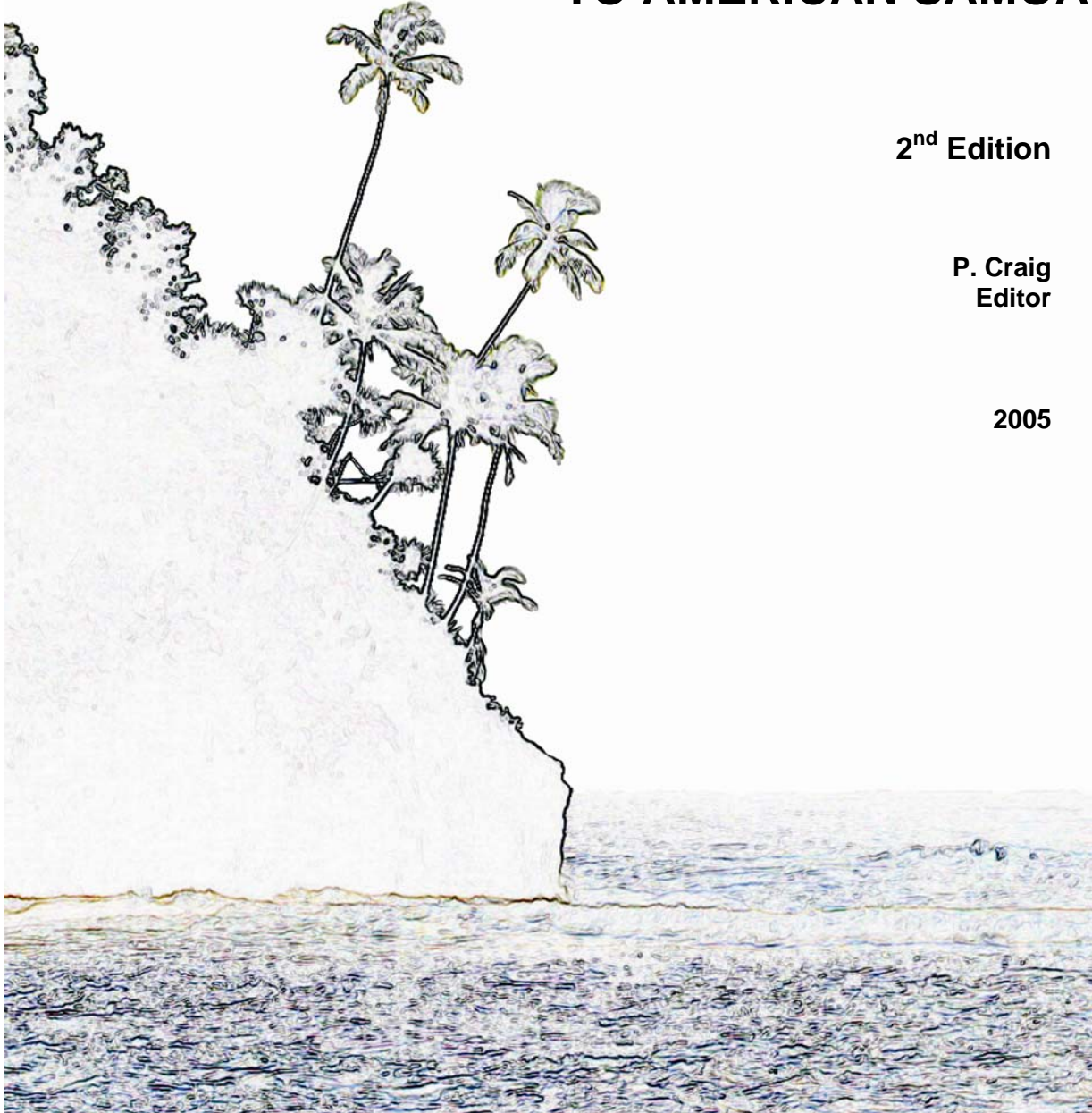


NATURAL HISTORY GUIDE TO AMERICAN SAMOA

2nd Edition

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Preface & Acknowledgments

This collection of articles provides a glimpse into the marine and wildlife resources in American Samoa's tropical, oceanic environment. The articles were written by biologists at the Department of Marine & Wildlife Resources (DMWR), National Park of American Samoa (NPS), Land Grant Program at the American Samoa Community College (ASCC), and University of Hawaii (UH). Our purpose in writing was to make the results of our studies available to teachers, students, visitors and whoever else might be curious about Samoa's environment. The use of English, Samoan and scientific names of plants and animals varies among chapters, so the reader is referred to cross-referenced lists in the species checklists and the plant index at the end of this report (Appendix 2).

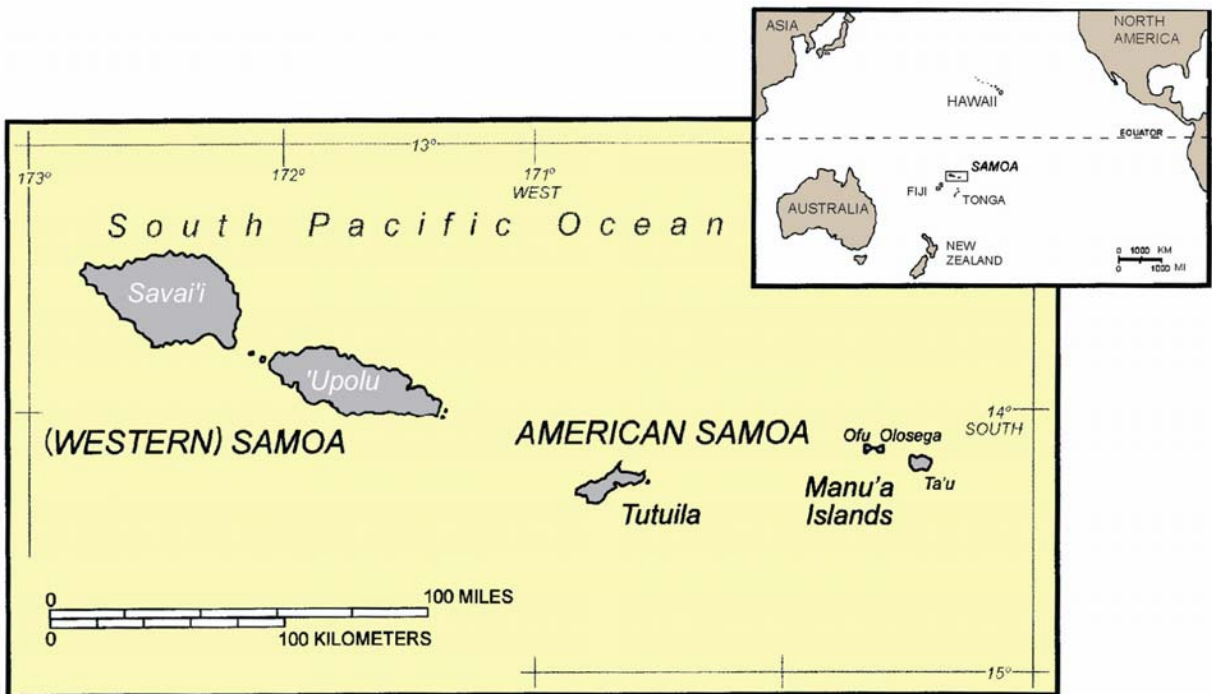
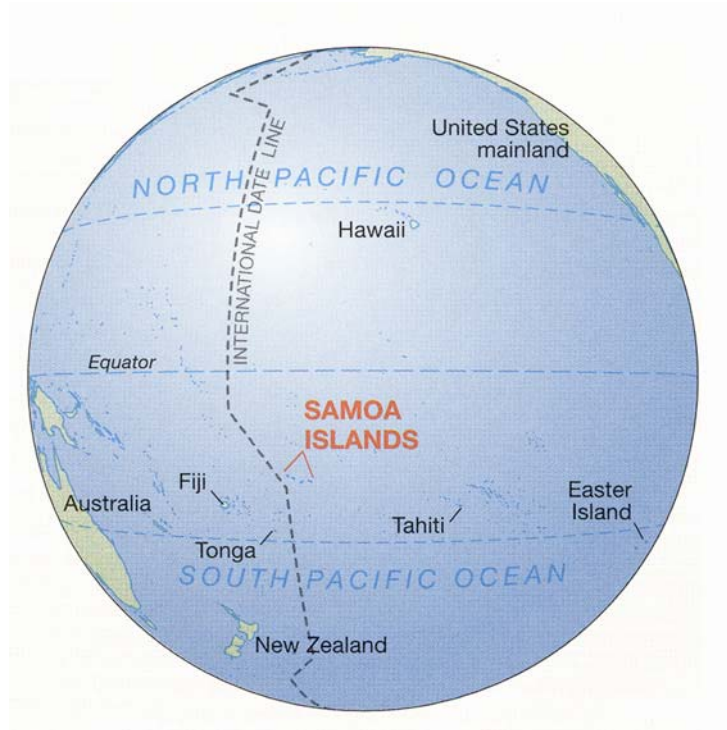
Several individuals, organizations and publishers kindly allowed their illustrations to be reprinted in this volume; their credits are listed in Appendix 3. Special thanks to Dick Watling for permission to reproduce the excellent pictures from his books "Birds of Fiji, Tonga and Samoa" and "Birds of Fiji and Western Polynesia" (Pacificbirds.com).

Joshua Seamon, Matt Le'i, Larry Basch and Tavita Togia provided comments throughout the text, and Tavita Togia and Art Whistler provided the plant reference list in the Appendix 2. Lelei Peau spearheaded the effort to translate the Guide into the Samoan language.

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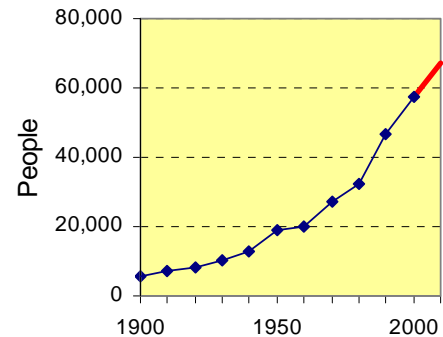


1. Local facts and maps

Samoa Archipelago. This chain of 13 Pacific islands (9 inhabited) plus two remote atolls is located 14° south of the equator near the international date line. It is divided into two political entities, the US Territory of American Samoa and the neighboring independent country of Samoa, formerly known as Western Samoa. The youngest islands in this chain lie towards the east (Ta'u). The land area of (western) Samoa (2934 km², 1132 mi²) is approximately 15 times larger than the land area of American Samoa (197.1 km², 76.1 mi²).

Territory of American Samoa. The total land area of 76.1 square miles (197.1 km²) includes five volcanic islands (Tutuila, Aunu'u, Ofu, Olosega, Ta'u) and two remote atolls (Rose, Swains).

Population. Polynesians arrived here about 3,000 years ago. The current population (62,000 in 2005) is growing rapidly at about 1.8% per year, which equates to about 1,100 additional babies and immigrants per year. Most people (96%) live on Tutuila Island. The ethnic composition is approximately 90% Samoan, 4% Tongan, 2% Caucasian, and 4% others.



Topography. The main islands are steep mountains that emerge from the ocean floor 2-3 miles below the sea surface. Peak elevations are 3,170 feet on Ta'u Island (Lata Mountain) and 2,142 feet on Tutuila Island (Matafao Peak).

Climate. Hot, humid and rainy year-round, but there is a long, wet summer season (October - May) and a slightly cooler and drier season (June - September). Total rainfall is 125 inches at the Tafuna airport and 200+ inches in mountainous areas.

Tropical cyclones (hurricanes). While very destructive, cyclones are a natural but erratic feature of the environment in this part of the world. The most recent ones in American Samoa have occurred at intervals of 1-13 years: 1981 Esau, 1987 Tusi, 1990 Ofa, 1991 Val, 2004 Heta, 2005 Olaf.



Native flora and fauna. Most native species here are closely related to those in Indonesia, but due to our remote location in the Pacific Ocean, the diversity of terrestrial species here is low: 343 flowering plants, 135 ferns, 25 resident or migratory land and water birds, 20 resident seabirds, 3 mammals (all bats), 7 skinks, 4 geckos, 2 sea turtles, 1 snake, and other occasional visitors. In contrast, the diversity of marine species here is high: 890 coral reef fishes, over 200 corals, and several whales and dolphins. Insects and other invertebrate species here are not well known.

Endemic species. Species found only in the Samoan Archipelago include one bird (Samoan starling), one stream fish, several land snails, and about 30% of local plant species. Five flowering plant species are endemic to American Samoa itself. Marine endemics have not been identified, but a thorough investigation has not been conducted.

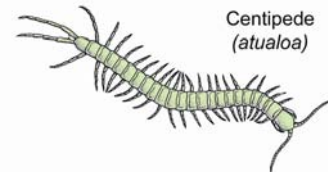
Threatened or endangered species. Federally listed species here include humpback and sperm whales, and the green and hawksbill sea turtles. Additional species 'of



concern' in the Territory include the sheath-tailed bat, 3 birds (Spotless Crake, Friendly Ground Dove, Many-colored Fruit Dove), several land snails, and others.

Pests and weeds (invasive non-native species). There are many: rats, 3 bird species (2 mynas and bulbuls), feral pigs, dogs, cats, toads, house gecko, tilapia and molly fishes, African and predatory snails, various insects, about 250 alien species of vascular plants (many of them weed species), and others.

Dangerous species. Few. On land, no poisonous snakes, but a bite from a large 8-inch centipede can be extremely painful. In the ocean, sharks are generally not a problem but stepping on the poisonous spine of a stonefish can be a serious medical emergency although this rarely happens. Consumers of fish should note that ciguatera poisoning has been found (infrequently) in several snappers (locally called *mu*) and a few other fish species. Also, avoid eating any fish or invertebrate caught in Pago Pago Harbor, because they are contaminated with heavy metals and other pollutants.



Tropical diseases. Malaria is not present, but two other mosquito-transmitted diseases can occur here: dengue fever (caused by a virus) and filariasis (elephantiasis, caused by a parasitic nematode worm). However, the chance of getting either by a visitor is slight (see chapter on mosquitoes). Leptospirosis, a common tropical bacterial disease spread through contact with the urine of infected animals (pigs, dogs, cats, rats), is fairly common among local residents (17% recent infection history); most people have mild flu-like symptoms but it can be fatal.

Chronology of local environmental events. See Appendix 1.

Conservation areas as of 2005:

Site ¹	Year	Location	km ²	acres
Rose Atoll National Wildlife Sanctuary	1973	Rose Atoll	158.8	39,251
Fagatele Bay National Marine Sanctuary	1985	Tutuila	0.7	161
National Park of American Samoa ²	1988	Tutuila, Ofu, Ta'u	42.6	10,520
Vaoto Territorial Marine Park	1994	Ofu	0.5	120
Sea Turtle/Marine Mammal Sanctuary ³	2003	All territorial waters (0-3 miles offshore)		
Community-based marine protected areas	-----	several villages	---	---

¹All fishing is prohibited at Rose Atoll, but traditional subsistence fishing is permitted at the other sites. The village marine protected areas have been periodically opened to fishing.

²An expansion of the National Park on Olosega and Ofu islands was pending in 2005.

³Governor's Executive Order No. 005-2003 established the turtle/marine mammal sanctuary.

Other "special management areas" in the Territory include Pago Pago Harbor, Nu'uuli Pala Lagoon and Leone wetlands.

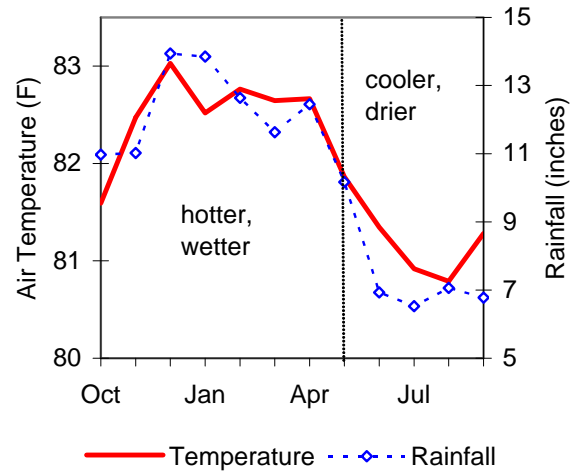
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2. Seasons and cyclones

Samoa's weather may seem warm, wet and humid all year, but we do have two seasons. Not exactly summer and winter, because Tutuila is a small dot in a vast tropical ocean, so the ocean moderates our weather year-round. Our seasons are sometimes referred to as tropical wet and dry periods, although you may wonder, when is it ever dry here?

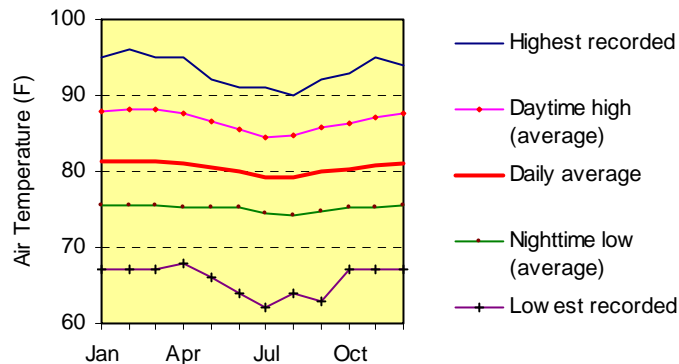
October through May is our 8-month hot and wet summer. Rainfall at the Tafuna airport weather station is about 11-14 inches per month and air temperature (averaged over a 24-hour period) is about 82-83° F (for the period 1990-2002). Our cold spell occurs from June through September when averaged air temperatures plummet to 81° F and rainfall is reduced by half.



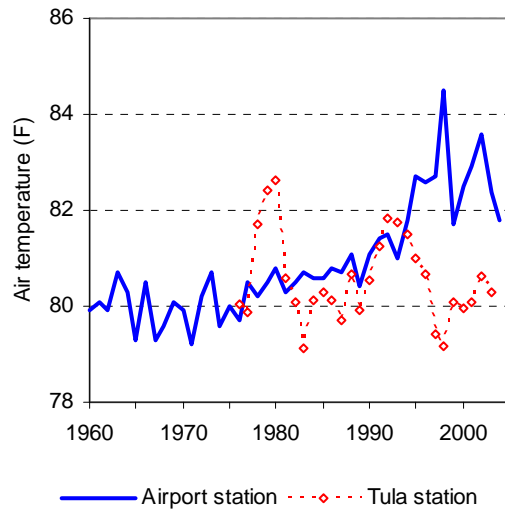
Actual rainfall can vary much more than this, as we all know. Minimum and maximum records for rainfall over a one-month period are 0.3 and 32.7 inches. The amount of rainfall we receive depends largely on where we are standing. The harbor area is very wet -- it receives about 200 inches of rainfall per year. Lata Mountain on Ta'u receives over 300 inches (25 feet) per year. The Tafuna plains are much drier and receive a mere 125 inches per year.

If it seems like it rains every day here, it almost does. In most years, the airport weather station detects at least a trace of rain 300 days of the year. But a noticeable amount of rain (at least one tenth of an inch) occurs on about 50% of the days of the year. But remember, the airport (where these measurements are taken) is the driest part of our island. Relative humidity at the airport fluctuates in the 80s (daily range 73-90%).

Air temperatures in recent years typically fluctuate from nighttime lows around 77° F to afternoon highs in the upper 80s. We now average 60 days per year at 90° or above. Record highs and lows here are 96° and 62° F.



But if it feels like our climate it is getting warmer, it is, but the picture is a little complicated. We have two long-term records of air temperature in American Samoa, the NOAA weather stations at the Tafuna airport and at Tula. Temperature trends at these two sites are quite different, probably due to local conditions where the temperatures are actually measured. Temperatures measured at the airport weather station have risen steadily over the past 20 years (see graph), but no such increase has been recorded at the NOAA station in Tula. The airport station measures air temperatures at a height of about 5.5 feet above the ground, and it is located on the Tafuna Plains which is rapidly being built up with buildings and roads, so it is probably detecting a near-ground increase in temperature that is felt by us. Whether other parts of Tutuila are warming in a similar fashion is not known. In contrast, the Tula station is on the upwind side of the island and it measures air temperatures at 50 feet above the ground, so it is less affected by near-ground conditions. It shows no increase in temperature, as would be expected at our remote oceanic location.



As summer progresses, the temperature of the ocean's surface waters also increases by about 3^o F. Warmer ocean temperatures, in turn, help provide the energy to start tropical cyclones, thus the chance of a cyclone is greatest between November and April.



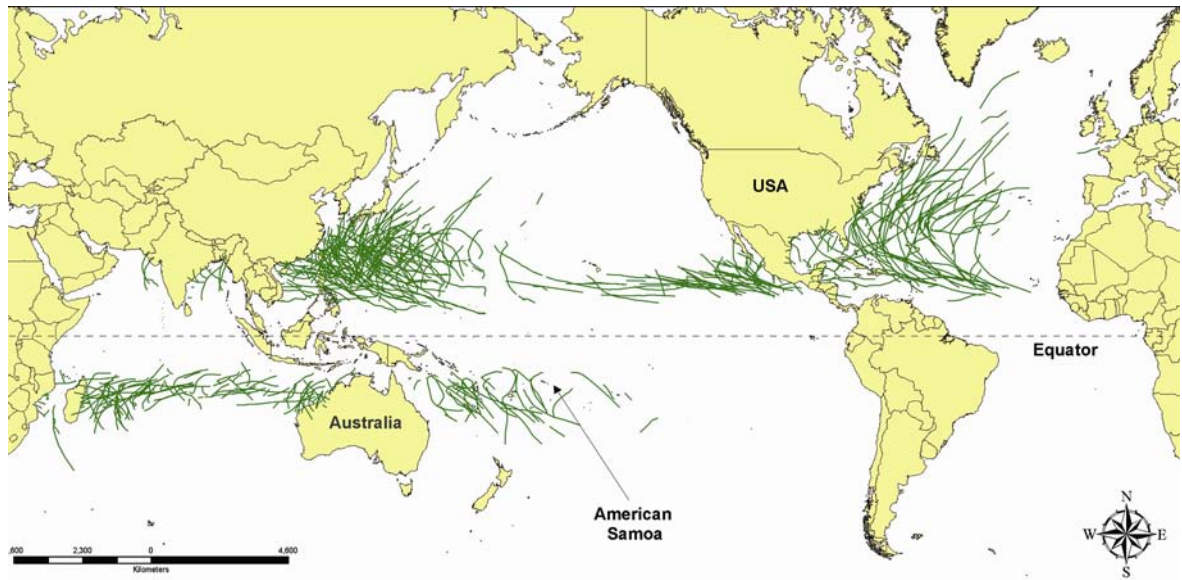
Tropical cyclones have hit American Samoa at intervals of 1-13 years during the past 24 years: 1981 Esau, 1987 Tusi, 1990 Ofa, 1991 Val, 2004 Heta and 2005 Olaf. Their severity varied -- Tusi was particularly damaging to Manu'a, the back-to-back cyclones Ofa and Val hit Tutuila hard, Heta's overall impact was moderate, Olaf slammed Manu'a hard.

A world map of cyclone tracks (next page) helps put some perspective on American Samoa's susceptibility to tropical cyclones. This map shows the tracks of all cyclones greater than 74 mph during the 10-year period 1994-2003. It shows that cyclones are generated primarily in two bands that lie north and south of the earth's equator at latitudes of about 10-30^o. American Samoa lies near the edge of the cyclone band in the southern hemisphere where cyclone activity begins to fade.



Damage from Cyclone Val in 1991. Note loss of forest foods for wildlife.

It is curious that there are no cyclones along the equator or around South America. This occurs because cyclones require two general conditions to develop: (1) warm ocean waters at least 80⁰ F (26.5⁰ C) to fuel the cyclone, and (2) enough Coriolis force (caused by the earth's rotation) to provide stability and spin to a developing storm. Coriolis force is weakest along the equator, so developing storms there remain unstable and do not develop into cyclones. South America has few cyclones due to cool water temperatures (upwelling along the west coast) or other climatic conditions (on the east coast) that are not conducive for cyclone development.



Tracks of tropical cyclones during the 10-year period 1994-2003.

Cyclones are a regular but erratic feature of the environment in our part of the world, so it is likely that native species inhabiting American Samoa are able to cope with cyclone impacts and recover, given enough time and assuming that their recovery is not jeopardized by human-related conditions such as habitat loss due to human population increases, competition by invasive alien species, pollution, or changing environmental conditions due to global climate change.

Returning to the topic of seasons, some plants and animals in Samoa schedule their activities, such as flowering or spawning, according to the seasons. These biological events tend to occur over a much longer period in the tropics compared to colder regions of the world, because the distinction between our two seasons is not great and growing conditions here are generally good year-round. Nevertheless, seasonal patterns of flowering and fruiting mean times of abundance or scarcity for some of our native wildlife, particularly the fruit bats (*pe'a*) and Pacific pigeon (*lupe*).

Some animals schedule their seasonal migrations to our islands to avoid winters elsewhere in the world. We see more golden plovers (*tuli*) and tourists during the October to March period when they flee winter in the northern hemisphere, while humpback whales (*tofola*) visit us in August-October when they escape winter in the southern hemisphere.

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