grow to 12-15 inches in shell length, although the majority found today are smaller. Because giant clams need sunlight so that the algal cells inside their tissues can photosynthesize, they inhabit shallow, clear waters to 60 feet deep. Clams are also filter feeders. They strain the ocean water for plankton.

Clams are an important and favorite food item throughout the South Pacific, but their accessibility in shallow waters and slow growth make them very susceptible to over-harvest. This the case in American Samoa, where few remain. Giant clams have been severely depleted throughout much of the archipelago and their future is unclear. One concern is that the individuals that remain are present in such low densities that their reproductive success and subsequent spawning may be diminished. An important factor in the conservation of these clams may be the existence of Marine Protected Areas where they are protected from human impact. One such area is Rose Atoll, an important refuge for giant clams.

Survey results show that with the exception of Rose Atoll, giant clams are uncommon throughout the archipelago. Given that giant clams are highly prized by Samoans, it seems likely that fishing pressure has contributed to the low levels of clam stocks. For example, an interview survey in 1995 found that the population of giant clams has decreased substantially on Tutuila in the memory of local fishermen. This information is consistent with local statistics, which show a decline in the harvest of giant clams over the last two decades. Other causes of decline include human impacts such as coastal development, pollution, illegal harvesting of clams in protected areas, and the aquarium trade industry.

There has been an interest in growing clams in hatcheries to supply markets for food and the aquarium trade. The Department of Marine and Wildlife Resources has operated a hatchery here for over a decade and tried to encourage local production by supplying small clams for local 'farmers' to grow them on their reefs. The effort has met with limited success for several reasons. First, considerable dedication is needed because it may take years to grow the clams to a commercial size. Secondly, the clams have to be protected from poachers and predators on a consistent and regular basis over many years. In general, giant clam mariculture here has usually supplemented short-term family needs rather than create an ongoing commercial enterprise and significantly increasing the clam populations.

Laws exist which regulate clam harvest in American Samoa. These include: giant clams taken for personal consumption must be at least 6 inches in shell length, or, if sold, a license is required and giant clams must be at least 7 inches. However, regulations for personal consumption are very hard to enforce.
Recommendations for improving giant clams stocks include:

- Enforcement of environmental regulations must be greatly improved.
- Enhance education of local village communities on the effects and problems associated with uncontrolled exploitation of this resource.
- Expand the network of community-based marine protected areas within the villages.

SEA TURTLES

Status	Trend
C	⬇

Two turtle species nest in the Territory, and several others may be found in offshore waters. The hawksbill or "*laumei uga*" (*Eretmochelys imbricata*) is usually the species that nests on Tutuila and Manu'a beaches. Perhaps only 2 or 3 hawksbill females now use a suitable beach in a season. Our other species is the green sea turtle (*Chelonia mydas*). It is also found around our islands, but it nests primarily at Rose Atoll.

These long-lived turtles have complicated life cycles that involve repeated long-distance migrations to and from nesting and feeding areas in American Samoa. Migration data from 10 tagged green sea turtles at Rose Atoll revealed the following. Eight swam 1,000 miles directly to Fiji. Another went past Fiji to Vanuatu, and the last one went in the completely opposite direction to French Polynesia near Tahiti. This pattern of large-scale movements between a turtle's nesting area and feeding area means that turtle stocks in the South Pacific Ocean are all mixed together. While some of "our" turtles were caught in Fiji, the reciprocal is also true: turtles that feed in our waters probably originated from islands elsewhere in the South Pacific. This mixing greatly complicates conservation efforts. It means that region-wide cooperation among the island countries of the South Pacific is essential; otherwise, turtles protected in American Samoa may be killed later when they migrate to other islands.

Turtle numbers have declined so much that they are now considered endangered species. This worldwide decline of sea turtles is due to overharvesting, loss of nesting beaches, and incidental kills in fishing gear. Pacific populations of one of our species (hawksbills) are "rapidly approaching extinction" according to a recent review. Because of this, tough federal and Territorial laws exist here to protect turtles and their eggs. Fines exist for killing a turtle or importing any turtle products into the Territory (shells, stuffed turtles, turtle combs, etc.). These days fewer turtles are being taken in American Samoa, probably due to both their scarcity and the outreach programs that inform children and villagers about the endangered status of the turtles.

Sea turtles play a large role in Samoan culture and have traditionally been harvested for food. The shells were often made into bracelets, combs, and fishing hooks. It also was used in the headpiece worn by a *taupou* during important ceremonies. Turtles were incorporated into Samoan songs and art, and there are even turtle petroglyphs (rock carvings) in Faga'itua and Leone. And, of course, there's the legend about the Turtle and Shark that appear in the sea at Vaitogi when villagers sing a special song. It is sad that many young Samoans have never even seen a live sea turtle.

Recommendations for improving sea turtle populations include:

- Increase education efforts;
- Laws protecting both the turtles and their habitats need to be enforced;
- Since sandy beaches are essential as turtle nesting areas and hauling sand away from our beaches results in the loss of critical habitat for these species, sand removal from beaches should be prohibited and enforced;
- Enforcement of the ban on turtle parts for sale or trade needs to be implemented.

WHALES

Status	Trend
C	⬇

Almost all sightings of whales in American Samoa are of humpback whales that come to our waters between August and October to mate and give birth. Adult humpbacks (*Megaptera novaeangliae*) grow up to 50 feet long and weigh about 40 metric tons. Humpbacks are air-breathing mammals that live in the ocean. Humpbacks eat small schooling fishes and krill (small shrimps). Other than humpback whales, there have only been two recent sightings of dead sperm whales which washed up on the shores of American Samoa.

The appearance of humpbacks in American Samoa is an important segment of their migration up and down the South Pacific Ocean. During the warm months of the southern hemisphere, the whales feed in the rich waters of Antarctica, 8,000 miles to the south. Biologists call this particular group of whales the "Group-5 Antarctic stock." When winter sets in, the Group-5 whales seek warmer water. They migrate northward, with some going towards Australia and others migrating towards Tonga. Apparently most of this latter group remain near Tonga, but at least some migrate onward to the Samoan Islands.

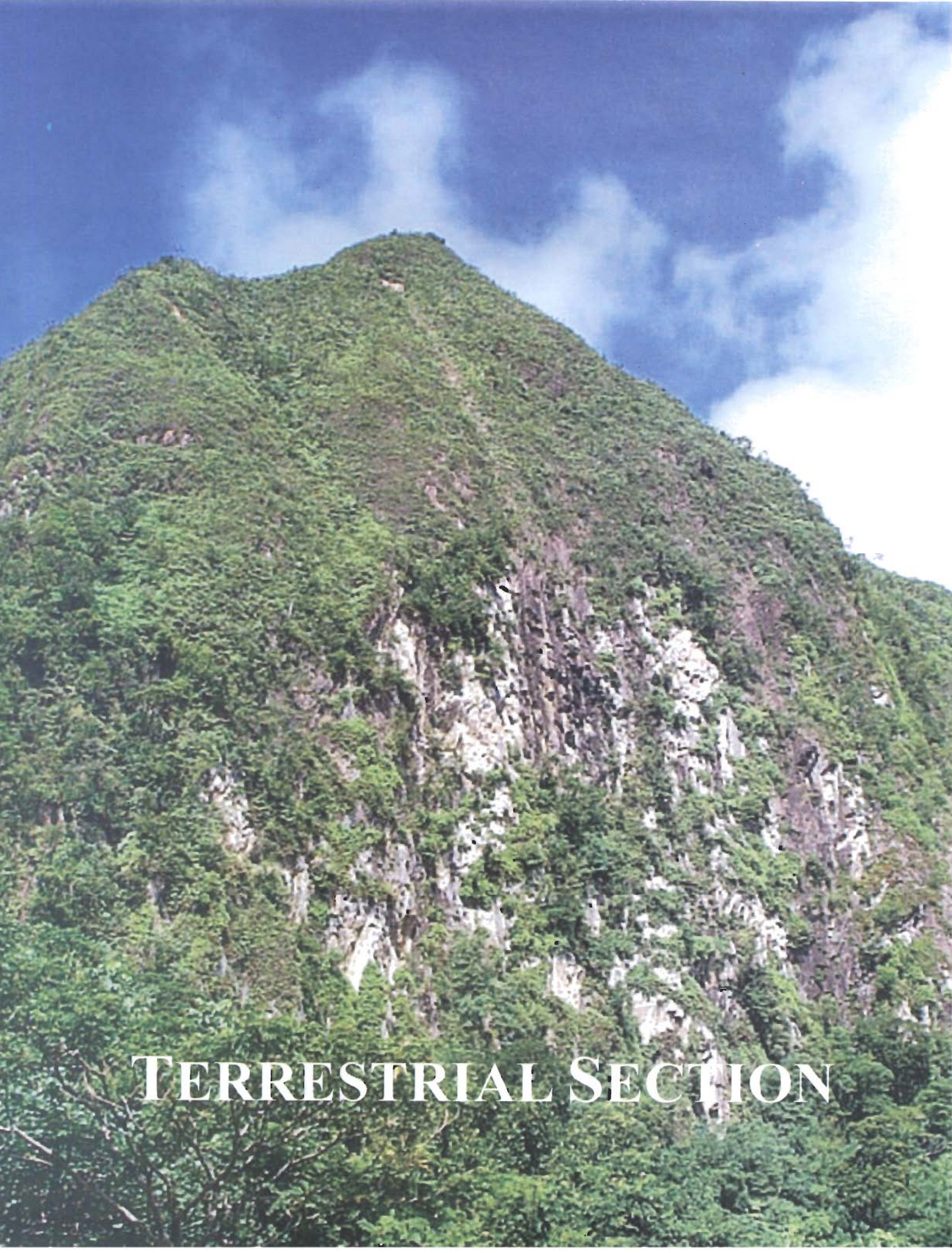
Humpbacks are most common in September and October, but can arrive as early as July and leave as late as December. They occur in small groups of adults or in mother-calf pairs. Humpbacks have been sighted around all 7 of the islands in the Territory, but we don't know how many are actually here.

Humpback whales are currently listed as an endangered species because their world-wide populations were decimated by whalers in the 1800's and 1900's. By the time commercial whaling was stopped in 1963, 95% of the humpbacks in Group-5 had been killed. Recovery of Group-5 has been unexpectedly slow, perhaps because a subsistence harvest of these whales occurred in Tonga as late as 1978 and Russia continued to hunt them in the Antarctic until recently. In any event, our whales remain in very low numbers.

Whales are protected by the Marine Mammal Act. This means that one cannot kill them, harass them, or possess parts of whales. Whale bone carvings are illegal to possess. Because humpbacks use our waters to give birth to their young, it is important to protect them when they are here. Whales should not be approached closely. Boaters, divers and swimmers should stay at least 100 yards away, and watch from there. Please call the Department of Marine and Wildlife Resources (633-4456) or the Fagatele Bay National Marine Sanctuary (633-7354) to report any whale sightings in the Territory.

Recommendations include:

- Enforcement of the Marine Mammal Act in American Samoa;
- Educate boaters, fishermen, and divers to stay at least 100 yards from whales;



TERRESTRIAL SECTION

RAINFOREST

Status	Trend
B	⬇

Almost all of the forest in American Samoa is classified under the broad term "lowland forest". Montane, ridge, slope, valley, lava flow forests, and various flat land areas (swamps, marshes, mangroves), ranging from 3000 to 0 ft, are all included in this term, although twenty plant community types have been identified in American Samoa. The shifting agriculture traditionally practiced by Samoans probably enhanced overall forest diversity, both in species composition and habitat structure, as did their introduction of new species.

Unlike virtually every other tropical country, a significant proportion of American Samoa is still covered in primary tropical forests and native vegetation. The islands of the Territory are too small and steep for commercial forestry to be viable. Most of the forest that has been lost is in coastal areas. The greatest loss of unique forest habitats has occurred as the few level areas of American Samoa were developed for human settlement in the last 100 years. These habitats, such as mangrove forests, habitat along streams and the lava flow forests of Tafuna plain are rare and under continual threat. Primary forest at higher elevation and on a steeper slope has been less affected by development, although these forests are threatened by agricultural development, hurricanes and invasive species.

The challenge at present is to protect the rare habitats that survive in the Territory, and maintain the native forests at higher elevations. The protection and maintenance of Territorial forests would represent a unique achievement, and would have many direct benefits to the people of American Samoa. The forests of American Samoa could provide a sustainable source of timber and plants for food, traditional medicine, traditional construction and crafts. As well, the forests protect the land from erosion and water contamination and protect humans from landslides and flooding. The forests are home to native animals and the variety and beauty of our forests have the potential to attract tourists and scientists, to the benefit of our economy. There are several actions that will help protect American Samoa's forests:

- Document and continue to monitor the forest by mapping and frequent inventories. This provides a gauge of the extent of ongoing habitat loss, as well as a reference for changes in plant community that may be related to climate change.
- Institute and enforce existing restrictions on land clearing, particularly on slopes or in mature forests, and on any cutting of selected species. This would both reduce loss of soil due to erosion and provide maximum protection for lowland forests.
- Vigorously implement replanting of native species, from small scales such as roadsides or yards to larger scales such as parks and fallow plantations. Native mangrove species (*Rhizophora mangle* and *Brugiera gymnorrhiza*) are especially susceptible to extension due to waste dumping and land filling.
- Cease any introduction of non-native trees except for small-scale planting of species with usable fruit crops. Flowering 'ornamentals' and 'timber' species are particularly harmful, as they often compete with native species for pollinators and space, while providing little more value than many native species.
- Encourage eco-tourism and scientific investigation that will utilize the forest resource without damage to it.
- All of the above points will require public education about the importance of healthy forests for the Territory.

Status	Trend
B	⬇

VERTEBRATE WILDLIFE

The vertebrate wildlife of American Samoa is limited in diversity, and almost all of the species are shared with other Polynesian islands. With a few exceptions, most species of native wildlife appear to sustain breeding populations. It is believed that in most cases wildlife populations can and generally do recover from the devastating effects of hurricanes and other natural catastrophes. Of greater concern, however, are human activities that directly (such as hunting) or indirectly (e.g., destruction of essential forest and wetland habitats) reduce populations. Such activities typically do not have the intermittent, cyclical nature of natural events; they tend to be sustained, rather than of short-duration, and intensify over time. Thus, if native animals are to remain part of American Samoa's biological and cultural heritage, it is vital to maintain current measures that enhance the species' ability for replenishment and maintenance (e.g., hunting restrictions, regulation of entry of exotics, habitat protection) and retain only cultural practices that are compatible with population sustainability (e.g., traditional hunting methods). Because there is a lack of information on amphibians and reptiles, the following descriptions are restricted to the commonly known groups of birds and mammals.

BIRDS

There are 59 species of birds in American Samoa, of which 44 are found here at all times. Of the 44, 20 are seabirds and 24 are land and waterbirds. The resident land birds include 4 non-native species: the red jungle fowl (*Gallus gallus*), jungle myna (*Acridotheres fuscus*), common myna (*A. tristis*), and the red-vented bulbul (*Pycnonotus cafer*). Populations of mynas and bulbuls are well-established and they are commonly associated with urban, agriculture, and edge habitats. Other exotic species are also kept as pets, a practice which should be prohibited. The Pacific pigeon or **lupe** (*Ducula pacifica*) is a species of great cultural importance to Samoans. They have been historically hunted together with the many-colored fruit dove, or **manuma** (*Ptilinopus perousii*) and the purple-capped fruit dove, **manutagi** (*P. porphyraceus*). These three species are currently protected under a total hunting ban mandated through an executive order in 1992, instituted to aid in the natural recovery of birds and fruit bats that were devastated by hurricanes in the early 1990s. Although bird numbers have climbed from the post-hurricane lows, there has been little continuing increase in recent years. There has been one recorded bird extinction in American Samoa: the **ma'o** (*Gymnomyza samoensis*). The spotless crake, (*Porzana tabuensis*), may have also disappeared. Several species are of concern due to their limited distribution, restricted habitat preferences, and/or small populations. Among these are: the gray duck, toloa (*Anas superciliosa*), shy-ground dove, **tu'aimeo** (*Gallicolumba stairi*), many-colored fruit dove, or manuma, and the Fiji shrikebill, or **segaolevau** (*Clytorhynchus vitiensis*).

MAMMALS

Three species of bats constitute the only native mammals of American Samoa: two fruit bats, **pe'a vao** (*Pteropus samoensis*) and **pe'a fanua** (*P. tonganus*), and the insectivorous sheath-tailed bat, **pe'a pe'a vai** (*Emballonura semicaudata*). The earliest reliable estimates from the late 1980s put the population of *P. tonganus* at about 12,000 which dropped to less than 1,000 following Hurricanes Ofa (1990) and Val (1991). It is currently estimated around 7,000. Estimates of *P. samoensis* are difficult to obtain because the species is largely solitary, unlike *tonganus* that roost in colonies that can be counted. However, the historical trend of the populations of the these species appear to mirror each other. The population of *P. samoensis* that was greatly reduced following the hurricanes appears to have recovered. The sheath-tailed bat, which typically lives in caves, is on the verge of extinction. They have been rarely sighted foraging and most documented cave roosts are now empty of these bats.

WETLANDS

Status	Trend
D	⬇

Wetlands are defined as those areas that are inundated or saturated by surface water at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation typically adapted for life in saturated conditions. Wetlands include, but are not limited to, cultivated and non-cultivated marshes (salt and fresh), swamps, aquifer recharge areas, floodplains, streams and springs.

Wetlands perform numerous functions. They (1) act as flood controls and prevent storm damage; (2) provide habitat for some fish, shellfish, and bird species; (3) aid in pollution abatement and trap sediment; (4) provide groundwater recharge areas for aquifers; (5) provide areas for agriculture; (6) provide a continual source of water supply, (7) provide areas for recreation; and; (8) are integral components of the Samoan culture, serving as habitat for plants which provide traditional dyes and medicines.

An estimate of the size, location, and type of wetlands present prior to European contact is not possible. However, given the age of villages and the locations of wetlands on the islands, we can surmise that the people of American Samoa have had a long and prosperous relationship with wetlands. Information on wetlands during the first half of the twentieth century (1900-1961) is vague. While some authorities estimate a 25% loss of mangroves during this time, others claim a loss of 30-40%.

Using aerial photography, wetland loss was calculated for the years between 1961 – 1991. This time in history marked a period of rapid development, first in infrastructure (roads, schools, offices, hospitals) and then in commercial and residential ventures. Within these 30 years, Tutuila lost approximately 30% of its remaining wetlands, while Manu'a lost approximately 10% (Aunu'u's acreage remained unchanged). One consequence of wetland losses has been an increase in the number of houses and businesses flooded during storms. Water that once was stored and released through wetlands now flows to developed areas.

Wetland loss continues to plague Tutuila. In 1999 alone, there were 18 Stop Orders issued for adverse impacts to wetlands effecting 400 feet of streams and 2,675 square feet of swamps and marshes. The main cause of the loss in wetlands is due to clearing and filling to accommodate village homes, piggeries, and commercial buildings. With the population of American Samoa anticipated to double within the next 20 years, the struggle to conserve remaining wetland resources will only intensify. In addition, the health of wetlands has been impacted through continued use of wetlands and streams as places to dump solid waste and for animal operations and auto repair shops.

Wetland loss is being addressed through education, proper conservation and resource management, and regulations and enforcement. On paper, American Samoa is a leader on the regulatory front. However, enforcement of regulations is a continuing weakness. Finally, because most wetland areas are filled for buildings, large scale wetland restoration is a difficult proposition and not feasible. However, small scale restoration and enhancement projects are possible with the support of local communities.

INTRODUCED SPECIES

Status	Trend
B	⬇

Introduced species in American Samoa include species that have arrived intentionally, usually as food crops, forestry, nursery plants, livestock or pets, and species that have arrived accidentally, usually as hitchhikers in agricultural products, freight and boat ballast. Such non-indigenous species may be beneficial, benign, or harmful to native ecosystems. Those that spread rapidly and are harmful are referred to as invasive species. The Polynesians brought some species with them when they arrived here, including ornamental plants, food crops such as breadfruit and taro, and animals such as pigs (different from and probably less destructive than the European pigs that are feral in the forests here today) and Polynesian rats (probably an unintentional introduction). Since they have been here for so long, it is difficult to assess the impact that Polynesian introductions have had on the ecosystem.

The modern introduction of invasive plant and animal species poses an immediate threat to our native ecosystems. The battle against invasive species such as the cane toad and the experience of invasions that have devastated natural ecosystems and agriculture in other Pacific islands such as Hawai'i (numerous plants and animals), Fiji (*Miconia calvescens*) and Guam (Brown Tree Snake), have proven that invasive species can be difficult to keep out and can be nearly impossible to control once present.

Invasive species have traits that allow them to spread easily, to survive in difficult environments, and to grow rapidly. Thus, many invasive plant species are weeds, which can survive in marginal conditions (roadsides) and can spread using clinging seeds or by producing seeds that are eaten by birds and dispersed in their droppings. Many invasive insects are very good at out-competing native insects, including important native pollinators. Invasive birds are often those that thrive in man-made habitats such as cities, but may also displace native species in natural habitats. Invasive vertebrates such as rats, snakes and feral cats can cause the extinction of native birds by eating their eggs or chicks. Unfortunately, those species that are easy to recognize as potentially invasive are the most difficult to exclude.

We can make several generalizations about introduced species. First, consumer and predator species, ants for example, can have particularly far-reaching effects. It will probably never be possible to determine all the impacts of introduced ants. These abundant insects are inconspicuous, but affect many species. Second, a single introduced species can affect a whole ecosystem. This has been observed on other islands where nitrogen-fixing plants were intentionally introduced for forestry and agricultural purposes. Third, even very specialized species can indirectly affect many other species. Thus, when taro blight arrived, it had important indirect effects on other plants and animals. There is no easy solution to the problem of introduced species, since travel to and from isolated places is now easier than ever. However, some steps can be taken to minimize future problems:

- No species should be intentionally introduced without lengthy quarantines and exhaustive study;
- Any intentional introduction should receive approval from all relevant government agencies, particularly the Dept. of Agriculture, DMWR and ASEPA;
- When an invasive alien species is detected, action to eliminate it must proceed rapidly: legal responsibility and authority to do so must be given to the appropriate agencies;
- Finally, we must create a culture in which people value native species, and in which they actively resist the appeal of exotic species.

AIR & WATER RESOURCES

AIR QUALITY

Status	Trend
A	⬇

Air quality in American Samoa is generally considered excellent. The two significant sources that could impact air quality in the Territory are automobile exhaust and emissions from diesel-powered generators. Aircraft utilizing Tuitula's airport provide an additional minor source of air pollution. The Territory is fortunate that the topography of the island allows for rapid dispersion of these emissions.

The most recent model of emissions due to transportation indicated that automobiles are the primary source for carbon monoxide and hydrocarbons in American Samoa. The Pago Pago urban area has the greatest concentration of these pollutants due to high population density and the enclosed nature of the harbor. Sulfur oxides produced by the generation of electricity and diesel engine combustion are also increasing due to the continued use of high sulfur fuel. ASPA now uses high efficiency generators, which have reduced emissions, but the need for electricity continues to grow and thus emissions are still increasing. Air emissions in the Pago Pago Harbor area continue to be studied.

In addition to the above, ASEPA has completed odor studies on both canneries, with the assistance of experts from the U.S., which have pinpointed the areas of concern at each cannery. Upon implementation of these improvements, it is hoped that odors affecting the quality of life in the harbor area will diminish.

Recommendations include:

- Review Territory's existing waiver for the continued use of high sulfur diesel fuel
- Study maximum vehicle density desirable in the Territory
- Increase enforcement efforts concerning ban on non-EPA approved vehicles
- Continue to monitor and review odor reduction practices at cannery facilities

WATER QUALITY

Status	Trend
C	⬇

Fresh Surface Waters

The small, steep watersheds and periodic intense rainfall within the Territory cause stream flows to fluctuate quickly. Despite highly variable flows, the streams of American Samoa are able to support a variety of aquatic species, several of which may be harvested for consumption. A stream should also provide a safe place to play, relax and enjoy nature's beauty. Stream water quality is most affected by development along a stream that changes the hydrology and shade on a stream, by development within a watershed that causes erosion and increased turbidity within a stream, and by nutrient pollution from poorly constructed human and pig waste disposal systems. In some areas, improved service by sewage lines and subsequent decrease in the number of poorly constructed septic systems has improved the water quality of streams. Note that while the majority of the drinking water for the population is provided by the government system, there are outlying villages that continue to use surface water diversions as a source of drinking water.

Ground Waters

The Tafuna-Leone plain is the site of the majority of American Samoa's residential and business development. The plain is also the site of the majority of the wells that pump ground water for distribution. Because volcanic stratum of Tutuila is highly permeable and does not filter water very well, there is a constant risk of groundwater contamination from pollution at the surface. The greatest threats to groundwater quality in American Samoa are pesticide residues, pollutants associated with automobiles and nutrient pollution from poorly constructed human and pig waste disposal systems. As in many small tropical islands with highly permeable soils, the fresh water aquifer floats on layer of salt water beneath the ground. Rare dry periods of two to three months duration result can in critical drinking water shortages as salt water intrudes on the depleted fresh water lens aquifer. The Territory suffered its worst drought of historical times in 1974. In 1998 the Territory experienced a drought, but not as severe as the 1974 drought and there was not a noticeable increase in chlorides in the drinking water.

Embayments/Open Coastal Waters

Embayments and open coastal waters in American Samoa are for the most part characterized by the fringing coral reefs that surround all of the islands in the Territory. Designated uses include fishing and food gathering, recreation, support of marine life, mariculture, and scientific investigations. The reefs also provide a buffer for the islands against the impact of waves. The greatest threats to near-shore water quality and to the health of the reefs in American Samoa are found in run off from the land, especially nutrient pollution from poorly constructed human and pig waste disposal systems as well as increased turbidity and nutrients from erosion. Solid waste, i.e. improperly disposed of trash, is another source of pollution in open coastal waters and embayments.

The American Samoa Environmental Protection Agency monitors popular recreational beaches on Tutuila and in Manua. The beaches are monitored for Enterococci bacteria, which are an indicator of fecal pollution. Results are compared with the American Samoa Water Quality Standards to determine if a beach is safe for swimming. Weekly public notices are released that warn the public of the hazards of swimming at beaches that are in violation of the standards. Data from the monitoring program indicates that while some beaches have chronic fecal pollution, almost all beaches are affected by pollution after heavy rains. This discovery shows that efforts to reduce nearshore pollution must focus on the adjacent communities within the watershed.

WATER QUALITY

Status	Trend
C	⬇

Ocean Waters

Designated uses include fishing, scientific investigations, boating, support of marine life, and recreation. While there is a small offshore fishery, it is unknown whether offshore waters are affected by pollution. High strength wastes from the tuna canneries are dumped five miles offshore, but it is doubtful that the waste has more than a localized effect.

General Trends in Water Quality

The Pago Pago harbor is the only water body whose water quality has improved due to the segregation and ocean dumping of high strength wastes and the movement of the low strength waste outfall to the outer harbor. Elsewhere in the Territory, data indicates that water quality has decreased in streams in populated areas, most embayments, nearshore waters, and wetlands.

Status	Trend
B	⬇

DRINKING WATER RESOURCES

The value of a reliable source of high quality drinking water cannot be overstated. Clean water is vital to our quality of life and to economic prosperity. It is generally taken for granted that adequate water supplies will always be available on Tutuila. However, water managers have observed trends in water quality, and available water quantity, that refute these assumptions. Although there appears to be ample drinking water resources in American Samoa, there are significant threats to the island's water supply, both in terms of water quantity and quality. Major threats are climate variability, chronic pollution from poor waste management and uncontrolled development, and rapid population growth.

Most drinking water on Tutuila comes from groundwater reserves, called aquifers, which are large bodies of saturated rock, located below the ground surface. Below the fresh water saturated rock lies a layer of rock saturated by salt water, which infiltrated from the surrounding ocean. In a few villages, water is supplied by "village" water systems, which are surface water catchments and not part of the American Samoa Power Authority (ASPA) water system.

ASPA operates a system of wells that pump water from groundwater aquifers and distributes it to homes and businesses via a network of pipes, valves, and storage tanks. The largest and most productive aquifers on Tutuila are located beneath Malaeimi Valley and the Tafuna-Leone Plain. Tutuila aquifers have an estimated sustainable yield of approximately 22 million gallons per day under average rainfall conditions. The current total pumping capacity of all operable ASPA wells is approximately 12 million gallons per day, and the average total water consumption on Tutuila is 7 million gallons per day.

Rainfall on Tutuila is 150-250 inches per year, depending on geographic location. Because of the high porosity of the island's soils and underlying rock, rainwater rapidly infiltrates into aquifers, and flows laterally towards the ocean. As a result, aquifers exist as relatively shallow lenses of fresh water floating on top of salt water. If there is plentiful rain, infiltration keeps pace with or exceeds pumping rates, and the fresh water lens volume remains relatively constant. During weeks or months of drought, the fresh water lens becomes thinner, and the underlying seawater begins to mix with the fresh water, leading to high salinity in the drinking water. High soil porosity is also partly responsible for the second major threat to drinking water; the degradation of drinking water quality from contaminants as a result of human activity on the land. Bacterial contamination from pig waste, improper septic tanks, and outdoor toilets, can be flushed directly into underground water supplies by infiltrating rainwater. Chemical contaminants from spilled oil, fuels, discarded paints, solvents, or cleaners, and leachate from garbage piles, follow the same pathway into the aquifers as the rainfall. It is certain that contamination of drinking water supplies from human activities will become more prevalent in the future as the population grows. Population growth is the third major threat to Tutuila's water resources; over pumping to meet the demands of a rapidly growing population depletes groundwater reserves faster than rainfall can replenish them. Tutuila's population doubled in the past 30 years. At the current growth rate the population will double again by 2025. At the present per capita consumption rate, water resources will be taxed to the maximum at that time, and will only be sustainable if normal rainfall patterns persist.

Status	Trend
B	⬇

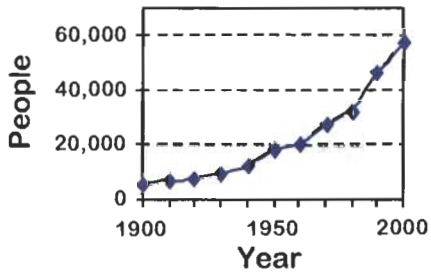
DRINKING WATER RESOURCES

Tutuila groundwater resources show evidence of degradation and it is imperative that action plans be implemented to change these trends. Recommendations to protect our island's water supply include:

- Eliminate piggeries, septic tanks, and cesspools that have improper waste management;
- Implement education programs to promote home water system maintenance and conservation;
- Establish "inclining block" consumer rates (an increase in cost per gallon, as more water is used, e.g., $0.05/gallon for first 500 gallons used, $0.15/gallon for second 500 gallons used, $0.25/gallon for third 500 gallons used, etc.) to provide economical incentives for conservation;
- Designate significant aquifer recharge zones such as Malaeimi Valley as "Special Management Areas" to control development;
- Establish well-head protection zones, and;
- Eliminate illegal cross-connections (village systems to ASPA system).

ENVIRONMENTAL ISSUES

Population growth in American Samoa.



POPULATION TRENDS

Status	Trend
D	⬇

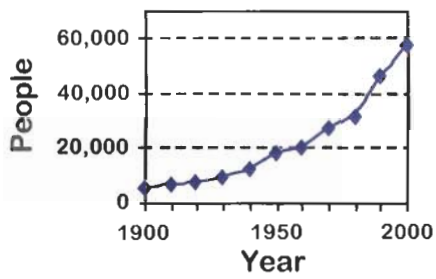
The rapid growth rate of the human population is perhaps the most critical world-wide issue for the 21st century. It is also a very real problem in American Samoa. Our Territory consists of 7 small islands with a total land base of 76 square miles. Tutuila is home to most, with 96% of the population residing there. Although Tutuila also contains the most of the Territory's land mass, only one third of this mountainous island contains land suitable for human occupation (19 square miles with slopes less than 30%).

The current population of American Samoa is approximately 57,000. During the past ten years, the population increased by 10,300 people, which is an increase of 23%. The population of American Samoa will reach 100,000 within the next 15-20 years and nearly 200,000 by the year 2040 unless significant change occurs. In 1990, our growth rate of 3.7% per year was one of the world's fastest. At that rate, a population doubles in only 19 years. By 1999, the rate dropped to about 2.5%, which is a very significant and encouraging reduction. However, this does not mean our growth is now under control. Even at this rate, the population of American Samoa will reach 100,000 by 2020.

The driving force in population growth is the number of children each woman has during her life. This number has been slowly declining from 6.2 children 20 years ago to 4.5 in 1986-1990, with a further reduction to about 4.0 in 2000. Even at 4 children per female, the population of American Samoa will continue to grow rapidly. At 2 children per female the population still increases for a number of years due to the large number of children already here, but would thereafter stabilize. At 1 child, the population gets smaller. Other factors affecting population include migration (people leaving the Territory never to return), immigration (people moving to the Territory permanently), and death rates. Currently the immigration of new residents into the Territory exceeds the out migration by about 200 people per year.

This population growth has noticeable, and in many cases severe, impacts on the everyday lives of American Samoans. The population rise will affect the economy, infrastructure and land use, education, social and medical services, the environment, and the Samoan culture. For instance, groundwater supplies of drinking water will not be able to keep pace with the population growth by 2040. One estimate of the sustainable supply found it will support only 112,000 people on Tutuila island. In addition, there is an increasing risk that the available supply of drinking water will be contaminated by sewage and pollutants from the rapidly increasing population located within the major growth center of Tualauta County. Other findings include: increases in the amount of solid waste generated will necessitate a new landfill site by 2007; additional generators will be needed to provide electricity; to maintain the present student/teacher ratio (which is already high), 2,000 additional teachers will be needed by 2040; costs of educating our youth will escalate from $38 million in 1996 to $141 million by 2040; total inpatient and outpatient costs will rise from $19 million in 1996 to $53 million by 2040; sewage will increase 300% by 2040 and impact ground waters, streams, and nearshore waters. Additionally, the projected population increases will have a major impact on Samoan culture. As the population grows, land disputes will increase and there may be pressure to replace communal land tenure with a more equitable land distribution system. Entire traditional cultural value systems may have to be reassessed.

Population growth in American Samoa.



POPULATION TRENDS

Status	Trend
D	⬇

The Governor's Task Force on Population Growth has developed a set of recommendations to address the population issue. Two kinds of recommendations were developed – those that examine ways to reduce population growth and those that look at ways to improve our living conditions or "quality of life" on a crowded island. It is also important to recognize that our government has very limited control over population growth. Decisions about family size and migration are essentially private decisions. The government is often limited to various forms of persuasion, education, indirect regulation or incentives. It has few direct controls over national immigration.

However, the task force recommends the following courses of action to reduce population growth:

- Overhaul our immigration system, including the redesign of immigration forms to make it easier to interpret data collected. Policies to reduce immigration that could be considered include discouraging low wage jobs that are typically filled by imported workers, encourage the development of local small business, reduce the size of government, and perhaps encourage out-migration by better educating and training American Samoans who then might prefer to migrate off-island for opportunities not available in American Samoa. Department of Immigration is updating its immigration procedures and is installing new computer hardware to track visitors, immigrants and visas.

- Lower birth rates through positive reinforcement to women. In many countries around the world, it has been observed that birth rates tend to fall as the average level of education increases, particularly for young women. To this end, education initiatives should be directed toward young women. These could include college scholarships, as well as simple advocacy for young women who wish to pursue their education. Non-educational initiatives could include preferential placement of women in vacant jobs, as well as encouraging women to advance their careers through increased training. Department of Health and Social Services has begun a publicity campaign to discourage teen pregnancy.

For more information on population growth in American, the recommendations listed above, and recommendations for improving living conditions as the population increases, please refer to the "Impacts of Rapid Population Growth in American Samoa" by the Governor's Task Force on Population Growth, February 2000.

CLIMATE CHANGE & GLOBAL WARMING

Status	Trend
C	⬇

Studies show that the world is getting hotter and many people attribute this temperature rise to a "greenhouse effect" that is caused by excessive production of carbon dioxide gas. This is not some new exotic contaminant - it is a naturally occurring gas. Humans exhale carbon dioxide from every breath we take, and plants use it as a building block to grow. The problem is that vast quantities of carbon dioxide have been produced by the combustion of gas and oil. This increased level of carbon dioxide acts like a thick blanket around the earth that traps the sun's heat, warming the earth.

Global warming is not just a worry in other parts of the world, where industrial nations are producing most of the gases. A warming trend is occurring right here in American Samoa, as evident from data taken by the NOAA weather station since 1960. There has been a steep increase over the past 15 years, with 1998 being the hottest year. In American Samoa, temperatures have increased faster than the worldwide average and are now 2-4 degrees F warmer than they used to be in the 1960s and 1970s. Our 'cool season' is now as warm as our 'hot season' used to be. Some of this increase may be temporary now that El Nino (a naturally occurring phenomenon) is waning, but a multi-year increase is readily apparent. Similar patterns are occurring worldwide; 1998 was the hottest year on record, and it was a full 1 degree F warmer than the previous long-term average from 1961-1990. That may not seem like much, but it can trigger significant alterations in the world's weather patterns. That, in turn, can have serious consequences such as changing productive farmlands into deserts, and causing sea levels to rise as polar ice caps melt and seawater expands as it warms.

There are 3 main impacts as a result of global warming. First, tropical storms and hurricanes may increase, because warmer air and ocean temperatures typically influence the development of these weather systems, resulting in increased rainfall. Second, a rise in sea level will increase damage and erosion along our coastline. This will require increased funding and construction for road repairs and coastline stabilization. Additional cement-lined and riprapped shorelines may be necessary. Rising sea levels may also raise the level of saltwater penetration under our island, thereby reducing the groundwater supply that we use for drinking. Third, warmer temperatures may affect our island's ecosystems. Plants might do well in a warmer climate unless there is a drought or conditions that prove favorable for outbreaks of insect pests or disease (similar to the taro blight). Fruit bats may become heat-stressed because they are dark in color. In the marine environment, warmer water temperatures are known to kill coral. Some plant and animal species may shift their present abundance and distribution patterns.

Recommendations for mitigating the effects of global warming in American Samoa include: (1) Drinking water: encourage individuals to protect and conserve the island's limited supply of freshwater. Implement incentives for supplementing water needs with cisterns that collect rainwater. (2) Structures: require hurricane-proof houses with secure roofs; new buildings and structures should be built away from shorelines. (3) Shore Protection: sand or coral rubble removal from beaches should not be permitted. These materials help absorb the force of storm waves, thereby reducing damage to coastline houses and roads. Conservation and restoration of coastal wetlands would help buffer and mitigate the effects of rising sea levels. (4) Utility Lines: phone and electric lines should be buried. (5) Reduce greenhouse gases: reduce our reliance on oil and gas; use energy-efficient cars and appliances that produce fewer emissions. Support incentives that encourages individuals to use less energy. Support recycling - it not only reduces litter and waste volume, it lowers emissions because it uses less energy to reuse such materials

Status	Trend
C	⬇

SOLID WASTE & LANDFILL

In ancient times, all of the solid waste that Samoans produced was bio-degradable. This means that the baskets, wood and other materials that became waste would rot away into the ground once they were discarded. But, we clever humans have developed materials that break down very slowly, such as glass, plastic, metal, and paper. When these materials become waste, they stick around for a long time. If our modern trash is not disposed of properly, it becomes litter and threatens the beauty of the Territory and our health. Proper disposal of solid waste means throwing materials like plastic and glass in the trash bin to be collected, and disposing of leaves and wood and natural materials by spreading them in our plantations to fertilize and protect the soil.

As the population of American Samoa grows, so does the amount of solid waste produced. In 1996, 50 tons of solid waste were being produced and collected per day. By 1998, this number climbed to 85 tons per day. In addition to the rise in population, solid waste collection service has improved. There are now more trash bins, better accessibility to bins, and more regular pick ups. Better service has contributed to the increase in the amount of solid waste being collected. The total amount of trash in the American Samoa landfill to date is unknown, but it has been in operation since about the late 1960's. Projections estimate that the current landfill will be filled by the year 2007. A new landfill is planned at an adjacent site.

Landfills are a mixed blessing. On one hand, landfills conveniently take the trash out of the sight and smell of the public and safely isolates it. On the other hand, they pollute the land and air where they are located and continually need to be expanded or new ones created as the trash continues to be collected. Landfills are very expensive to operate and maintain. In addition, trash placed in landfills takes many years to break down. This is why it is important not to put bio-degradable garden and plantation waste into the trash bins and landfill. This natural waste takes up precious space in our landfill and shortens its useful life.

Recommendations for management of solid waste:

- Dispose of solid waste properly. This includes efforts to eliminate litter, and should include a program to teach the public to compost plant waste.
- Conduct public education about waste reduction and material re-use.
- Install efficient incinerators to dispose of cardboard. This will reduce the trash volume of the landfill by 63%.
- Ocean dump clean scrap metal, to create artificial reefs, instead of holding/storing it (scrap metal recycling companies have not found it profitable to take our scrap metal).
- Implement a beverage recovery charge on all aluminum, glass, and plastic drink containers.
- Pursue options for recycling within the Territory and off-island.
- Implement an advanced disposal fee for material coming on island that can not be disposed of easily, such as batteries, tires, care bodies, plastic bags, plastic beverage containers, and cardboard boxes.

Status	Trend
C	⬇

HAZARDOUS MATERIALS

The primary hazardous material imported into American Samoa is fuel for cars, aircraft, ships, and electrical generators. British Petroleum and Mobile Oil are the Territory's fuel suppliers. These companies must maintain Emergency Response and Spill Prevention Contingency Plans. These plans are reviewed annually during drills coordinated by the U.S. Coast Guard and Clean Islands Council. Bulk fuel storage and transport hold a risk of an oil spill that will harm surface waters, including coral and stream habitats.

A by-product of fuel consumption is used oil. Improperly handled fuel and used oil pose a significant hazard to the Territory's surface waters, ground water, and land. Fortunately, American Samoa is able to dispose of the majority of used oil via energy recycling in burners at Samoa Packing. ASEPA has established community collection points for used oil generated by consumers. As the production of waste oil increases, it is likely that the capacity of this method of disposal will eventually be exceeded. Used oil may contain toxic metals. Used oil pollution results from an accumulation of small spills that may migrate to and pollute our groundwater resource.

In addition, there is an increased household and commercial use of chemicals and products that can harm the environment if not used and disposed of properly. Such products include pesticides, fertilizers, detergents, paints, photographic chemicals, and solvents. These materials pose a variety of threats that range from cancer to nutrient pollution. On a small island, where businesses and households are close together and the drinking water resource is vulnerable to pollution, there is a critical need to properly manage products that pose a risk to our environment.

Another major hazard to human health and the environment comes from ammonia gas used by the fishing industry for refrigeration. If released into the environment, this substance could produce substantial human casualties. The companies using this product are required to maintain on-site ammonia leak response capability.

Recommendations include:

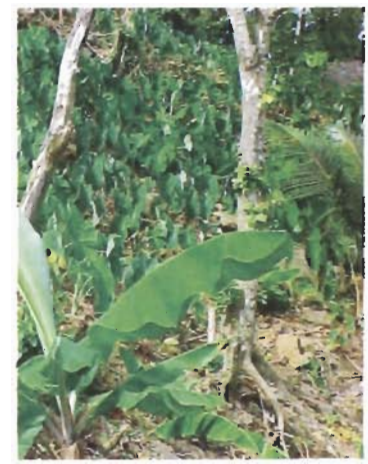
- Increase public sector capability to respond to hazardous material incidents
- Maintain community waste oil collection program
- Renew Territory's hazardous materials inventory
- Prepare and disseminate additional public education materials concerning proper use, handling, and disposal of common toxic/hazardous products
- Implement routine inspection program for commercial sites using and storing toxic/hazardous substances

PLANT DISEASES

Status	Trend
B	⬇

Most infectious plant diseases are caused by introduced pathogens, usually fungi, bacteria or viruses. By their very geography, islands are protected from invasion by most of these organisms. To colonize islands in the past, pathogens had to arrive on strong winds, in seed dropped by birds, or by other natural means. From the very first canoe to today's modern airliners, however, people have unwittingly brought plants and their pathogens to every island they visited. Often the damage pathogens cause goes unnoticed, but sometimes they move to local agricultural crops or forest trees. The local plants may not be as resistant to the new pathogens and diseases spread quickly, causing an epidemic.

Other parts of the world have struggled with devastating epidemics—the potato blight famine in Ireland, stem rust of wheat in the mid-western US, and rice blast in Asia—but American Samoa has recorded few diseases of note. This is partly due to its relative isolation, but traditional farming practices also play a large part. Subsistence agriculture is based on planting small numbers of a particular crop in separated areas, often interplanted with other species. In American Samoa, taro (*Colocasia*) for example has traditionally been interplanted with giant taro (*Alocasia*), cassava (*Manihot*), banana, breadfruit, and coconut. Every few years, the crop is moved to another site and the old site allowed to recover.



As agriculture in American Samoa becomes a business, however, larger areas are planted with the same crop. Unbroken fields of taro or bananas, for example, supply a food base in which pests and disease-causing organisms can multiply rapidly. Continuous planting of the same crop in the same location also increases the pathogen population. In 1993, American Samoa produced almost 800,000 pounds of taro; this declined to 50,000 pounds in 1994 and 11,000 pounds in 1995 due to the taro leaf blight epidemic. Samoan taro was very susceptible to the fungal pathogen, *Phytophthora colocasiae*, and the disease swept the islands. Banana plantations are also at risk due to their size and perennial nature. Banana production is presently affected by Banana Bunchy Top Virus, toppling-over disease caused by the burrowing nematode (*Radopholus similis*), banana scab moth (*Lamprosema octasema*) and the black leaf streak fungus (*Mycosphaerella fijiensis*).

Possible threats to American Samoa's agriculture are on the horizon. One threat would be an alteration in the taro leaf blight fungus, allowing it to overcome the resistance of newly introduced Micronesian taro (*talo Palau*). Another danger may come with a change in whatever conditions are keeping the normally devastating Banana Bunchy Top Virus under control. If the disease begins to spread as it did in Australia in the 1920's or in Hawaii today, banana production could disappear. A potential risk in clearing forested land for agriculture is spread of the brown root rot fungus (*Phellinus noxius*), which attacks many cultivated woody plants. The greatest threat to local plants, however, is the unknown pests and pathogens yet to be introduced into the Territory. Recommendations made elsewhere for strict, enforced quarantine measures and public education, along with early reporting of disease outbreaks can reduce, but not eliminate, the risk of future epidemics.