

THE FEDERATED STATES OF MICRONESIA

PRELIMINARY REPORT TO THE CONFERENCE OF THE PARTIES OF THE CONVENTION ON BIOLOGICAL DIVERSITY

MAY 2001



TABLE OF CONTENTS

INTRODUCTION	3
THE FEDERATED STATES OF MICRONESIA.....	3
THE MARINE ENVIRONMENT.....	4
THE TERRESTRIAL ENVIRONMENT	5
STATUS OF BIODIVERSITY	7
PLANTS	7
ANIMALS	8
THREATS TO BIODIVERSITY	9
LEGISLATION AND INSTITUTIONAL FRAMEWORK.....	11
INSTITUTIONAL STRUCTURE.....	14
TRENDS IN NATURAL RESOURCE MANAGEMENT	15
CONSTRAINTS TO NATURAL RESOURCE MANAGEMENT	17
STRATEGIES AND ACTIONS FOR A NBSAP	18
REFERENCES.....	22
ACRONYMS.....	22

Tables and Figures

Table 1. General vegetation types of FSM high islands	6
Table 2. Approximate numbers of native and introduced species of plants	8
Table 3. Categories of birds recorded from the four states of the FSM	9
Table 4. Items addressed by legislation and regulations in the FSM	13
Table 5: National and State Government agencies, committees and NGOs	14
Figure 1: Map of the Federated States of Micronesia	24

Introduction

This is a preliminary report by the Federated States of Micronesia (FSM) to the Conference of the Parties (COP) for the Convention on Biological Diversity (CBD) as required by Article 26 of the Convention. This preliminary report is based on the FSM State of the Environment Report (Gawel 1993), the FSM Nationwide Environmental Management Strategies (NEMS) (SPREP 1993), the Proceedings of the Second FSM Economic Summit (1999), the proceedings of the Coastal Fisheries Consortium (FSM 2000) and the First National Biodiversity Strategy and Action Plan (NBSAP) Workshop (FSM 2001). The FSM is currently in the process of formulating a NBSAP with financial assistance under the biodiversity enabling activity of the Global Environmental Facility and will submit a more comprehensive national report to the COP after the completion of its NBSAP. The information for the second national report will be based upon Statewide consultations to be held as part of the process of preparing the NBSAP. It will also include a review of agencies and programs whose work relates to the FSM NBSAP. This preliminary report provides basic information on the nations biodiversity, threats and constraints to the conservation and sustainable use of this biodiversity. The legislation and institutional framework relating to biodiversity is described and a series of strategies and actions derived from the First National Biodiversity Strategy and Action Plan Workshop are presented.

The Federated States of Micronesia

The Federated States of Micronesia is a young nation derived from part of the former United Nations Trust Territory of the Pacific Islands (TTPI). It is allied with the United States through a Compact of Free Association initiated in 1986. The FSM became a full member of the United Nations in 1991 and signed the Convention on Biodiversity in 1992.

Located in the Central and Western Caroline archipelago, the FSM consists of the four states of Kosrae, Pohnpei, Chuuk and Yap. With an Exclusive Economic Zone that extends from approximately 1 degree S to 14 degrees N latitude and 135 to 166 degrees E longitude, this nation of small islands extends over an area of approximately 2,978,000 sq. km. The total land area of the FSM is only 4,840 square km. There are 30 high islands, one raised coral island and 33 atolls whose individual islets bring the total number of islands to over 600 (see map on page 23). These islands range from islets barely above sea level to the high island of Pohnpei which reaches 791 meters above sea level (Gawel 1993). The total population recorded in the 1994 census was 105,506, with a distribution of 50.5% in Chuuk State, 32% in Pohnpei State, 10.5% in Yap State and 7% in Kosrae State.

The per capita GDP for the FSM in 1996 is \$1,835. This is in an economy that has subsistence farming, wholesale and retail and government services as its main activities. Government services dominate the economy at 43% of GDP with expenditures totaling \$173 million in FY91. This is supported mainly by the Compact of Free Association with the United States. Some of the financial provisions of the Compact will expire in 2001 but is also being renegotiated.

The climate is tropical marine with daily temperatures ranging from about 24⁰ C (mid 70's F) to 29⁰C (mid 80's F) with little average variation throughout the year. Rainfall ranges from 304cm (120 inches) per year for drier islands, and over 1,016 cm (400 inches) per year in the mountains of Pohnpei. Humidity averages over 80 per cent. Northeast trade winds prevail from about November to May when conditions may be drier on western islands of the FSM. The region is affected by storms and typhoons which are generally more severe in the western islands, and by periods of drought and excessive rainfall associated with the "El Nino" (ENSO) phenomena. In recent times, the droughts of 1982-1983 and 1997-1998 were especially severe.

Ownership of land and marine areas varies between States. In Kosrae and Pohnpei, land is both privately and state owned, while marine areas are owned by the State. In Chuuk most land and marine areas are privately owned and acquired through inheritance, gift or, recently, by purchase. In Yap almost all land and marine areas are owned or managed by individual estates and usage is subject to traditional control of heads of estates or in some areas, is restricted to residents of a particular village or municipality and those who have been granted permission to utilize the area in a particular way, sometimes to harvest only particular species. In all states, land cannot be sold to non-citizens of the FSM. These land and marine ownership patterns greatly influence the establishment of conservation areas discussed later in this report.

The Marine Environment

The major coastal marine communities are mangrove forests, sea grass beds, lagoons and coral reefs. These ecosystems are linked physically and biologically: reefs serve as breakwaters that allow coastal mangroves to develop; the calcium carbonate of the reef provides the sand and sediment in which mangroves and sea grasses grow; and the mangroves and sea grass communities settle silts from the land and provide nutrient inputs into the coastal ecosystem and serve as spawning, rearing, and foraging habitat for the many species associated with the reefs. It is known that the FSM has approximately 300 species of corals, 1,000 species of fish and 1,200 species of mollusks. Other marine groups are not as well documented and further studies are needed to collect such data.

Mangrove forests provide rich nurseries for many species of shrimps, lobsters and fishes. They also provide a home for birds which feed on fishes, crabs and other prey. Mangroves protect coasts from erosion and serve as a filter/buffer on the effects of runoff sedimentation and pollution. They also serve as a source of building materials, fuel wood and craft wood.

Seagrass beds are an important habitat lying seaward of mangrove forests. Their roots help to stabilize sediments and their leaves provide shelter and food to many organisms as well as a source of detritus which becomes an important food source for life of the coral reefs. Seagrass beds also serve to moderate currents and as a nursery ground for some invertebrates and fish.

Lagoons are important for they provide the primary source of food for the inhabitants of the coral reefs. They are the home of many kinds of large plankton blooms. Baitfish feed on the plankton

and the larger carnivores in turn feed on the baitfishes.

All major types of coral reefs are found within the FSM including barrier reefs, fringing reefs, atolls and submerged reefs. Common reef habitats in the FSM include lagoon reefs (pinnacle, patch), passes, channels, shallow reef flats, terraces, submerged reefs, slopes, reef holes, embayments, quasi estuaries, seagrass beds, mangroves, mud and sand flats. Climatic conditions, especially on the larger volcanic islands produce high yearly rainfall which provides additional freshwater and nutrients to the adjacent reef system. These terrestrial inputs increase reef habitats and reef biodiversity within these islands. Coral reef biodiversity and complexity is high within the reefs of the FSM and this diversity increases notably from east to west within the region. Using stony corals as an example, approximately 150 species are known from Kosrae, 200 from Pohnpei, and 300 from Chuuk. Reef biodiversity is highest in the Indo-Western Pacific, which is also thought to have the world's highest overall marine biodiversity. Over half the world's coral reefs are located within this region of which the FSM is part.

Coral reefs are noted for some of the highest levels of gross productivity on earth. The net productivity of coral reefs is approximately 2,500 grams of carbon per square meter per year, compared to 2,200 grams of carbon per square meter per year for tropical forests and only 125 grams of carbon per square meter per year in the open ocean. Coral polyps -- the thin layer covering reef structures -- provide much of the energy that fuels these communities. These tiny animals contain algae which convert sunlight to fuel, obtaining nutrients from the polyp wastes. Reef-building corals and certain calcareous algae, which may constitute more than half of a coral reef's stony substance, lay down a foundation of calcium carbonate. Over generations this accumulation results in often massive structures, providing homes and hiding places for countless other creatures. Coral reefs are the net result of thousands of years of growth. As such, many are among the earth's oldest living communities.

The oceanic waters of the FSM also contain a diversity of environments from the productive pelagic surface waters to the benthic environment of some of the deepest waters on the planet. Due to these extremes of environment and their very different accessibility, there is a large difference in the amount known of the environments within the ocean waters. The pelagic oceanic waters produce a very rich pelagic fishery, exploitation of which currently is the FSM's most valuable economic resource. As a result there exists considerable information of the biological diversity of this environ, however the benthic environ is poorly known. There has been little consideration of the deeper water biota and hence it is also not so well documented.

The Terrestrial Environment

The terrestrial environment stretches from high tide level to the tops of the highest mountain. It includes a considerable range of vegetation types, including the following types arranged roughly from mountainous island interiors out to coastal mangroves or sandy beaches: Cloud forest, upland forest, palm forest, plantation forest, agroforest, areas dominated by Merremia vines,

savannas, native secondary forest, thickets of introduced trees, cultivated areas, freshwater marsh, swamp forest, Nypa swamp, mangroves, atoll forest, forest of rocky coasts and beach strand.

Basic vegetation types that could be readily discerned on 1:10,000 black and white aerial photographs taken in 1974 - 1976 have been mapped for the high islands of the FSM (Whitesell et al 1986, MacLean et al 1987, Falanruw et al 1987a&b). Types that were under 1 hectare in area or difficult to discern using photo interpretation were not included. The distribution of major types based on this data is given in Table 1.

Table 1. General vegetation types of FSM high islands (in hectares) (adapted from Whitesell et al 1986, MacLean et al 1987, Falanruw et al 1987a&b)

	Kosrae 1983	Pohnpei 1983	Chuuk* 1976	Yap 1976
Mangrove	1,562	5,525	306	1,171
Swamp Forest	345	214		155
Upland Forest	5090	12,548	677	2,556
Palm Forest		1,383		
Agroforest ***	2,585	11,865	2,378	2,538
Secondary vegetation	1,272	1,843	252	553
Grasslands		1,476	174	2,175
Marsh		149	234	165
Other nonforest **	263	490	149	403
Total Area	11,186	35,493	4,170	9,716

* In Chuuk State, only the islands of Moen, Dublon, Fefan & Eten were included in the survey

** Other = inland water, urban, nonforest and types totaling less than 100 hectares in area

*** includes coconut plantations

Additional work is needed to discern important types of native vegetation such as the cloud covered moss forests of the mountains of Pohnpei and Kosrae, and to identify forest types within the broad category of “upland forest”. The forests of the eastern states of the FSM are more characteristic of rainforests, having abundant rainfall throughout the year, while the forests of Yap are adapted to a monsoon climate with frequent periods of drought. There is a gradient in the species composition of native forests of the FSM with the forests of Kosrae and Pohnpei having a greater abundance of ferns and fewer species of native trees species than the forests of Yap. There is also an increase in the number of species of basic mangrove trees going from the eastern to western ends of the FSM.

The nature of the “agroforest” category differs from island to island. In Pohnpei it depicts areas from early to late stages of shifting agriculture, as well as settled homesteads. In Chuuk the type consists largely of coconut/ breadfruit ‘tree gardens’ on sloping land. In Yap the type represents long established tree garden/ taro patch systems involving landscape architecture to manage water flow through the system. The nature of savannas also differs from east to west. In Pohnpei and Kosrae these open areas are generally indicative of disturbance and are filled largely with Ischaemum grass or Gleichenia ferns. The savannas of Yap are much older and some contain a more diverse and characteristic set of savanna species including some endemics.

Status of Biodiversity

Knowledge of the flora and fauna of the FSM is not complete. The following account is based on readily available literature and reports from participants in the First National Biodiversity Strategy and Action Plan Workshop.

Plants

There are over 1239 species of ferns and flowering plants in the FSM. Approximately 782 species are native, including about 145 native species of ferns, 267 native species of monocots, and 370 native species of dicots reported in the checklists of Fosberg et al, 1979, 1982 and 1987. The number of endemic species (species found only on one or a few places in the world) is considerable, but an authoritative listing of the species, subspecies and varieties found only on one or more islands of the FSM and nowhere else in the world has not been made. The report for Pohnpei State, the only island for which there is a published flora and significant subsequent work, gives some 750 species of plants of which 110 are endemic. Over 457 species have been introduced to the islands of the FSM by the first Micronesians and subsequent visitors and settlers. The introduced species include a set of food plants and plants useful for other purposes that were brought by early Micronesians. Selection over the thousands of years that Micronesians have inhabited the FSM has resulted in a rich diversity of cultivars of a number of these species. This heritage of cultivars has not been well documented. More recent introductions include cultivated species such as food plants and ornamentals which require people’s care, species which have naturalized and live and reproduce without people’s care, weeds, and a growing number of invasive species that spread out of human or natural control and are a threat to native species. Approximate numbers of native and introduced species in the four states of the FSM are shown in Table 2 which is based on the checklists of Fosberg et al 1979-1987. The numbers of introduced species has increased since the compilation of this checklist.

Table 2. Approximate numbers of native and introduced species of plants in states of the FSM.
Data derived from Fosberg et al, 1979, 1982, 1987.

Island	Ferns		Monocots		Dicots		Totals	
	Native	Introd.	Native	Introd.	Native	Introd.	Native	Introd.
Yap	45	2	144	64	187	176	376	242
Chuuk	45	3	95	61	158	108	298	172
Pohnpei	106	4	138	90	194	197	438	291
Kosrae	74	0	121	51	121	51	250	72

Animals

The only native mammals are approximately five species and subspecies of fruit bats of the genus Pteropus and a sheath-tailed bat of the genus Emballonura. Taxonomic studies of the fruit bats are not complete, and it is possible that all may be endemic species and subspecies. The Pteropus fruit bats (or flying foxes) are considered to be keystone species essential to the long-term survival of forests as they serve to pollinate and disperse seeds of forest species. Other mammals that have been introduced include at least 3 rats: the ‘Polynesian’ rat, Rattus exulans, the roof rat, R. rattus, and the Norway rat, R. norvegicus; mice Mus musculus, dogs, cats, pigs, goats, a few cattle which have not generally persisted, and on Pohnpei, the introduced Philippine deer Cervus mariannus (Wiles et al. 1999.)

Studies of marine mammals in the FSM have not been carried out or were not available, but it is known that there are a number of species of whales and dolphins within the FSM and a dugong Dugong dugong was killed in Yap about a generation ago. The endangered species act of the Trust Territory of the Pacific Islands that has been carried over to the FSM lists the Dugong, Blue whale Balaenoptera musculus and Sperm whale Physeter catodon as endangered species.

Some 119 species of birds have been reported in the FSM. These include 31 resident seabirds, 33 migratory shorebirds, 19 migratory land or wetland birds and 5 vagrant species (Engbring et al. 1990). Each State of the FSM has one or more endemic birds. They include the Dusky White-eye of Kosrae and Pohnpei, The Pohnpei Lory, the Pohnpei Greater White-eye, The Pohnpei Flycatcher, The Pohnpei Mountain Starling, the Pohnpei and Chuuk ground dove, the Truk greater white-eye the Oceanic flycatcher, the Yap Monarch and the Yap Greater white-eye.

Table 3. Categories of birds recorded from the four states of the FSM (after Engbring et al. 1990)

State	Native land and wetland residents	Resident seabirds	Non-resident seabirds	Shorebirds, migrants and vagrants	Introduced birds	Totals
Kosrae	10	5	9	16	2	42
Pohnpei	20	11	8	20	3	62
Chuuk	17	11	10	33	2	73
Yap	13	6	12	50	3	84

A number of Micronesia's birds are declining in numbers and becoming rare. Buden (2000) reports a reduction in total birds per observation stations for 18 native resident land birds ranging from 67.4 - 78% in each of 6 major elevation zones. Three species from the FSM are included in the U.S. Endangered species list: the nightingale reed warbler (Chuuk, and Woleai, and Lamotrek atolls in Yap state and Pohnpei), the Pohnpei Greater White-eye endemic to Pohnpei, and the Pohnpei mountain starling. Candidate endangered species include the resident race of Short-eared owl on Pohnpei, the Truk Monarch, the Truk Greater White-eye and the Truk subspecies of the Micronesian pigeon. The Pohnpei mountain starling is on the verge of extinction (Engbring et al. 1990, Buden 1996). Several other species are recently extinct including the Kosrae rail and Kosrae mountain starling.

There is one introduced amphibian and over 22 species of reptiles in the FSM, most of which are native. At least 2 endemic species are known: an endemic gecko, Perochirus scutellatus, found in abundance on Kapingamarangi atoll but elsewhere only from a single specimen collected on another FSM atoll of Ulithi; and an endemic skink, Emoia ponapea, found only on Pohnpei. A number of new, and probable endemic species are likely to be described.

Threats to Biodiversity

At one time Micronesians were almost completely dependent on the natural resources of islands for their lives. As human populations grew, so did their impact on natural resources. Species have been lost and ecosystems damaged by the dense populations of the FSM's past. At the same time, the people of the FSM have adapted to living with limited island ecosystems. Micronesian cultures incorporate practices having conservation value and thus served to buffer people's impact on the environment. The cultural and technological adaptations to living with island ecosystems are an important heritage of the past and asset for the future.

Today the population of the FSM is growing rapidly, and patterns of resource use are changing. New technologies enable people to have a much greater impact on the natural environment, and

commercial markets encourage greater exploitation of natural resources. Infrastructure developments such as roads and unsustainable agricultural practices have led to deforestation. For example, on Pohnpei island the reduction in the area of native upland forest from 42% of the total vegetation cover in 1975 to but 15% in 1995 is attributed largely to clearing to plant sakau (kava or Piper methysticum). The availability of off-island markets has resulted in unsustainable exploitation of resources. Examples include the unsustainable harvest of fruit bats from Yap to Guam and the unsustainable boom in the export of mangrove crabs when airstrips were completed in Pohnpei and Kosrae. The commercial demand for reef fish has “put cash in the driver’s seat” and resulted in the decline of traditional controls over access to this resource. Stocks of inshore reef fish have declined in all state centers. The availability of a cash market has also encouraged destructive fishing methods such as the use of dynamite and chlorine products.

Another set of threats to biodiversity results from loosely controlled use of powerful technology in activities such as earth moving, dredging and sand mining. These activities result in changes in drainage patterns, destruction of natural habitat, filling of wetlands and erosion and siltation, that threaten ecological processes. There is a growing problem of pollutants including solid waste, sewage and nutrient discharges, oil spills, asphaltic oils, PCBs, chlorine, pesticides, herbicides, fertilizers. Greenhouse gases, ammonia and other cleaning chemicals. Other threats also include deteriorating explosives and chemicals from sunken ships, lead contamination, ship groundings, commercial ship discharges such as oil, sewage and offal from fishing vessels.

Increased travel and transport has decreased island insularity and brought new pests and invasive species, diseases, spills or leakage of oil and hazardous substances from ships transiting through FSM waters, threats from toxic materials and nuclear accidents and new concerns such as impacts of genetically altered organisms. There are increasing issues of access such as bio-prospecting, intellectual property rights, and fair sharing of benefits from the use of island resources.

Global climate change and climate extremes are of special concern to the FSM. The severe ENSO events of 1982-1983 and 1997-1998 brought increased impacts from storms and severe periods of drought followed, in some islands by excessive rainfall. Groundwater sources were taxed, agricultural systems were damaged and problems of wildfires and invasive species were greatly aggravated. Periods of especially low tides and warm inshore water damaged inshore marine resources. Then the especially high seas that followed, resulted in salinization of many taro patches and some fresh water sources. Coastal erosion is also becoming more evident. The islands’ biodiversity also face natural disasters such as typhoons and storm surges which occur periodically in the islands.

Legislation and Institutional Framework

Because of the government structure of the FSM federation with a National Government and four semi-autonomous State governments, each of the four States have their own constitutions along with the FSM constitution. This structure makes it a prerogative of each State to enact their own legislation in line with their powers as mentioned in the FSM Constitution to address the threats to or conserve biodiversity. At the state level there are also municipal ordinances and traditional precedents but these are not included as part of this preliminary report.

The source of the National Government's authority to regulate is the FSM Constitution. The Constitution clarifies the National and State Governments' roles in implementing the FSM's obligations under the Convention on Biological Diversity. The FSM Constitution explains that a power that is expressly delegated to the national government, or a power that is of such an "indisputably national character as to be beyond the power of a state to control", is a national power." However, a power that is not expressly delegated to the national government or prohibited to the states, is a state power. The FSM Constitution also sets out powers that are expressly delegated to the FSM Congress. There are many powers listed, but the important ones for purposes of this report include the power to ratify treaties, the power to regulate foreign and interstate commerce, the power to regulate navigation and shipping, except within lagoons, lakes, and rivers, the authority to regulate the ownership, exploration, and exploitation of natural resources within the marine space of the FSM beyond 12 miles from island baselines, and the authority to promote health by setting minimum standards, coordinating state activities relating to foreign assistance and providing training and assistance to the states.

Responsibility for environmental issues is shared between the FSM National Government and the individual FSM States. This sharing of responsibility has at times resulted in legislation that appears duplicative at the State and National levels. It has also resulted in gaps in legislation and areas in which the location of responsibility between the State and National Governments has been less than clear.

The State and National Attorneys General at one time formulated a tentative Joint Opinion regarding State and National jurisdiction over certain environmental issues. This Opinion, though not signed, concludes that the protection of ecosystems, such as reefs and mangrove swamps, is the responsibility of the States; agriculture, forestry and watershed protection in general are regulated by the States, although the National Government has regulatory authority if any aspect of these areas has a clear effect on foreign or interstate commerce or concerns the public health.

In essence, that opinion recognized that the primary responsibility for land management, natural resource management and development planning rests with the four individual States of the FSM. The States take the lead role in ensuring that development is avoided in vulnerable areas and ensuring that critical natural systems are protected. Most of the States have made efforts to

control development and manage natural resources through the creation of land use plans, coastal zone plans, legislation and regulations. The National Government provides guidance and technical assistance to the state, when needed and requested, on matters related to planning, economic development, natural resources, fisheries, and the environment.

Because the FSM was a UN Trust Territory previous to becoming independent, the FSM Constitution provides that a statute of the Trust Territory continues in effect except to the extent it is inconsistent with the FSM Constitution or is amended or repealed. When the first official codification of the laws of the FSM was completed in 1982, the preface to the Code acknowledged that the Code included many laws that were arguably within the exclusive jurisdiction of the states. The committee reviewing the Code determined that such questions would be better answered by time, court decisions and congressional action. Time, court cases and congressional action have in fact clarified the role of some of these provisions.

Some states have adopted legislation to incorporate these provisions as part of state law. Other states have chosen to directly apply these carryover provisions as they now appear in the FSM Code and in related carryover regulations. Table 4, to a limited extent, reviews the issues addressed by existing national and state legislation.

Table 4. Items addressed by legislation and regulations in the FSM. (Source: Presentations at 1st FSM NBSAP Workshop)

	National	Yap	Chuuk	Pohnpei	Kosrae
Marine	<ul style="list-style-type: none"> - Destructive fishing practices (explosives, poisons, chemicals) - hawksbill, green and sea turtles, trochus, black-lip mother of pearls oyster shells, artificially planted sponges. - Marine mammals (porpoises, whales, seals, dugongs) - Endangered species: blue whale, sperm whale, hawksbill & leatherback turtles 	<ul style="list-style-type: none"> - Use of explosives, poisons, chemicals and other substances - Mesh sizes for nets - Reef and environmental damage (oil spills, shipwrecks) - Trochus, turtle meat and eggs and clam meat, pearl shell - Foreign fishing licenses 	<ul style="list-style-type: none"> - Establish entities to promote, develop, support commercial use - and to regulate exploitation - National legislation may be used by State 	<ul style="list-style-type: none"> - Use of explosives, chemicals, poisons and other substances to harvest freshwater shrimps - mangrove crabs, lobsters, trochus, black coral, bumphead parrotfish, groupers, mangrove crabs, Baitfish. - Foreign fishing vessels - Marine water quality and dredging/mining 	<ul style="list-style-type: none"> - Use of explosives electrical charges, poisons, chemicals, other substances - no procurement on Sundays - hawksbill turtle, sea turtle or eggs, Black lip mother of pearl oysters, trochus, lobsters, live fish, mangrove crabs, sea cucumbers, clams and clam sanctuary and endangered Species - Fishing gears and stowing or storage and Driftnets - Foreign vessels and Transshipment - Reef damage by dredging, grounding, removals - Contamination of marine waters
Terrestrial	<ul style="list-style-type: none"> -Endangered species: Truk Micronesian pigeon, nightingale reed-warbler, Truk great white-eye, Pohnpei mountain starling, Truk palm and Truk poison tree 	<ul style="list-style-type: none"> - Establish extension agents - Penning of animals and tagging of dogs. - Wild pigeon, coconut crabs, fruit bats - Wildfires - Pesticide regulations 	<ul style="list-style-type: none"> - Earthmoving regulations - Pesticides 	<ul style="list-style-type: none"> - Coconut crabs - Designation of State Bird (Pohnpei lory) - Forest (timber, water, wildlife and forage), Watershed forests and mangroves -Subsidies for Copra, pepper and rice 	<ul style="list-style-type: none"> - Psittacine birds importation - State Bird designation - Pigeons
Environmental Quality	<ul style="list-style-type: none"> - Pollutants discharge - Environmental impact - Earthmoving - Quarantine control - Historical sites and antiquities (research permitting process) - Copyrights, trademark and patents 	<ul style="list-style-type: none"> - Control pollution, oil spills, solid waste, sewage - Environmental impact studies - Earthmoving and sedimentation control -Damage to coral reef - Building permit process - Preservation of culture 	<ul style="list-style-type: none"> - National pollution laws and earthmoving regulations may apply - Environmental Impact Assessment, Waste management, water quality. 	<ul style="list-style-type: none"> - Air pollution, pesticides, water quality, solid waste, sewage, - Earthmoving controls - Environmental impact assessments - Groundwater 	<ul style="list-style-type: none"> - Pollution, Water quality, littering, sewage - Development Review Process and landfill - Antiquities and traditional culture

Institutional Structure

The Institutional structure for implementing activities in line with the Convention on Biological Diversity in the FSM and for implementing activities supporting legislation and regulations outlined previously, is complex at both the National government level as well as within each of the four States of the FSM. The primary agencies, committees, and NGOs are tabled below. Other agencies and NGOs not listed are also involved but to a lesser degree. The Committees and Council are established primarily to improve coordination and ensure integration across sectors. Most of these committees and councils have cross-sectoral representation. It should be noted that most of the government agencies tasked with resource conservation are also the same ones with the mandate of exploiting the same resources which they are tasked to conserve. The four States implement projects and programs and are supported by the national level. This structure is outlined in Table 5.

Table 5: National and State government agencies, committees and NGOs involved in biodiversity conservation.

	National Level	Yap State	Chuuk State	Pohnpei State	Kosrae State
Council and Committees	The President's Environmental Management and Sustainable Development Council	Environmental Stewardship Committee		Resource Management Committee	Resource Management Committees
Terrestrial Biodiversity	Department of Economic Affairs	Department of Resources and Development, Division of Agriculture and Forestry	Department of Agriculture	- Department of Land and Natural Resources - Bureau of Economic Affairs	- Development Review Commission - Department of Land, Agriculture & Fisheries
Marine Biodiversity	Department of Economic Affairs	Department of Resources and Development, Marine Resources Management Division	Department of Marine Resources	- Department of Land & Natural Resources - Bureau of Economic Affairs	- Development Review Commission - Department of Land, Agriculture & Fisheries
Environmental Quality	Department of Health, Education and Social Affairs	Environmental Protection Agency	Environmental Protection Agency	Environmental Protection Agency	- Development Review Commission
Non-government	- Micronesian Island Conservation - College of Micronesia - USDA NRC Office	- Yap Community Action Program - Yap Institute of Natural Sciences		- The Nature Conservancy - Conservation Society of Pohnpei	

Trends in Natural Resource Management

Operating within constraints common to a small developing country, the FSM has activities currently being implemented by government and non-government organizations and institutions. These include projects to raise awareness of biodiversity issues such as bird conservation, reseedling or replanting projects, establishment of plant nurseries or aquaculture farms, improvement of the quarantine system, setting up of mooring buoys, coral reef monitoring and monitoring of commercial species such as Trochus and sea cucumbers (beche de mer), setting up of geographic information systems, establishment of conservation or protected areas and others.

A number of trends in natural resource management can be discerned from the activities in the FSM. Public awareness and capacity building are gaining importance and are seen as critical factors for successful efforts to conserve or protect biodiversity. There are more training opportunities available to resource managers, especially for those at the community level and also an increase in public awareness activities on the importance of biodiversity. The efforts for biodiversity conservation in the past were more focused on commercially viable resources and very species-focused whereas a trend is emerging where efforts are more integrated in nature, focusing on an ecosystem approach rather than on specific species. It is recognized that because of the small size of the islands, any management effort must treat islands as one system, or for example, as a coastal zone.

The need for coordination of resource management efforts between the National Government and national-level organizations and state governments is recognized and is beginning to be addressed through activities such the FSM National and States Economic Summits and other meetings like the FSM Coastal Fisheries Consortium (FSM2000).

Non-Governmental organizations (NGOs) focused on conservation and environmental protection are present or emerging in most states and there is a trend toward integration of efforts of these groups with traditional leadership and government agencies dealing with natural resources. A regional consortium of marine and coastal scientists and managers, known as the Marine Resources Pacific Consortium (MAREPAC) has been formed to enhance local capacity and management activities.

Two foci for protecting natural resources are developing: protected areas and sanctuaries, and the concept of traditional or community management of these areas. The FSM NEMS points out that most modern reserve systems are based on a concept of protected areas as “a system which safeguards cultural and other values, while at the same time providing a high level of security for the protection of habitat, plant, animal, cultural and/or spiritual attribute(s)” (NEMS 1993: 48). The Second FSM Economic Summit (1999) further recommended that States be encouraged “to establish and support a system of conservation areas where special measures are taken to conserve biological diversity” (FSM 1999:100) A matrix of strategies, programs and activities and agencies and groups responsible for them was developed at the Second FSM Economic Summit.

There are at least 16 formally protected areas in the FSM. Together they comprise an area of 702 sq. km with a protected land area of 106.3 sq. km. This makes 15% of land protected (SPREP 1999). Protected areas in each state of the FSM include: for Kosrae: Trochus sanctuary, Utwe - Walung Marine Park, and Ringe Te Suh, Maskelynes Islands; for Pohnpei: Trochus sanctuary, Nan Madol, Minto Reef, Nemwen Na, Nemwen Nangih, Oroluk Sanctuary, Kephera (Black Coral) Sanctuary, Enipen Marine Park, Pwudoi Sanctuary in Pohnpei, and watersheds included in the Pohnpei Watershed Management Project; for Chuuk, Trochus sanctuary, the Chuuk State Lagoon, the Chuuk State Underwater Monument and the Chuuk Giant Clam Farm; for Yap, Trochus sanctuary and the zone of traditionally managed marine areas.

There is also a distinct emerging trend of community or village level participation in all aspects of resource management. The eastern States of Pohnpei and Kosrae, which have considerable area of state-owned terrestrial and marine resources, have led the nation in establishing formal protected areas with the full participation of communities. These efforts are viewed as successful due to this participation. Initial support for management activities in these areas was provided through the South Pacific Regional Environment Program (SPREP), and efforts are currently underway to identify sustainable financing mechanisms for continued management.

Prospects for creating similar protected areas in the western States of Chuuk and Yap are complicated by land and sea tenure issues. In these States, the government does not own the resources that need to be protected, so cannot designate protected areas. At the same time however, the existence of traditional controls may make it possible to revitalize and where necessary, revise and strengthen traditional management systems into especially cost effective and sustainable systems of resource stewardship.

Whether it is for the management of government designated protective areas or islands where traditional management is enhanced with conservation science, the community must be involved in management of protected areas. While scientists are gathering data that may someday be useful in managing resources, resources cannot be managed unless there is some way to influence the activities of the people who use these resources. It appears that the precedent and remnants of traditional management systems in the FSM could be combined with modern conservation (wise use) science into an especially effective system of resource management.

Efforts to involve the community in natural resource management include the participatory rural appraisal component of Pohnpei's watershed program, a "grow low" campaign to encourage sakau (kava) producers to grow lowland sakau and thus spare forested uplands, community visioning, community awareness of the marine environment, training of community conservation officers, identification of spawning aggregation sites for groupers and community environmental awareness through the youth to youth program in Pohnpei. The State of Kosrae has developed a Kosrae Island Resource Management Program with both government participation and participation from all segments of the public including youth and senior citizens, municipal leaders and church leaders. In Yap, an Environmental Stewardship Committee has been formed by the council of Chiefs to work cooperatively with the state government and private sector to

develop an integrated program involving Yap's communities. As with efforts underway in other states, there is need for a full spectrum of support, from government commitment to principles of sustainable resource use, to financial and technical support to build community capacity in environmental stewardship.

Constraints to Natural Resource Management

Although the people of the FSM are taking measures to address the numerous threats to the fragile and vulnerable islands, there are constraints that continue to make biodiversity conservation an even greater challenge to the small nation. As a developing nation struggling to be a part of the global community, the FSM is continually faced with the question of sustained financial resources to support resource management efforts. The lack of sufficient and sustainable funding leads to other constraints relating to information availability, human resources, institutional capacity and coordination.

The limited information on the biodiversity of the FSM is widely dispersed with very little being available within the FSM. There is also no authoritative listing of endemic species and the list of endangered species has not been updated since it was originally written during the former TTPI administration. There is almost no monitoring of the condition of natural resources. Only in Pohnpei has there been a survey to note changes in vegetation since 1976. Coral reef monitoring is carried out but with very limited resources. Urbanization removes people from day to day contact with natural resources so that there is no longer a feedback system between people and their environment that could alert people to problems. Research is very limited and if undertaken, is often not for the benefit of the islands. Without sufficient and useful information on the resources, decision-making often does not address the root causes of our problems and often addresses short term rather than long-term objectives. The public continues to require awareness-raising of the issues and especially of the impact of their activities on biodiversity.

The dispersed nature of the FSM population makes it difficult to have sufficient human resources in the environmental management sector with a few resource managers having to oversee a large geographical area. Some offices have barely enough manpower to fulfill their mandates. Not only is the number lacking but the existing personnel are usually in need of training to improve their skills to effectively carry out their tasks. This leads to the lack of or ineffective enforcement of regulations and implementation of plans.

The system to address biodiversity issues is insufficient. For example, there is a lack of management plans for sustainable development. The government structure also does not adequately provide for effective coordination between national and state governments, traditional leadership and communities; and between scientific researchers, resource management agencies and resource owners and stewards. Land tenure systems also complicate the establishment of protected areas and sanctuaries. Legislation and regulations though enacted or adopted to enable effective enforcement are difficult to enforce, are duplicative, or, in some places, non-existent.

All these constraints need to be continually addressed to effectively tackle the threats to the nations biodiversity.

Strategies and Actions for a NBSAP

In order to meet the objectives of the CBD by addressing the threats and constraints identified, the following strategies and actions have been suggested primarily at the recent NBSAP workshop and are categorized into four broad strategies:

- 1) Enhance in-country awareness, coordination and technical capacity to protect biodiversity;
- 2) Inventory and monitor biodiversity;
- 3) Prioritize and mitigate key threats to biodiversity; and
- 4) Develop and promote sustainable alternative livelihoods.

This broad outline will be used to guide meetings in the communities within all the four States, the results of which will be used in developing state and national biodiversity strategies and action plans.

1. Enhance in-country awareness, coordination and technical capacity to protect biodiversity

The NBSAP Project is in a good position to be a focal point for sharing information and coordinating efforts at local and national levels. The Project can strengthen or develop partnerships between national and state agencies, traditional leadership, NGOs, Community-based Organizations (CBOs), the private sector, churches, communities and stewards of natural resources in the FSM. The resulting network would support the development of state and national BSAP's and their implementation on a continuing basis.

An effective network requires coordination especially between levels of government and between governments. The National Government could improve coordination with states by reviewing the institutional structure supporting biodiversity efforts in the states and providing sources of funding for state biodiversity efforts. Activities relating to the Biodiversity Convention will be linked with those relating to the Convention on Climate Change and other relevant conventions, especially to improve dissemination of information. Coordination between agencies implementing related Conventions to which FSM is a Party is required.

The linkages between scientific experts and local management agencies are needed in order to assure a flow of information, ensure technology transfer and to encourage relevant research. To undertake research in the FSM, a permit process should be developed to track research in the natural sciences and to ensure local capacity building in the process by using local counterparts. Biodiversity education should be incorporated into the formal and informal educational system,

and leaders need to be kept informed of biodiversity issues and provided with relevant data for effective decision-making. Students should be encouraged to major in fields relating to natural resource management and sources of scholarships for appropriate degree programs and relevant training opportunities should be identified. Progress of students who are currently pursuing degrees in relevant fields must be monitored and they should be encouraged to participate in natural resource programs during and upon completion of their studies.

The NBSAP Project is initiating involvement of local expertise in projects by linkages with existing programs and involving local institutions such as the College of Micronesia, the only college in the FSM. A list of FSM expertise in fields relevant to biodiversity conservation should be compiled for this project and future programs. Services of the myriad outside agencies available to assist with natural resource management should be reviewed and the most relevant institutions asked to help develop local capacity and meet local needs. Capacity development needs to extend beyond government and into the NGOs and particularly into communities.

All these efforts require sustainable sources of funds. In addition to conventional sources, new sources will need to be identified and accessed to support alternative methods of doing things. One alternative mechanism for sustained funding is the development of a conservation trust fund.

2. Inventory and monitor biodiversity

A program to survey the biodiversity of the FSM will be initiated by the NBSAP with an emphasis on the inventory and monitoring of endemic and endangered species as a priority in biodiversity conservation. Initial literature surveys will support the development of state and national BSAPs and thorough literature surveys and group reviews will follow as part of the BSAP program. A set of relevant materials will be made available for public use at institutions such as Micronesian Seminar and the COM-FSM libraries and relevant state institutions. The College of Micronesia-FSM is encouraged to become involved with this inventory of the FSM's biodiversity so as to sustain activities initiated by the NBSAP Project. To inventory past research and experts working in the FSM, a roster of expertise on taxonomic groups as well as ecosystem types will be developed drawing on literature, contacts and records of research permits processed through the Historical Preservation Office. The NBSAP process will identify and assist State local naturalists to become area specialists to work with and learn from visiting researchers.

Integration of the FSM inventory and monitoring efforts with regional and international efforts such as the Coral Reef Monitoring program and programs to monitor endangered and threatened species is necessary. There is also considerable amount of information resources with relevant regional bodies having been formed to manage and study oceanic resources. These include the Forum Fisheries Agency and The Offshore Fisheries Programme of the Secretariat of the Pacific Community. These programs to inventory and analyze results to identify rare, threatened, endangered and keystone species, habitats, and processes should be conducted by local experts wherever possible and with outside expertise only when necessary. Anytime outside experts are

used, a local counterpart must be involved. The information gathered should then be organized in a database wherein all the States can update the information through databases to be developed within each state and updated through ongoing monitoring programs to continuously understand the status of biodiversity and intensity of threats.

While a large array of outside agencies is in existence to assist with “sustainable development” and “capacity building” through consultancies, the FSM is short on people to make use of such services. The need for financial support, scholarships and other assistance to develop professional staff, and positions for professional staff to address biodiversity issues is clear. It is also clear that vital action must take place at the village level. With limited resources, the FSM must somehow transform biodiversity concerns from being the work of small government offices into community concerns and appropriate actions at the village level. We look forward to state-level consultancies to contribute to this end.

3. Prioritize and mitigate key threats to biodiversity

The numerous threats need to be addressed despite the limited human and institutional capacity of the FSM. Some of the actions necessary to address the threats involve process and participation. A coordinated development review process including environmental impact assessments is needed in each state where the process is lacking. Public participation in such processes is required if it is to be effective. Development of local capacity to conduct environmental impact assessments through teams of local expertise complemented with outside expertise is necessary. National and state standards be reviewed and gaps filled so that there are at least minimal standards throughout the FSM to provide for checks and balances between national and state coverage.

To directly address the threats, information on the balance between resources and population need to be linked with family planning programs. To ensure that resources are not exploited in an unsustainable manner, exportation of resources must not exceed levels necessary to maintain the resource base to “feed ourselves first.” To assist communities in preparing for weather extremes, the Climate Change Coordinator will obtain updates on developing ENSO events and develop a chain of communication to disseminate this information to states and communities. To help in setting priorities in combating invasive species, existing lists of invasive species should be reviewed and a ranking system developed to prioritize those that represent the most serious threats. Communities will need to collaborate rapidly to respond to outbreaks. An example could be the formation of rapid response teams. Actions must be integrated to address effects of development activities and to change attitudes to ensure sustained and effective conservation of biodiversity.

4. Develop and promote sustainable alternative livelihoods

In order to ensure conservation and sustainable use of biodiversity, there is a need to explore other alternatives to conventional methods to exploit natural resources and alternative ways to

manage them. A system of protected areas, sanctuaries and periodic closures will be necessary to approach this in an integrated fashion. Land, coastal areas and reef management will be integrated. Biodiversity conservation needs to be integrated with planning for economic development so that economic development is ecologically sound and the private sector will be encouraged to develop ecologically sound enterprises. Appropriate traditional management practices will be integrated with modern conservation science to ensure that the communities maintain practices that have been effective over years of experience and that measures supported by modern science are available to deal with the emerging issues related to the modern lifestyles being adopted.

The international community should recognize that these alternatives, which integrate traditional systems, could be as effective if not more effective, than the usual internationally recognized methods of resource management. Then, for example, traditional systems for protecting areas would be included in IUCN criteria for protected areas.

These models of sustainable use and natural resource management can be the FSM's gift to the global community and to future generations.

References

- Buden, D.W. 1996. Rediscovery of the Pohnpei Mountain Starling (*Aplonis pelzelni*). *The Auk* 113(1):229-230.
- Buden, D.W. 2000. A comparison of 1983 and 1994 bird surveys of Pohnpei, Federated States of Micronesia. *Wilson Bull.* 112(3):403-410.
- Engbring J., F.L. Ramsey and V.J. Wildman 1990. Micronesian forest bird surveys, the federated states: Pohnpei, Kosrae, Chuuk and Yap. U.S. Fish and Wildlife Service. Department of the Interior, Washington D.C.
- Falanruw, M.C., C.D. Whitesell, T.G. Cole, C.D. MacLean, A.H. Ambacher. 1987. Vegetation Survey of Yap, Federated States of Micronesia, USDA Forest Service, Resource Bull. PSW-21, 9pp+ 4 maps.
- Falanruw, M.V.C., T. Cole, A.H. Ambacher, K.E. McDuffie & J.E. Maka. 1987. Vegetation Survey of Moen, Dublon, Fefen and Eten, State of Truk, Federated States of Micronesia, USDA Forest Service, Resource Bull. PSW-20, 6pp+ 3 maps.
- Falanruw, M.V.C. 1988. On the status, reproductive biology and management of fruit bats of Yap. *Micronesica* 21 (1-2), pp. 39-51.
- Fosberg, F.R., M-H. Sachet and R. Oliver 1979. Geographical checklist of the Micronesian Dicotyledonae. *Micronesica* 18(1):23-82.
- Fosberg, F.R., M-H. Sachet and R. Oliver 1982. Geographical checklist of the Micronesian Pteridophyta and Gymnospermae. *Micronesica* 18(1):23-82.
- Fosberg, F.R., M-H. Sachet and R. Oliver 1987. Geographical checklist of the Micronesian Monocotyledonae. *Micronesica* 18(1):23-82.
- Gawel, M.J. 1993. The Federated States of Micronesia State of the Environment Report. SPREP
- FSM 1999. Proceedings of the 2nd FSM Economic Summit. Pohnpei, FSM
- FSM 2000. Coastal Fisheries Consortium Report of Proceedings. FSM Department of Economic Affairs, Pohnpei.
- MacLean, C.D., T.G. Cole, C.D. Whitesell, M.C. Falanruw, A.H. Ambacher. 1986. Vegetation Survey of Pohnpei, Federated States of Micronesia. USDA Forest Service, Res. Bull. PSW 18. 19p. + 11 maps.
- SPREP 1993. The Federated States of Micronesia Nationwide Environmental Management Strategies. Apia, Western Samoa.
- Trustum, N.A. 1996. Pohnpei's Watershed Spatial Plan and Management Guidelines. Landcare Research, New Zealand, Ltd. Palmerston North, New Zealand.
- Whitesell, C., C.D. MacLean, M.C. Falanruw, T.G. Cole, A.H. Ambacher. 1986. Vegetation Survey of Kosrae, Federated States of Micronesia, USDA Forest Service, Resource Bull. PSW-17, 8pp+map.
- Wiles, G.J., D.W. Buden and D.J. Worthington 1999. History of introduction, population status, and management of Philippine deer (*Cervus mariannus*) on Micronesian Islands. *Mammalia*, t.63,n^o2: 193-215

ACRONYMS

BSAP	Biodiversity Strategy and Action Plan
CBD	Convention on Biological Diversity
CBO	Community-based Organizations
COM	College of Micronesia
COP	Conference of the Parties
ENSO	El Nino/Southern Oscillation Phenomena
FSM	Federated States of Micronesia
IUCN	International Union for the Conservation of Nature and Natural Resources
MAREPAC	Marine Resources Pacific Consortium
NBSAP	National Biodiversity Strategy and Action Plan
NEMS	National Environmental Management Strategies
NGO	Non-governmental Organization
SPREP	South Pacific Regional Environment Programme
TTPI	Trust Territory of the Pacific Islands
UN	United Nations

Figure 1. Map of the Federated States of Micronesia.

