A BLUEPRINT FOR CONSERVING THE BIODIVERSITY OF THE FEDERATED STATES OF

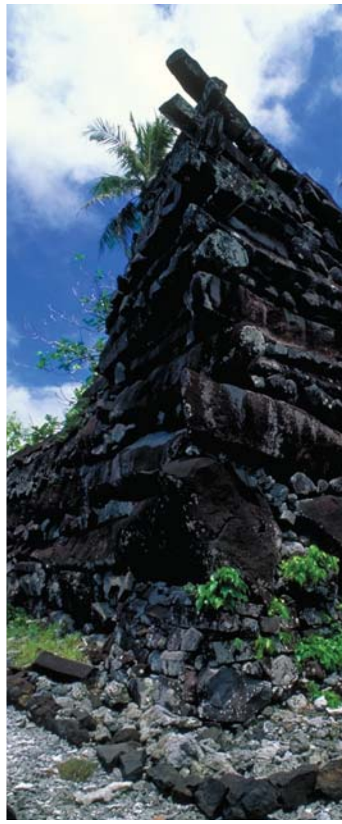
micronesia

Vision: The Federated States of Micronesia will have more extensive, diverse and higher quality of marine, terrestrial and freshwater ecosystems, which meet human needs and aspirations fairly, preserve and utilize traditional knowledge and practices, and fulfill the ecosystem functions necessary for all life on Earth

funded and supported by

This plan was funded and supported, and is owned by: the FSM National and State Governments The Nature Conservancy, U.S. Forest Service, UNDP-Global Environment Fund, US Department of the Interior.

contents



This Page:
Nan Madol ruins on Pohnpei Island

Cover Photo:
Dausokele Estuary on the north side of Pohnpei Island

acknowledgements

This plan was a collaboration of many individuals and organizations. It was funded and supported by: The Nature Conservancy, U.S. Forest Service, UNDP-Global Environment Facility, US Department of the Interior, and the Federated States of Micronesia and respective state governments. Many thanks to all whom gave generously their time and expertise to help protect the extraordinary biodiversity within the Federated States of Micronesia.

As will be discussed further in Section 3.2, the contributors were organized into four "teams":

We gratefully acknowledge all those who contributed photos: Jez O'hare, Margie Falanruw, Dave Vecella, Pius Liyagel, Charles Chieng, Patricia Leon, and Holly Copeland.

CORE TEAM

Bill Raynor	The Nature Conservancy FSM Country Program
Wayne Ostlie	The Nature Conservancy Worldwide Office
Karen Poiani	The Nature Conservancy Hawaii Field Office
Stuart Sheppard	The Nature Conservancy Worldwide Office
Audrey Newman	The Nature Conservancy Hawaii Field Office
Donna Shanefelter	The Nature Conservancy Hawaii Field Office
Holly Copeland	The Nature Conservancy Wyoming Field Office

NBSAP STEERING COMMITTEE

Francis Itimal	NBSAP Chairman
Simpson Abraham	Kosrae Island Resource Mgmt. Program, Kosrae
Youser Anson	Dept of Land & Natural Resources, Pohnpei
Dr. Don Buden	College of Micronesia, Pohnpei
Jane Chigiyal	Dept of Foreign Affairs, Pohnpei
OKean Ehmes	NBSAP Project Manager
Jane Elymore	Dept of Health, Education & Social Affairs, Pohnpei
Joseph Giliko	Dept of Resources & Development, Yap
Edigar Isaac	Dept of Finance & Administration, Pohnpei
Brett Kant	Dept of Justice, Pohnpei
Sonia Kephas	NBSAP Support Staff
Joe Konno	Chuuk Environmental Protection Agency, Chuuk
Willy Kostka	Conservation Society of Pohnpei, Pohnpei
Ishmael Lebehn	Dept of Economic Affairs, Pohnpei
John Mooteb	Dept of Economic Affairs, Pohnpei
Eugene Pangelinan	National Oceanic Resource Management Authority, Pohnpei
Moses Pretrick	Dept of Health Education & Social Affairs, Pohnpei
Maderson Ramon	Dept of Economic Affairs, Pohnpei
Bill Raynor	NBSAP Vice Chairman (NGO)

SCIENCE TEAM

Simpson Abraham	Development Review Commission, Kosrae
Tony Abraham	Division of Marine Surveillance, Kosrae
Dr. Steve Amesbury	University of Guam Marine Lab, Guam
Herson Anson	Division of Forestry, Pohnpei
Donald David	Division of Marine Development, Pohnpei
Ahser Edward	College of Micronesia-FSM
Okean Ehmes	FSM National Biodiversity Strategy and Action Plan Coordinator Coordinator, Pohnpei
Marjorie Falanruw	US Forest Service, Yap
David Hinchley	The Nature Conservancy TNC, Palau
Tarita Holm	Palau National Office of Environmental Response and Coordination, Palau
Francis Itimai	FSM Fisheries Division, Pohnpei
Eugene Joseph	Conservation Society of Pohnpei, Pohnpei
Joe Konno	Environmental Protection Agency, Chuuk
Willy Kostka	Conservation Society of Pohnpei, Pohnpei
Ishmael Lebehn	FSM Department of Economic Affairs, Pohnpei
Patricia Leon	The Nature Conservancy, Pohnpei
Steve Lindsay	Micronesian Aquaculture and Marine Consultant Services, Pohnpei
Dr. Harley Manner	Department of Geography, University of Guam
Valentine Martin	FSM Fisheries Division, Pohnpei
Madison Nena	Kosrae Conservation and Safety Organization, Kosrae
Romeo Osiena	Department ofMarine Resources, Chuuk
Innocente Penno	Office of the Governor, Chuuk
Dr. Bob Richmond	University of Guam Marine Lab
Andy Tafilicheg	Yap Fisheries Division, Yap
Mayoriko Victor	The Nature Conservancy, Pohnpei

LOCAL EXPERTS TEAM

Rooston Abraham	Fisheries Development Division, Kosrae
Simpson Abraham	Development Review Commission, Kosrae
Tony Abraham	Division of Marine Surveillance, Kosrae
Les Aidel	Dept. of Division of Commerce and Industry, Kosrae
Jackson Albert	College of Micronesia Land Grant, Kosrae
Julita Albert	Environmental Protection Agency, Chuuk
Andy J. Andrew	Utwe Resource Management Committee, Kosrae
Sebastian Anefal	Department of Economic Affairs, Yap
Herson Anson	Division of Forestry, Pohnpei
Jocyleen Anson	Division of Surveying & Mapping, Pohnpei
Youser Anson	Dept of Land & Natural Resources, Pohnpei
Bernard Billimont	Municipal Affairs Coordinator, Chuuk
Ethan Brown	Division of Forestry, Pohnpei

Continued on page 6

This Page:
Native dances on Yap.

LOCAL EXPERTS TEAM (CONTINUED)

Soichy Buliche	Commission on Resources and Development, Satowan
Stuart Campbell	Department Primary Industries, Cairns, Queensland, Australia
Blair P. Charley	Development Review Commission, Kosrae
Kathy Chaston	Yap Community Action Program, Yap
Charles Chieng	Yap Community Action Program, Yap
Eliot Cholymay	Department of Education, Chuuk
Madachiro Christlib	State Legislature, Chuuk
Carlos Jose Cianchini	Isla Caja de Muertos Natural Reserve, Department of Natural Resources, Puerto Rico
Rob Coles	Queensland Department of Primary Industries
Anne Cummings	Development Review Commission, Kosrae
Rinson Edmond	Division of Consumer Services, Department of Commerce and Industry
Largo Edwin	Peace Corps, Pohnpei
Okean Ehmes	FSM Department of Economic Affairs
Konrad Englberger	South Pacific Commission, Pohnpei
Andy George	Development Review Commission, Kosrae
Singkitchy P. George	Department of Commerce and Industry, Kosrae
Yosiwo P. George	State Court, Kosrae
Barb Gimlin	Federal Emergency Management Agency, Wash., D.C.
Kondios Gornelius	Department of Land, Kosrae
Charlie Hallers	Department of Public Affairs (Youth Division), Chuuk
Florencio Harper	State Legislature, Chuuk
John B. Ham	Council of Pilung, Yap
Mary Jane Hartman	Chuuk
Bruce Howell	Department of Public Works, Kosrae
Peres Ioanis	Environmental Protection Agency, Pohnpei
Melissa Iwamoto	Division of Marine Resources, Yap
Robert H. Jackson	Development Review Commission, Kosrae
Rainer Jimmy	Peace Corps, Pohnpei
Amanisio Joseph	Department of Agriculture, Chuuk
Benisio Joseph	Department of Education, Chuuk
Person Joseph	Department of Social Affairs, Pohnpei
Kainid K. Kanto	College of Micronesia-FSM, Chuuk
Martha Kanus	Headstart Program, Chuuk
Dylan Kesler	Oregon State University
Maheta T. Kilafwasru	Malem Municipal Government, Kosrae
Joe Konno	Environmental Protection Agency, Chuuk
Mark Kostka	College of Micronesia-Coop. Extension Service, Pohnpei
Cal Legdesog	Department of Education, Yap
Saimon Lihpai	Division of Forestry. Pohnpei
Steve Lindsay	Micro Aquaculture & Marine Consultant Services, Pohnpei
Pius Liyagel	Division of Agriculture and Forestry, Yap
John A. Mangefel	Yap Environmental Stewardship Consortium, Yap
Moses Marpa	Division of Transportation, Yap
Tyler McAdam	Conservation Society of Pohnpei, Pohnpei
Len McKenzie	Department of Primary Industries, Queensland, Australia
Venantius Meryog	Division of Marine Resources, Yap
Thomas A. Mooh	Yap
John Mootmag	Yap Evironmental Stewardship Consortium, Yap
Toyo Mori	Department of Transportation, Chuuk
Cyprian Mugunbey	Yap
Dr. V.K. Murukesan	Agricultural Experiment Station—Land Grant, College of Micronesia, Yap
Madison Nena	Kosrae Conservation and Safety Organization, Kosrae
Kosaky Niwwiano	Resource Management Committee, Lelu,Kosrae
Yoshiyuki "Alik" Oda	Development Review Commission
Herbert Osawa	Environmental Protection Agency, Chuuk
Romio A. Osiena	Department of Marine Resources, Chuuk
Kiupu K. Palik	Kosrae
Innocente Penno	Dept. of Education, Chuuk
Jackson A. Phillip	College of Micronesia-Coop. Ext. Service, Pohnpei
John Pona	Council of Pilung, Yap
Ted Ratun	Yap
Tanseny Reynold	Governor's Office/Women Affairs
Jayson Robert	Guide and Assist Through Awareness, Chuuk
Marcus Rosario	Nett District Government, Pohnpei
Francis Ruegorong	Division of Marine Resources, Yap
Rudolph Ruethin	Division of Marine Resources, Yap
Nimos Salik	Tafunsak Municipal Government, Kosrae
Stoner Sanney	Resource Management Committee,Walung, Kosrae
Valentine Santiago	Conservation Society of Pohnpei, Pohnpei
Narciso Sebastian	Department of Education, Chuuk
Aaron K. Sigrah	Governor's Office, Kosrae
Betty Sigrah	Development Review Commission, Kosrae
Kachusy Silander	Housing Authority, Chuuk
Bumio Silbanuz	Division of Tourism & Parks, Pohnpei
John Silbanuz	Division of Forestry, Pohnpei
Joshua Simor	U.S. Environmental Protection Agency
Tamdad Sunog	Division of Agriculture and Forestry, Yap
Andy Tafileiching	Division of Marine Resources, Yap
Kaye Taylor	Peace Corps, Chuuk
Mason Timothy	FSM National Aquaculture Center, Kosrae
Francis Tipeno	Department of Education, Chuuk
John Tun	Historic Preservation Office, Yap
James S. Ungin	Yap
Imos (Mike) Urumai	Department of Marine Resources, Chuuk
Mayoriko Victor	The Nature Conservancy, Pohnpei
Matthew M. Yarofalmal	Division of Marine Resources, Yap
Elmund Yleizah	Environmental Protection Agency, Chuuk

Above:
Young Pohnpeian man preparing sakau (Piper methysticum)

The single multi-area conservation strategy recommended by this plan is to create a government framework that enables local communities to establish and maintain conservation areas.

The oceanic islands of the Federated States of Micronesia (FSM), also known as the Caroline Islands, are home to some of the most biologically diverse forests and coral reefs in the world. Many individuals, communities, agencies and organizations are acting to conserve the irreplaceable natural resources of the FSM. However, for the most part conservation activities have been small-scale and disconnected, and lacked comprehensive goals for conservation success. A shared "blueprint" FSM's biological resources—a clear picture of the places in the nation where those resources reside and prioritization of conservation needs, is required in order to set and achieve conservation objectives. This conservation plan articulates such a blueprint.

This plan is the result of over two years of coordinated work by individuals within the governments of the Federated States of Micronesia, the U.S. Forest Service, The Nature Conservancy, university scientists, and local experts. The impetus for this effort was the development of the FSM's National Biodiversity Strategy and Action Plan (NBSAP). Completed in April 2002, a major goal of NBSAP is to protect and sustainably manage a full representation of the FSM's marine, freshwater, and terrestrial ecosystems. It is a goal of this conservation plan to contribute to the NBSAP objective and build on the current momentum for conservation.

The methods used to develop the FSM Blueprint, or FSM Ecoregional Plan, have been developed by The Nature Conservancy, a global non-profit conservation organization dedicated to preserving biodiversity through the conservation of species, natural communities, ecosystems and the processes that support them. The key steps in the ecoregional planning process are:

- Determine the region of interest (eco-region);
- Define the representative ecological systems, natural communities, and selected species that should be conserved (conservation targets);
- Delineate the healthiest examples of these ecological systems, natural communities, and species;
- Determine how many examples of these ecological systems, natural communities, and species need to be conserved (conservation goals);
- Determine the areas that capture the most and best examples of these ecological systems, natural communities, and species (Areas of Biodiversity Significance);
- Determine which of these areas are of highest priority to conserve in the short term (priority action areas);
- Develop actions that will help to conserve many Areas of Biodiversity Significance identified above (multi-area strategies).

During the planning process, the planning team identified fifty-three conservation targets (12 systems, 6 communities, 4 special ecological features, and 29 species) selected from the several hundred systems, communities, special ecological features and species identified in the FSM. During a series of six workshops held throughout the FSM, experts employed existing vegetation maps, field reports, personal observations and literature to delineate specific examples of these targets, or "target occurrences". Areas of Biodiversity Significance (ABS) were delineated by drawing boundaries on maps around groups of ecologically similar target occurrences. During ABS delineation, the team focused on areas where nesting and co-occurrence of species and ecological systems contributed to an area's ecological complexity and integrity. Where possible, the teams extended boundaries to tie together terrestrial and marine ecological systems and define Areas of Biodiversity Significance that encompass entire ecosystems. The first iteration of the portfolio of Areas of Biodiversity Significance for the FSM Ecoregional Plan encompasses 130 sites. The combined sites encompass 291,753 ha (1,126.11 square miles), or 19% of the Federated States of Micronesia's entire terrestrial and inshore area (including reefs and lagoon areas, but excluding the nation's territorial waters, which consist mostly of open ocean).

Using the Conservancy's methodology for developing conservation goals, the planning team set quantitative goals for each conservation target that would "support the evolutionary pathway of target species in continually changing ecosystems, looking into the future at least 100 years or 10 generations". An assessment of the Areas of Biodiversity Significance revealed that of 130 sites, goals were met or exceeded for 20 out of the 53 selected conservation targets (38%). Terrestrial habitats fared especially poorly due to their smallness and direct impact of human actions, and restoration of terrestrial habitats may need to be undertaken to meet the minimum target extent for these systems to assure their functionality and continued viability. In some cases, limited distribution and viability data on species conservation target populations prevented the teams from identifying enough occurrences to meet the goals. Many species conservation targets will require further biological monitoring to determine their spatial distribution, population, and overall viability.

Due to limited human and financial resources, a subset of priority ABS sites were selected through a ranking exercise carried out by Core and Local Experts Team members from Kosrae, Pohnpei, Chuuk and Yap during a series of workshops from June-October 2002. Five criteria were used to prioritize each ABS: biological value, feasibility, leverage, urgency of threat, and cultural and historic value. Altogether, 24 "Priority Action Areas" were selected to focus conservation action in the most biologically important and threatened areas within the next three to five years.

A threats analysis was conducted and overfishing/overhunting was identified as the most urgent and critical threat across marine and terrestrial ABS in all states, followed by coastal erosion and sea-level rise, inadequate landfills and dumping, erosion/sedimentation from land-based activities, destructive harvesting, and invasive species. Based on this threats analysis, the single multi-area conservation strategy recommended by this plan is to create a government framework that enables local communities to establish and maintain conservation areas. Many actions will be required to support this overarching strategy, including community-coalition building, securing funds, and conservation planning.

This conservation plan is by no means an exhaustive study on all that is known biologically about the islands and waters of the Federated States of Micronesia. However, as far as we know, it is the first effort to capture the collective biological knowledge of regional scientists and local experts and turn that knowledge into mapped focal areas for biodiversity protection. There is much work to be done, especially in understanding more about the size, distribution, life history requirements and health of the FSM's flora and fauna. Hopefully, future iterations of this conservation plan will be enhanced by new and on-going studies on the region's biodiversity. Perhaps most importantly, this plan provides a place to start—where those concerned about the special places in Micronesia can collectively focus their efforts. A place to begin.

This Page Top:
Pakin Atoll near Pohnpei Island

This Page Bottom:
Yapese outer island craftsman working on a traditional outrigger canoe

Opposite Page:
Traditional dancing in a Yapese village

Ecoregional planning is a comprehensive process for identifying and prioritizing a set of places or areas that, together, represent the majority of species, natural communities, and ecological systems found within a particular region.

Many individuals, communities, agencies and organizations are acting to conserve the irreplaceable natural resources of the Federated States of Micronesia (FSM) (Raynor 2000; FSM 2002). Until now, conservation activities have been mostly small-scale and disconnected, and lacking comprehensive goals for conservation success. A shared ″blueprint″ of FSM′s biological resources—a clear picture of the places in the nation where those resources reside—and a list of priority conservation needs was required to set and achieve more effective conservation objectives. This conservation plan, facilitated by the FSM Country Program of The Nature Conservancy in coordination with FSM agencies, scientists, and local experts, articulates such a blueprint.

The Nature Conservancy, a global non-profit conservation organization dedicated to preserving biodiversity, suggested it's ecoregional planning process as a framework for this conservation plan (TNC 2000). Ecoregions are relatively large areas delineated by biotic and environmental factors that regulate the structure and function of ecosystems within them. Ecoregional planning is comprehensive process for identifying and prioritizing a set of places or areas that, together, represent the majority of species, natural communities, and ecological systems found within a particular region. Ecoregional planning is based on four premises:

1. Planning at scales higher and broader than specific sites will more effectively conserve the full range of biodiversity and promote its persistence;
2. Many significant threats to biodiversity operate at the scale of multiple sites;
3. Coordinated regional efforts can facilitate the creation of new partnerships and alliances and can help avoid redundancy among groups working independently;
4. This approach can more accurately define an area for conservation, remediation, or restoration than those primarily based on connecting sites or tailoring plans to political boundaries or agendas.

Although this plan's methodology originates from The Nature Conservancy, other conservation organizations such as World Wildlife Fund use similar assumptions, underlying objectives, and planning methodologies (Dinerstein 2000).

On Pacific islands, where the abundance of rare and endemic species is matched by a corresponding lack of data and resources for their preservation, ecoregional planning offers a practical, rational approach for focusing and prioritizing conservation action. In response to this need, the Conservancy identified ecoregional planning as a top priority for its Pacific Country Programs in the summer of 2001. At the same time, the government of the Federated States of Micronesia was poised to develop its National Biodiversity Strategy and Action Plan (NBSAP), an outline of the nation′s biological resources and current threats and a corresponding set of proposed actions. The government requested that the Conservancy lead a planning exercise as part of a process of national consultation. These circumstances allowed participants to define mutual, obtainable conservation goals for conserving the biodiversity of the FSM.

2.1 OVERVIEW OF THE FSM ECOREGIONS

This conservation plan addresses conservation for two World Wildlife Fund ecoregions--the Yap Tropical Dry Forest and Carolines Tropical Moist Forest Ecoregions (Figure 1). The Yap Tropical Dry Forest Ecoregion contains the four islands of Yap proper, in addition to the nearby atolls of Ulithi, Ngulu, Fais, and Faraulep. The Carolines Tropical Moist Forest Ecoregion contains the remaining outer islands of Yap, known as the Remetau group, west through Chuuk, Pohnpei, and Kosrae. The boundaries of these two ecoregions also conveniently encompass the whole of the Federated States of Micronesia.

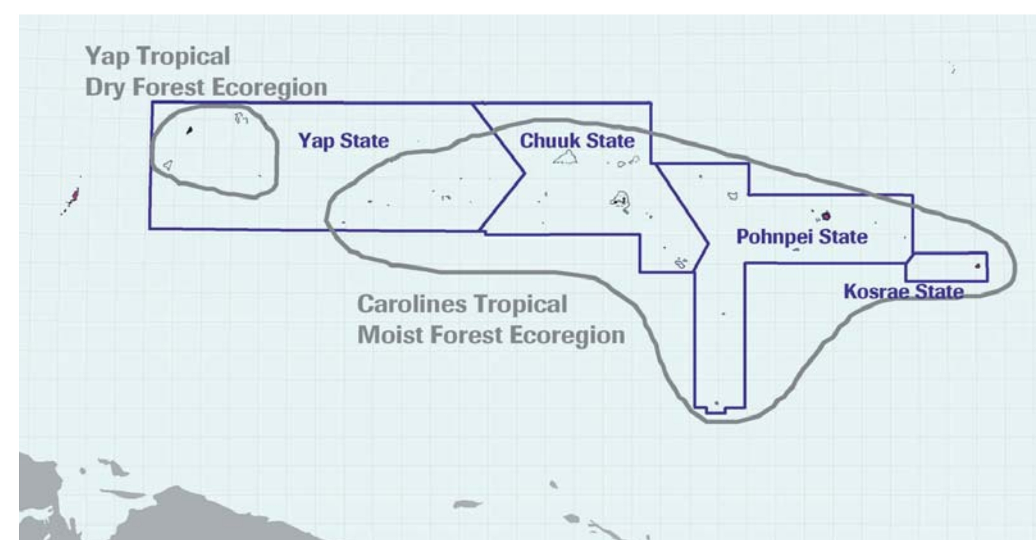
2.2 ECOLOGICAL CONTEXT

The oceanic islands of the Federated States of Micronesia, in the Caroline Islands, are home to some of the most biologically diverse forests and coral reefs in the world.

The proximity of Micronesia to the Indo-Malay region and the relative nearness between the islands themselves enabled the high islands and reefs to act as bridges for the migration of terrestrial and marine species. The distance between islands also separated individual populations, causing in some cases, the creation of new species. The islands of the eastern Carolines are more isolated from continental landmasses. As a result, the total number of species decreases from west to east within the FSM, but the proportion of endemic species increases. This pattern is characteristic of the science of island biogeography (Wilson 2000), of which the islands of Micronesia are veritable case studies.

Millions of years ago, volcanic activity created the islands and atolls of the FSM. Today, mountain peaks fringed by coral reefs thrust up out of clear blue Pacific waters. In other places, atolls are all that remain of islands that sunk beneath the surface, leaving rings of coral barrier reefs around coral and sand lagoons. Relatively high rainfall (approximately 120 400 inches/year) and a humid tropical climate dominate the

Figure 1. Map of Ecoregions



This Page Top:
Breadfruit
(Artocarpus altilis)

This Page Bottom:
Pohnpei Island airport
and harbor

Opposite Page:
Young Pohnpeian women
preparing for a traditional
dance

The marine systems of the FSM compose an enormous and largely unexplored resource, protecting some of the healthiest remaining populations of many globally threatened species.

FSM due to its location just north of the equator and in the Pacific's Intertropical Convergence Zone (ICTZ). Rainfall gradually decreases east to west. Kosrae in the easternmost Caroline Islands averages 252 inches/year, Pohnpei averages 200 inches/year in its lowlands (and up to 400 inches/year in the mountainous interior), while Yap averages 120 inches/year and has a notable dry season.

Typhoons are a dominant factor shaping biodiversity in Micronesia, however less so than farther north in the Marianas Islands and the Philippines, where typhoons are a regular (nearly annual) occurrence. Most typhoons in the region tend to spawn in the eastern Carolines (northeast of Pohnpei and Kosrae) and then move off toward the northwest, allowing for taller forests in Pohnpei and Kosrae. Occasionally, however, typhoons do devastate the terrestrial and marine environments of the Caroline Islands, with major typhoons occurring infrequently (25-50 year events). Overall, these factors combine to create a high diversity of plant and animal species in the FSM within a relatively small land area.

2.2.1 Yap Tropical Dry Forest Ecoregion

The Yap Tropical Dry Forest Ecoregion contains the westernmost islands of Yap State (Figure 1). The dominant vegetation types are mixed broadleaf forest, swamp, mangrove, savanna, and agroforests. Vegetation maps from 1976 aerial photos indicate that wild forests cover about 40% of the land area of Yap (including mixed broadleaf forest, swamp, and mangrove) (Falanruw et. al 1987). Agroforests (tree gardens) cover another 26% of the land area, and about 22% of the vegetation is savanna. Scientists believe that prior to human habitation, broadleaf deciduous forests covered most islands within this ecoregion. However, the introduction of human-induced wildfires within the Western Caroline Islands, a region naturally prone to frequent droughts, has resulted in extensive savannas (in Yap, Guam, and Palau).

Yap's forests and savannas support a number of endemic plant species, including Drypetes yapensis, Drypetes carolenesis, Trichospermum ikutai, Hedyotis yapensis, Timonius albus, Myrtella bennigseniana, Casearia cauliflora, and Pentaphalangium volkensii. The large tree Serianthes kanehirae and the distinctive tree Garcinia rumiyo, are endemic to Yap and Palau. Yap's mangroves are the most diverse in the FSM with as many species of mangrove trees in Yap as in Palau. Bulldozing activities, wildfires, and agricultural burning endanger Yap's native forests and endemic species.

Yap hosts at least three endemic bird species a monarch (Monarcha godeffroyi) and two white-eyes (Rukia oleaginea sp., Zosterops hypolais)--as well as the distinctive Yap Cicadabird and four range-restricted birds (Stattersfield et al. 1998, Pratt et al. 1987).

Two endemic species or subspecies of flying fox inhabit Yap State (Pteropus mariannus yapensis and P.m. ulithiensis) (Falanruw 1988). Both are listed under CITES (Convention on International Trade in Endangered Species), and are covered under the U.S. Endangered Species Act; they are also protected by Yap State legislation. Hunting and typhoons (Hilton-Taylor 2000), as well as drought and habitat disturbance, threaten Yap's flying foxes.

The marine systems of the FSM compose an enormous and largely unexplored resource, protecting some of the healthiest remaining populations of many globally threatened species. At least four of the world's seven species of sea turtles are recorded in Yap State, including the hawksbill turtle (Erytomochelys imbricata) and the green turtle (Chelonia mydas). In fact, the largest green turtle (Chelonia mydas) rookery remaining in the insular Pacific is found on several small islands of the atoll of Ulithi in Yap State. FSM's remote outer islands, including several atolls in Yap State also host a number of important seabird rookeries. The world's deepest and largely unexplored ocean trench, the Mariannas Trench, reaches its' greatest depth between Yap proper and the outer islands to the west.

2.2.2 Carolines Tropical Moist Forest Ecoregion

The Carolines Tropical Moist Forest Ecoregion contains the islands in Kosrae, Pohnpei, Chuuk, and easternmost islets of Yap State. Mixed broadleaf forests comprise the dominant vegetation type on the high volcanic islands. Historically, broadleaf forests almost completely covered these high islands, but people have since cleared or disturbed much of the lowland vegetation. A recent aerial survey of Pohnpei Island found two-thirds of the native forest to have been lost in the past twenty years.

Lowland vegetation on the high volcanic islands is dominated by mangrove and swamp forests, though large portions of these forests are being disturbed by human activities. Healthy examples of these forests still exist, though, along isolated coasts of Pohnpei and Kosrae. Located at just 450 meters on Pohnpei and Kosrae, montane cloud forests thrive on the unique combination of relatively high rainfall and elevation. These cloud forests are a global rarity, as they are some of the lowest elevation cloud forests in the world and are home to over 30 species of tree snails, 24 species of birds, and three species of endemic flying foxes (Raynor 1993).

Endemism is very high in this ecoregion, a result of a unique combination of distance and isolation. Plants and animals from the biologically diverse Southeast Asia mainland, although located thousands of miles to the west, were able to island hop through the Caroline Island archipelago, since the greatest distance between any island from Palau to the Marshall Islands is only 200-300 miles. As a result, over 200 endemic species inhabit the Carolines Tropical Moist Forest Ecoregion. Pohnpei Island, in particular, contains a high number of endemic species from its unique combination of size, soils, climate, geology, and topography in addition to being the highest geographic point for more than 2000 miles in any direction creating a geography not found anywhere else in the world.

The list of endemic species for this ecoregion includes four endemics with at least one endemic genus of over twenty-four species of native reptiles (Dahl 1980) and four flying foxes (P. molosinnus, P. insularis, P. phaeocephalus, P. mariannus ualnus). Thirteen birds are endemic to the ecoregion, including the Truk monarch (Metabolus rugensis), the Pohnpei fantail (Rhipidura kubaryi), the Pohnpei mountain starling (Aplonis pelzeni), and the Pohnpei lory

This Page:
Pohnpei tree fern
(Cyathea nigricans)

Opposite Page:
Outer island family living
on Pohnpei

(Trichoglossus rubiginosus). On the island of Tol in Chuuk, one of the world's most endangered rainforests survives precariously on the peak of Mt. Winipot (and other small mountaintops in the Chuuk lagoon).

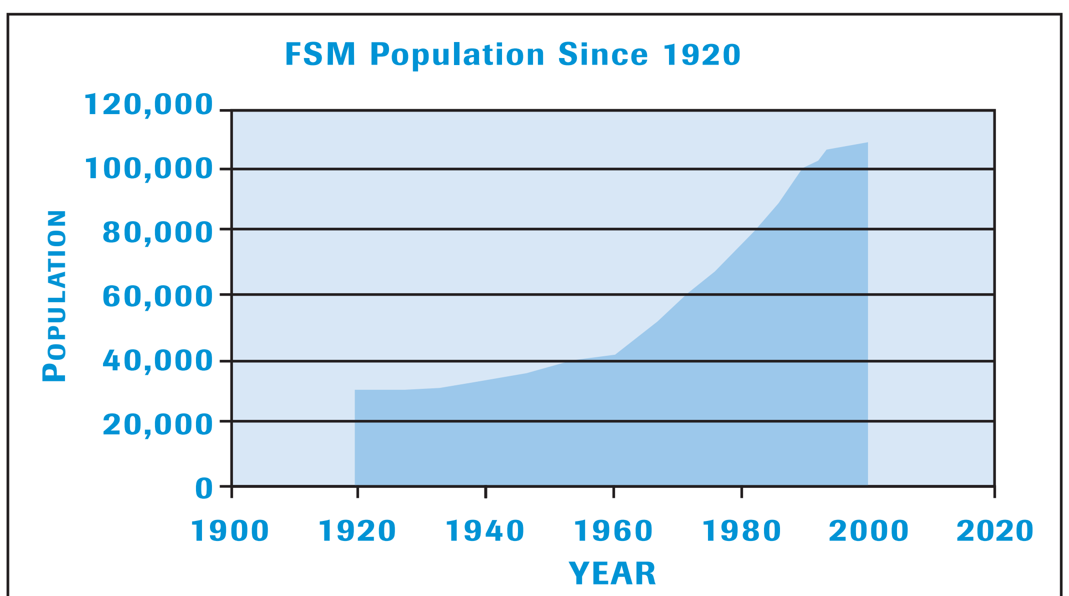
The islands of FSM exhibit a great diversity of marine ecosyste ms, from high volcanic islands with fringing and barrier reefs to coral atolls, including Chuuk lagoon, one of the world's largest (823 mi2/3130 km2) and deepest (60m/200 ft). The heart of the world's largest tuna fishery, FSM's offshore waters contain rich stocks of yellowfin, bigeye, skipjack, and other species of fish. According to the 2002 National Coral Reef Action Strategy (NOAA), "Reefs support more species per unit area than any other marine ecosystem, including about 4,000 documented species of fish, 800 species of hard corals and hundreds of other species. Scientists estimate that there may be another 1 to 8 million undiscovered coral reef species (Reaka-Kudla 1997). In many ways, coral reefs rival and surpass tropical rainforests in their biological diversity and complexity."

2.3 HUMAN CONTEXT

Factors that led to high biological diversity in Micronesia also led to high cultural diversity. Nine languages and numerous cultures exist over the 1,800-mile archipelago. The FSM's human population is currently 107,000. Most people live in the high volcanic island district centers of the four main island groups: Kosrae, Pohnpei, Chuuk, and Yap. During the 1980's, the population growth rate was three percent per year, one of the highest population growth rates in the world. Since 1996, emigration to the U.S. and it's territories (through provisions in the Compact of Free Association) has slowed population growth to just .3 percent annually. (FSM 2002c)

Interestingly, the population on some islands may have been higher during the nineteenth century than it is today. On Pohnpei, for example, the population in 1820 was estimated at 15,000 (Ashby 1993), yet traditional cultures were able sustain the biological resources of the island through careful use. The pre-contact population of Yap has been variously estimated at 273-530 people per sq. kilometer (709 1,378 people / sq. mile) (Falanruw 1995).

Figure 2. Population growth



While the impact of such a dense human population probably contributed to the elimination of forests and expansion of savanna (which comprised some 22% of the island vegetation as seen from 1976 aerial photographs), the culture also developed a world-class tree garden taro patch system of permiculture. In 1976, these "agroforests" comprised some 26% of the island's vegetation. Altogether, Yap's system of food production incorporated landscape architecture from uplands into nearshore waters (Falanruw 1994) in a traditional form of "ecosystem management." While there are limits to an island's carrying capacity, and while the context for many traditional practices is no longer present, the precedent of traditional management and the practice of some ecologically based technologies provides a framework for incorporating modern science into an island-relevant system of resource stewardship.

Tenure over land and marine areas varies island to island and state to state, but the majority of the nation's land and inshore marine areas are privately or collectively owned. The nation's people depend heavily on the natural environment for their survival as evidenced by the fact that median annual household income in 2000 was only US$4,618 (FSM 2002c). A healthy environment is profoundly linked with advances in health and education, economic development, and good governance. While growth in the FSM is constrained by limited natural resources, improvements in natural resource management are limitless. Building a healthy economic future for the FSM will necessitate sustainable management of the country's biological and natural resources.

Tremendous pressure for economic growth and changing cultural practices, combined with population growth and changing demography in the FSM threaten biological resources. Interior forests and coral reefs are rapidly being lost or degraded by bulldozing, deforestation, sedimentation, pollution, dredging and destructive fishing practices. Conventional western approaches to conservation--government management and enforcement of large-scale conservation areas--have been ineffective due to land and marine ownership patterns, the difficulties inherent to regulating activities in extremely remote locations, and the limited capacity of government natural resource agencies (FSM 2002; SPREP 1993; Micronesian Seminar 2002).

This Page:
Pohnpei elder teaching breadfruit preparation to her grandchild

Opposite Page:
Traditional Pohnpeian dancers

Annual grants will fund six government sectors, including the environment. In 2004, the first year of Compact II, the U.S. will give $76 million.

The FSM has a limited history of conservation management at the national level. Until 1979, there was but one conservation officer for what is now the Federated States of Micronesia, Republic of the Marshall Islands, Republic of Palau, and the Commonwealth of the Northern Marianas. At the 1999 FSM Economic Summit, the FSM's Environment Sector Strategy was updated and improved for inclusion in the country's on-going negotiations with the United States (Raynor 2000). The strategy calls for the establishment of a "network of effective community-managed, ecologically representative, and socially beneficial marine and forest protected areas in the nation to safeguard the country's precious natural heritage."

In April 2002, through a collaboration of local, state, and national stakeholders, the National Biodiversity Strategy and Action Plan (NBSAP) was completed. A major theme of the NBSAP is ecosystem management designed to protect and sustainably manage a full representation of the FSM's marine, freshwater, and terrestrial ecosystems. While there is no established framework for governing conservation in the FSM, or an established cadre of personnel dedicated to pushing environmental issues to the forefront today, it is a goal of this conservation plan to contribute to the NBSAP objective and build on the current momentum for conservation.

2.3.1 Political Context

The Federated States of Micronesia has a long history of colonial government by the Spanish, Germans, Japanese, and the United States, which administered the country as part of a United Nations Trust Territory of the Pacific Islands (TTPI) from 1945 to 1979. Self-governing since 1979, the FSM entered into a Compact of Free Association agreement with the United States in 1986. The FSM is currently completing negotiations for a second Compact agreement with new conditions to U.S. funding not in the original version.

3.1 ECOREGIONAL PLANNING FRAMEWORK

The Nature Conservancy's planning framework as outlined in Designing a Geography of Hope (2000b) was selected as the guiding ecoregional planning process. Following this framework the key steps in the ecoregional planning process are:

- Identify the species, natural communities, and ecological systems that represent the biodiversity of the Federated States of Micronesia;
- Record the best remaining examples of where these species, natural communities, and ecological systems occur;
- Define and delineate "Areas of Biodiversity Significance"--clusters of high quality examples of species, natural communities, and ecological systems;
- Prioritize Areas of Biodiversity Significance for action within the next two to five years through a documented consensus-based process;
- Identify threats common to many areas of high biological significance and determine multi-area strategies to guide conservation efforts;
- Identify key data gaps.

3.2 PLANNING TEAMS

In October 2001, a core conservation planning team led by Bill Raynor, the Conservancy's FSM Country Program director was assembled. The Core Team then selected a diverse group of individuals representing The Nature Conservancy, FSM federal and local state agencies, FSM-based universities, and local landowners and business people to participate at various stages in the planning process. Briefly summarized, the four teams assembled to complete this plan were:

1. Steering Committee: NBSAP task force.
2. Core Team: Led by Bill Raynor and composed of Conservancy conservation science and GIS staff, this team facilitated the planning process and coordinated completion of the final plan.
3. Science Team: A team of experts on the biology and natural resources of Micronesia, including resource management agency personnel from national and state governments, biologists from the College of Micronesia and University of Guam, and regional agency staff (especially the US Forest Service).
4. Local Experts Teams: Composed of local landowners, business people, state and municipal government staff, and NGO staff, these critical teams worked with the Core Team to review and approve the portfolio design, develop viability specifications, and prioritize the final portfolio into action areas.

3.3 THE PLANNING PROCESS

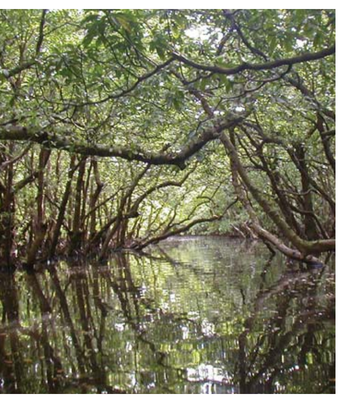
In October 2001, the Core Team and selected Science Team members focused on gathering data on potential conservation targets and devising a plan of action for engaging scientists and local experts in the planning process (see Figure 3 for timeline). The Core Team hosted two experts workshops in Pohnpei on October 29-30, 2001 and January 8-9, 2002. Scientists and local experts from all over the FSM attended. Those attending actively participated in the conservation planning process, sharing new conservation target occurrence and location information, creating a draft ecoregional portfolio, and reviewing goals

This Page Top:
Traditional cup made from a coconut shell

This Page Bottom:
Sea bird islands in FSM's outer islands provide breeding habitat for thousands of birds

Opposite Page:
A beach in the outer islands of Yap.

3.0 building a foundation for conservation design



for conservation targets. By the end of the second workshop, the participants had accepted a final conservation targets list.

In the summer of 2002, the Core Team met with the Local Experts Teams in all four FSM States (Yap, Chuuk, Pohnpei, and Kosrae). The goal of these meetings was to determine the final ABS list and collect information about them, including ownership, management, and contact information. Finally, each was ranked by a number of factors such as urgency of threat, cultural significance, and biodiversity value.

Following the individual state workshops, members of the Core Team compiled multi-site strategies based on input from the summer workshops. This document was written and the draft plan distributed to selected Core, Science, and Local Experts Team members for review.

3.4 Conservation Targets

The principal purpose of an ecoregional plan is to provide a method to sustain the long-term viability of a region's biodiversity. When addressing this task, one must ask: "What are the elements of biodiversity (or "conservation targets") that the plan should focus on?" Because it is impossible to develop a conservation plan based on each individual species occurring in a large region, a more strategic tactic is necessary. Conservation planners generally use a two-tiered approach to this problem—a "coarse-filter/fine-filter" approach. The "coarse-filter/fine-filter" strategy stresses the importance of conserving sufficient viable examples of all major ecological systems or communities (the coarse filter), in addition to any rare or specialized species that have special requirements and may not be adequately addressed through the coarse filter (Poiani 2000). For this plan, the Core Team chose the methods outlined in The Nature Conservancy's Designing a Geography of Hope (2000b), a "coarse-filter/fine-filter" approach, to guide conservation target selection. It is the combination of these coarse- and fine-scale features that helps capture the full array of biodiversity within the FSM.

The Core Team spent October 2001 consulting the literature and working with selected members of the Science Team to identify conservation targets. First, all terrestrial, freshwater, and near-shore marine ecological systems for the FSM

TYPES OF CONSERVATION TARGETS

- **Ecological Systems** - Dynamic spatial assemblages of natural communities tied together by similar ecological processes (e.g., hydrology, nutrient flows or cycling), underlying environmental features (e.g., soils, geology) or environmental gradients (e.g., elevation, hydrological-related zones).
- **Natural Communities** - Finer-scale plant assemblages of definite floristic composition and similar habitat conditions and physiognomy.
- **Special Ecological Features** - Unique, irreplaceable features that are critical to the conservation of a certain species or suite of species. Major groupings of species that share common natural processes or conservation requirements (e.g., freshwater mussels, and forest-interior birds).
- **Species** - (1) Imperiled and endangered native species; (2) Of special concern due to vulnerability, declining trends, disjunct distributions, or endemic status; (3) Focal species (including ecological keystone species, wide-ranging species, and umbrella species).

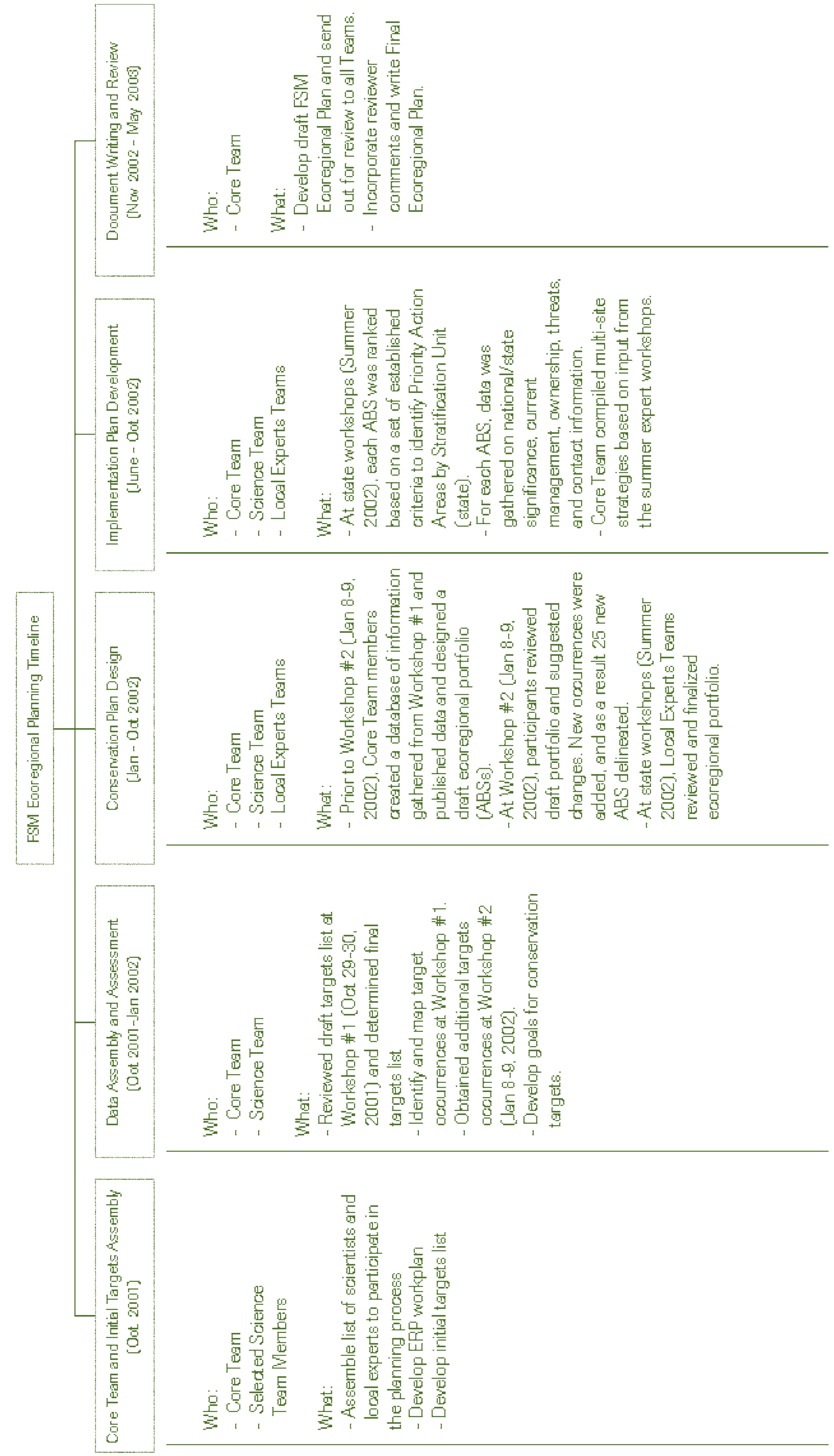


Figure 3. Process and Timeline for FSM Blueprint Development

The principal purpose of an ecoregional plan is to provide a method to sustain the long-term viability of a region's biodiversity.

Opposite Page Top: A betel nut palm (Areca catechu) overgrown with Chromolaena odorata, an introduced invasive species.

Opposite Page Bottom: A mangrove channel on Yap island

were identified. (e.g., Mixed Broadleaf Forest, Nearshore Marine Systems, Coastal Freshwater Swamp). Second, finer-scale natural communities (e.g., Ivory Nut Palm Forest, Terminalia/Nypa Swamp Forest) were identified, which would not likely be sufficiently addressed by the ecological systems. Finally, a long list of potential target species were identified using criteria identified in Geography of Hope (i.e., endemic, rare and imperiled, [including those classified as imperiled by the U.S. Endangered Species Act and the IUCN Red List] and disjunct). This list of potential fine-filter species targets was refined to a significantly smaller final targets list by determining which of these would not be adequately captured within the broad ecological systems identified above as targets. Finally, other critical ecological features (e.g., grouper spawning aggregation areas, sea turtle nesting beaches) were added to the list as potential conservation targets.

Freshwater Streams and Rivers was added as a single conservation target to represent all freshwater systems due to a lack of existing data on freshwater systems and the capacity to develop it. Had more data or capacity been available, an attempt would have been made to classify freshwater systems into narrower categories. This remains as a major data gap to be addressed in upcoming iterations of the plan.

By October 2001, the Core Team had a draft list of potential conservation targets. At a workshop held on Pohnpei from October 29-30, 2001, this list was presented to marine and terrestrial experts from around the region. The experts reviewed the conservation targets list and suggested possible additions and deletions. By the end of the workshop, the list was refined to a final set of 53 conservation targets, which best captured all the biodiversity of the FSM, including major ecological systems (12), natural communities (6), special ecological features (4), and rare and/or imperiled species (31) (Table 1, Appendix B).

Table 1. Conservation Targets

Terrestrial Ecological Systems
- Atoll Forest-Beach Strand Complex
- Fern-Sedge Savanna
- Limestone Forest
- Montane Cloud Forest
- Riparian Forest
- Swamp Forest
- Mixed Broadleaf Forest

Terrestrial Natural Communities
- Atoll Inland Mangrove
- Clinostigma Palm Forest
- Coastal Freshwater Marsh
- Ivory Nut Palm Forest
- Montane Perched Freshwater Marsh
- Terminalia/Nypa Swamp Forest

Marine & Coastal Ecological Systems
- Atoll Nearshore Marine
- Estuary
- High Island Nearshore Marine
- Mangrove Forest

Freshwater Aquatic Ecological Systems
- Freshwater Streams and Rivers

Special Ecological Features
- Giant Clam Concentration Areas
- Turtle Nesting Beaches
- Seabird Nesting Areas
- Grouper (Serranidae Family) Spawning Aggregation Areas

Marine Species
- Coconut crab (Birgus latro)
- Manta ray (Manta birostris)
- Napolean wrasse (Cheilinus undulatus)

Terrestrial Species
- Arno skink (Emoia arnoensis arnoensis)
- Caroline Island ground dove (Gallicolumba kubaryi)
- Chuuk flying fox (Pteropus insularis)
- Chuuk greater white-eye (Rukia rukia)
- Chuuk monarch (Metabolus rugensis)
- Chuuk poison tree (Semecarpus kraemeri)
- Cicadabird (Coracina tenuirostris)
- Giant Micronesian gecko (Perochirus scutellatus)
- Gray duck (Anas superciliosus)
- Kosrae flying fox (Pteropus mariannus ualnus)
- Long-billed white-eye (Rukia longirostra)
- Micronesian pigeon (Ducula oceanica)
- Micronesian pigeon var. Truk (Ducula oceanica teraokai)
- Micronesian swiftlet (Collocalia inquieta)
- Mortlocks flying fox (Pteropus phaeocephalus)
- Pohnpei flying fox (Pteropus molossinus)
- Pohnpei Island skink (Emioa ponapea)
- Pohnpei mountain starling (Aplonis pelzelni)
- Pohnpei short-eared owl (Asio flammeus ponapensis)
- Pohnpei tree snail 1 (Partula emersoni)
- Pohnpei tree snail 2 (Partula guamensis)
- Polynesian sheath-tailed bat (Emballoneura semicaudata)
- Ulithi flying fox (Pteropus mariannus ulithiansis)
- White-throated ground dove (Gallicolumba xanthonura)
- Yap flying fox (Pteropus mariannus yapensis)
- Yap monarch (Monarcha godeffroyi)

Freshwater Aquatic Species
- Pohnpei river goby (Lentipes sp. A)
- Pohnpei river goby (Sicyopterus eudentatus)

By the end of the workshop, the list was refined to a final set of 53 conservation targets, which best captured all the biodiversity of the FSM.

Opposite Page Top:
Traditional stone path in a Yapese agroforest

Opposite Page Bottom:
Hibiscus flower (Hibiscus rosa-sinensis)

3.5
TARGET OCCURRENCES AND VIABILITY

Once the final conservation targets were chosen, the Local Experts Team was assembled to identify the best remaining examples of these conservation targets. This was accomplished principally during the two workshops held in October 2001 and January 2002. Participants relied on personal observations and literature to delineate specific examples of these conservation targets, or "target occurrences". For terrestrial ecological systems and natural communities, they used existing vegetation maps (Falanruw et al. 1987a,b; MacLean et. al 1986, Whitesell et. al 1986). For marine ecological systems and special ecological features team members delineated examples based on their field experience and local accounts.

Data for species was based on previous inventories (where available) and complemented by expert knowledge. Collecting reliable species data was more problematic than for natural communities and ecological systems. Ideally, ecoregional plans are based on quantitative information such as field surveys of population size and condition. This data is not generally available in the FSM, and is more qualitative or observational in nature. As scientists continue to survey and record the flora and fauna of the FSM, future iterations of the plan can improve in this area (see Section 7 for specifics on data gaps).

Participants relied on personal observations and literature to delineate specific examples of these conservation targets, or "target occurrences".

Table 2. Description of Size, Condition, and Landscape Context

Size

A measure of the area or abundance of the conservation target's occurrence, relative to other known, and/or presumed viable, examples. For ecological systems and natural communities, size is simply a measure of the occurrence's patch size or geographic coverage. For animal and plant species, size takes into account the area of occupancy and number of individuals. Minimum dynamic area, or the area needed to ensure survival or re-establishment of a target after natural disturbance, is another aspect of size.

Condition

An integrated measure of the composition, structure, and biotic interactions that characterize the occurrence. This includes such factors as:
- Reproduction, age structure, biological composition, e.g., presence of native versus exotic species or presence of characteristic patch types for ecological systems.
- Structure, e.g., canopy, understory, and groundcover in a forested community; spatial distribution and juxtaposition of patch types or seral stages in an ecological system.
- Biotic interactions, e.g., levels of competition, predation, and disease.

Landscape Context

An integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the target occurrence, and connectivity.
- Dominant environmental regimes and processes include herbivory, hydrologic and water chemistry regimes (surface and groundwater), geomorphic processes, climatic regimes (temperature and precipitation), fire regimes, and many kinds of natural disturbances.
- Connectivity includes such factors as species having access to habitats and resources needed for life cycle completion, fragmentation of natural communities and ecological systems, and the ability to respond to environmental change through dispersal, migration, or re-colonization.

Table 3. Sample, Viability Ranking Criteria

CRITERIA FOR RANKING UPLAND BROADLEAF FOREST IN THE FSM

Size

Mixed Broadleaf Forests historically covered the high islands. Today, only patches of these forests remain due primarily to agricultural conversion. On Pohnpei, for example, 10,000 hectares of Mixed Broadleaf Forest were lost between 1975 and 1995; only 5,000 hectares of Mixed Broadleaf Forest remain.
- Very Good — large, unbroken/contiguous patches >500 Ha in size;
- Good — relatively large, mostly contiguous patches 250 Ha - 500 Ha in size;
- Fair — medium-sized, broken patches from 100 Ha to 250 Ha in size;
- Poor — small patches <100 Ha in size.

Condition

In a natural state, large storms (e.g. wind, rain) periodically prune and fell trees within Mixed Broadleaf Forests, but the forest recovers quickly and completely. The forest regeneration process has been especially altered due to forest bulldozing and burning for roads and agriculture, and the subsequent invasion of exotic species. The lower slopes on all islands are especially altered, and in some places, totally converted. Intact areas remain, but only on ridges, very steep slopes and valleys. Other unnatural processes impacting, or likely to impact the forest are introduced fire and changing typhoon and drought patterns due to climate change.
- Very Good — native forest intact with no disturbance;
- Good — mostly intact (<10% disturbed), possibly some invasive weeds present;
- Fair — moderate disturbance (10-25%), invasive species becoming established;
- Poor — more than 25% disturbed forest, invasive weeds established.

Landscape Context

Fragmentation and accessibility due to roads is the primary concern. In particular, access to the forest through roads and trails has accelerated agricultural clearing in those areas.
- Very Good — no roads within 1 mile, no major trails to the area;
- Good — no roads within 1/2 mile, some minor trails access area;
- Fair — road in vicinity (<1/4 mile), and/or major forest trails access area;
- Poor — road enters forest area, homesteading present.

Based on planning guidelines outlined in Designing a Geography of Hope (TNC 2000b), the quality or "viability" of each target occurrence is documented through estimates of size, condition, and landscape context (Table 2).

Based upon best available data and expert judgement, the teams estimated current size, condition, and landscape context for viable occurrences—ones that had a high probability of continued existence over one hundred years. An example for Mixed Broadleaf Forest (Table 3) shows how measurable, repeatable criteria for size, condition, and landscape context were established for each target. These three factors combined to create a viability rating (Very Good, Good, Fair, Poor) for each target occurrence. Due to a lack of solid scientific data, the criteria above are best estimates of the participants involved. In future iterations of the plan, these numbers will need to be revisited and updated by newly available data. Criteria for several conservation target types (e.g., marine species) still need to be developed due to lack of available data, specific expertise on the planning team, and time.

Above:
With up to 200 inches of rainfall annually, waterfalls are common on the high islands of FSM (Kepirohi Falls on Pohnpei Island)

3.6
CONSERVATION GOALS

Conservation goals determine the number and geographic distribution of viable target occurrences required to maintain the long-term viability of each conservation target One of the most important and most difficult steps in regional conservation planning is determining how many examples of the ecological systems, natural communities, special features, and species of focus need to be conserved. Goals were set relatively high as a proportion of available examples due to limited availability of data on conservation targets, which prompted the team to set conservative goals to avoid losing critical occurrences before their relative importance can be established.

The process of setting conservation goals is always difficult—scarcity of data seems to be the rule, not the exception. Few species have been studied well enough for scientists to estimate population numbers for long-term persistence (e.g., endangered species recovery plans in the United States). Estimates of the necessary number or extent of ecological systems and natural communities are even fewer. The planning teams, of course, sought to use the best available data. Unfortunately, in the FSM, there is little quantitative information with which to set goals; out of necessity, goals were therefore based primarily on expert opinion and intuition.

The planning team relied on the Conservancy's three-step methodology in developing goals:

Step 1:
Stratify the FSM into finer-scale sub-units. Stratification units are important to goal-setting, ensuring that examples of the conservation targets are captured across the region's geologic, climatic, and ecological variability. For this conservation plan, FSM state boundaries (Kosrae, Pohnpei, Chuuk, and Yap) were determined to be excellent stratification units since they correlate closely with biogeographic distribution patterns and other dominant environmental features. (see Figure 1).

DISTRIBUTION DEFINITIONS

Endemic conservation targets occur exclusively within the ecoregion, but can occur exclusively on an island, or within a state

Limited conservation targets typically occur within the ecoregion but also occur within a few adjacent ecoregions

Widespread conservation targets occur within the ecoregion and are common in many other ecoregions

Peripheral conservation targets occur rarely within the ecoregion - the core of their range is in other ecoregions

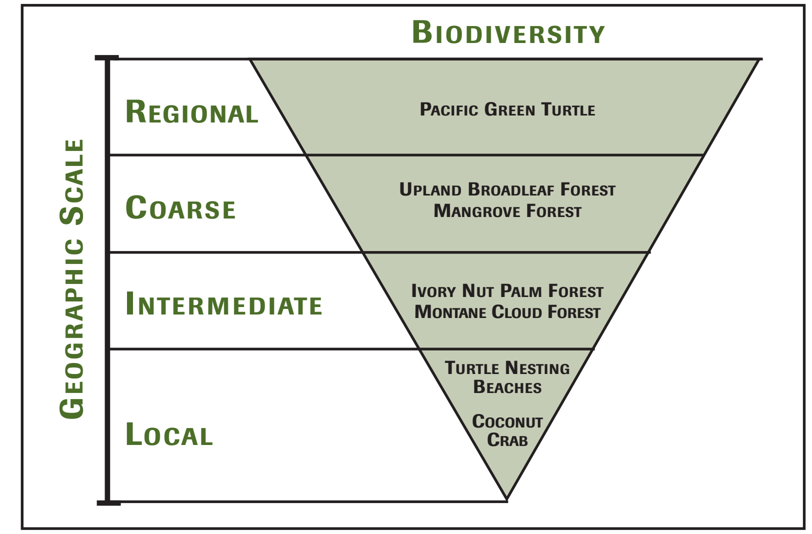
Step 2:
Assign attributes of geographic scale and distribution to each focal species, natural community, and ecological system so goals are adjusted based on ecological requirements that differ among the types.

The geographic scale of a conservation target refers to its spatial coverage. Scaled to island geography local-scale targets occur at tens of hectares, intermediate-scale targets occur at hundreds of hectares, and coarse-scale targets occur at thousands to tens of thousands of hectares (Figure 4).

The distribution of a species, natural community, or ecological system defines the range-wide distribution relative to the planning unit For example, endemic targets are restricted solely to the planning unit, while widespread targets are common in many other ecoregions (see above for definitions).

Understanding geographic scale and distribution helps planners set conservation goals that incorporate the vast differences in conservation targets and their unique requirements for persisting over the long-term.

Figure 4. Examples of the Spatial Scale of Biodiversity in the FSM



Step 3:
Set quantitative goals for each conservation target.

3.6.1
Goals for regional and coarse-scale ecological systems:

For coarse-scale terrestrial and marine systems (Mixed Broadleaf Forest, Mangrove Forest, High Island Nearshore Marine), goals were defined as a percent of their historic distribution within each stratification unit across the ecological planning unit (Table 4). Historic distribution was estimated based on topography, geology, and obvious patterns of land conversion. Percentage goals were difficult to determine scientifically, but regional experts considered the minimum dynamic area needed to withstand potential large-scale disturbance events such as typhoons and drought, both of which are expected to increase in frequency and severity due to global climate change (Wilcox 1992). Goals for marine ecological systems were set at 20%, based on current recommendations from the National Coral Reef Action Strategy (National Oceanic and Atmospheric Administration, 2002) to designate and manage 20% of the area of a marine system as a "no-take zone" as a threshold for maintaining healthy coral reefs and marine species populations. It is likely that future research will show that 20% is too small for particular species and habitats, so this should be considered a minimum goal, and the complete portfolio should include more, if possible.

Table 4. Conservation Target Goals for Ecological Systems, Natural Communities, and Special Features

Scale of Conservation Target	Conservation goals expressed as number of occurrences per state (stratification unit), or as a percentage of historic distribution.			
	Endemic	Limited	Widespread	Peripheral
Local	8	4	4	4
Intermediate	4	4	2	2
Coarse	30% of historic distribution	30% of historic distribution	30% of historic distribution	20-30% of historic distribution
Regional	None exist	4	4	None exist

Opposite Page: Ecotourism is a growing industry in the FSM (Village Hotel, Pohnpei)

By the end of October 2002, the teams had a "final" portfolio that included 130 Areas of Biodiversity Significance.

3.6.2 Goals for intermediate-scale and local-scale ecological systems, natural communities, and special ecological features

Conservation goals for local-scale endemic ecological systems, natural communities, or special features were highest at eight occurrences per state since there are relatively few locations where these conservation targets can be conserved. A minimum goal of four occurrences per state was set for limited, widespread, and peripheral local-scale ecological systems, natural communities, and special features. Conservation goals for intermediate-scale conservation targets ranged from four (endemic) to two (peripheral) (Table 4).

3.6.3 Goals for species targets

For species targets, the team considered habitat needs and migration patterns (if applicable) in setting conservation goals. Based on the Conservancy's ecoregional planning guidelines, two populations per state (stratification unit) was set as a minimum goal (The Nature Conservancy 2000). The minimum goal was increased for species that were:

a) more restricted in their distribution (e.g., endemic and limited),
b) smaller in geographic scale (e.g., local and intermediate), and
c) limited to one or two states (stratification units) in the planning unit.

As with ecological systems, natural communities, and special features, more restricted and smaller-scale species warranted higher conservation goals to capture more ecological variation and because these species were often endemic to the FSM (Table 5).

Goals for all conservation targets are listed in Appendix B. All conservation goals in this plan reflect best estimates by the team and must be tested and refined by monitoring the status and trends of the conservation targets over time.

Table 5. Conservation Target Goals for Species

Scale of Conservation Target	Conservation goals expressed as number of occurrences per stratification unit (state), or as a percentage of historic distribution.			
	Endemic	Limited	Widespread	Peripheral
Local	6 (two states) or 12 (one state)	4 (two states) or 8 (one state)	2	2
Intermediate	4 (two states) or 8 (one state)	2	2	2
Coarse	2	2	2	2
Regional	2	2	2	2

4.1 Portfolio Design and Selection

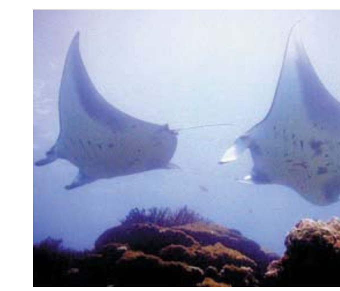
A key outcome of ecoregional planning is the identification of a suite of conservation areas, or "Areas of Biodiversity Significance" (ABS), that serves to capture the full array of biodiversity in an ecoregion (as detailed by the established conservation goals). In essence, it is a depiction of where conservation action is needed. This outcome is closely integrated with the development of conservation strategies to address the occurrences identified for inclusion into the ecoregional portfolio.

The process for delineating ABS′ occurred through a series of workshops where the planning teams drew boundaries on maps

around groups of ecologically similar target occurrences in close proximity. For example, an ABS was created to capture Pohnpei's Mixed Broadleaf Forest and all embedded species and natural communities. During ABS delineation, the team focused on areas where nesting and co-occurrence of species and ecological systems at multiple spatial scales contributed to an area's ecological complexity and integrity. Where possible, the team extended boundaries to tie together terrestrial and marine ecological systems and defined Areas of Biodiversity Significance that encompassed entire ecosystems. In all, 87 Areas of Biodiversity Significance were delineated during a first mapping exercise. During the January 2002 workshop, 100 additional target occurrences were recorded and 25 new ABS were delineated based on these new records.

The FSM ecoregional planning effort was identified to test an early version of the Ecoregional Portfolio Assembly Tool (EPAT) (Shoutis 2002). The tool was used to: 1) prioritize the ABS′ relative to each other, using factors of number of targets, variety of targets, and ABS functionality; and 2) assemble a draft ecoregion portfolio. Results of the draft portfolio suggested that inclusion of most ABS′ into the ecoregional portfolio was warranted. Very few conservation targets had available occurrence numbers to actually exceed established goals.

Because of a need to gain additional buy-in, and understanding the outcome of the draft portfolio assembly obtained through the use of EPAT, team leader Bill Raynor opted to more actively engage local partners and experts in the assembly of the ecoregional portfolio. Between June and October 2002, members of the Core Team consulted with the Local Expert Teams at locally-held workshops to solicit recommendations for the final portfolio. At these workshops, the Local Expert Teams worked closely with the Core Team to review and amend the data already gathered, and to rank each ABS by ecological integrity, urgency of threat, cultural significance, and feasibility. By the end of October 2002, the teams had a "final" portfolio that included 130 Areas of Biodiversity Significance.



This Page Left:
The Nature Conservancy's Program Director

This Page Top Right:
A male Yap Monarch

This Page Bottom Right:
Mantas

Opposite Page:
FSM National Capitol complex at Palikir, Pohnpei

4.2 THE ECOREGIONAL PORTFOLIO

The first iteration of the portfolio of Areas of Biodiversity Significance for the FSM Ecoregional Plan encompasses 130 sites (see Appendices A/D for maps and lists of all sites). The combined sites encompass 291,753 ha (1,126.11 square miles), or 19% of the Federated States of Micronesia's entire terrestrial and inshore area (including reefs and lagoon areas, but excluding the nation's territorial waters, which consist mostly of open ocean) (Table 6).

Because the land area of FSM is very small, 50% of the ABS (64 sites) and a majority of the total area (61% or 688 sq. mi.) are coastal marine sites connecting terrestrial and coastal targets. Marine-only sites, largely lagoons and coral reefs, comprise the second largest area at 28% (319 sq. mi.) of the total ABS area. Terrestrial sites, mainly upland native forests, make up just 8% (87.4 sq. mi.) of total ABS area, but total 23 sites. This reflects the relatively limited extent of natural terrestrial systems on small Pacific islands compared with the much larger marine systems surrounding them. Coastal freshwater areas, primarily coastal freshwater marshes, total just 3% (31.4 sq. mi.) of the total ABS area.

Table 6. Number and size of Areas of Biodiversity Significance by type

ABS Site Type	Number of ABS sites	Area (Hectares)	Area (Sq. Miles)
Terrestrial Sites			
Yap	3	651.94	2.52
Chuuk	9	4,328.06	16.71
Pohnpei	9	12,833.28	49.53
Kosrae	2	4,835.04	18.66
TOTAL TERRESTRIAL	**23**	**22,648.32**	**87.42**
Marine Only Sites			
Yap	6	49,471.10	190.95
Chuuk	10	20,683.29	79.83
Pohnpei	5	12,480.50	48.17
Kosrae	1	54.52	0.21
TOTAL MARINE	**22**	**82,689.39**	**319.17**
Coastal Marine Sites			
Yap	21	24,007.43	92.66
Chuuk	20	77,089.91	297.55
Pohnpei	18	75,695.26	292.17
Kosrae	5	1,466.07	5.66
TOTAL COASTAL MARINE	**64**	**178,258.67**	**688.04**
Coastal Freshwater Sites			
Yap	2	31.76	0.12
Chuuk	11	936.66	3.62
Pohnpei	3	5,283.09	20.39
Kosrae	4	1,904.89	7.35
TOTAL COASTAL FRESHWATER	**20**	**8,156.39**	**31.48**
OVERALL TOTAL	**130**	**291,752.77**	**1,126.11**

4.3 PRIORITY ACTION AREAS

All Areas of Biodiversity Significance in this plan are important to the long-term conservation of biodiversity in the FSM and justify conservation action. However, due to limited human and financial resources, the Core Team felt that a subset of priority sites was needed to catalyze partners into action and quickly make a conservation impact. These "Priority Action Areas" are intended to focus conservation action in the most biologically important and threatened areas within the next three to five years.

All Areas of Biodiversity Significance were ranked by Core and Local Experts Team members from Kosrae, Pohnpei, Chuuk, and Yap during a series of workshops from June-October 2002. Five criterion were used to prioritize each ABS: biological value, feasibility, leverage, urgency of threat, and cultural and historic value (see sidebar for definitions).

For each ABS, the criterion were scored high, medium, or low. The scores were averaged (each criteria was weighted equally) and ranked from highest to lowest overall (see Appendix E for definitions of high, medium, and low for all five criterion). The results were presented and discussed among the team members, with the highest-ranking ABSs designated Priority Action Areas.

The 24 Priority Action Areas capture an array of ecological systems, natural community and species targets, including the largest and most biologically important forests, marine ecological systems and coral reefs remaining in Micronesia (see Appendix F for a list of Priority Action Areas). Together, they represent 48% of the total terrestrial portfolio and 49% of the total coastal/marine portfolio, capturing at least one example of nearly all conservation targets:

- 100% (7 out of 7 total) terrestrial ecological systems
- 100% (4 out of 4 total) marine ecological systems
- 100% (6 out of 6 total) terrestrial natural communities
- 100% (4 out of 4 total) special ecological features
- 79% (19 out of 24 total) terrestrial species
- 100% (3 out of 3 total) marine species
- 100% (2 out of 2 total) freshwater/aquatic species

ABS CRITERION

Biological value:

1) the number of conservation targets within an ABS;
2) an overall viability score was calculated by combining individual viability rankings for each conservation target occurrence within the area.

Feasibility: The extent to which people, money, and a supportive sociopolitical environment are present to successfully implement conservation action.

Leverage: "Example Power," the potential for work at one ABS to catalyze effective conservation in other areas.

Urgency of threat: The degree to which an urgent, critical threat exists and is likely to destroy or seriously degrade the important species, natural communities, or ecological systems in the area.

Cultural and historic value: Areas with significance to the community, state or nation, including archeological sites, sacred grounds, ceremonial grounds, areas for collection of traditional use plants, hunting ground or trails (Yap and Kosrae only).

Above:
Rural family home on Pohnpei

Below:
Savanna fire on Yap Island

This suggests a need for restoration of terrestrial habitats in all four states to assure their continued viability.

4.4 SUCCESS AT MEETING CONSERVATION GOALS

An assessment of the Areas of Biodiversity Significance revealed that goals were met or exceeded for 20 out of the 53 selected conservation targets (38%) (Table 7).

Of the ecological system targets, the goals for Fern-Sedge Savanna, Riparian Forests (only in Yap), and Estuaries could only be met by selecting non-viable occurrences not currently in the portfolio. Some specialized targets, such as Montane Cloud Forest, Atoll Inland Mangrove, and Montane Perched Freshwater Marsh are so limited naturally that goals could not be met even when including all occurrences. In addition, despite including all remaining viable occurrences of historically widespread forest systems and communities (Mixed Broadleaf Forest, Clinostigma Palm Forest, Ivory Nut Palm Forest, and Terminalia/Nypa Swamp Forest), goals were not met for any of them. This suggests a need for restoration of terrestrial habitats in all four states to assure their continued viability.

Although many species targets are not imminently endangered, distribution and viability data were so poor for some of them that the team could not identify enough occurrences to meet the goals (Table 8). These species will require further biological monitoring to determine their spatial distribution, population, and overall viability. A few other terrestrial species are so rare and endangered, or have ranges so limited that only one, or in some cases, no occurrences could be confidently identified. *If these conservation targets are to survive and remain viable in the FSM, immediate research and monitoring on them is needed.*

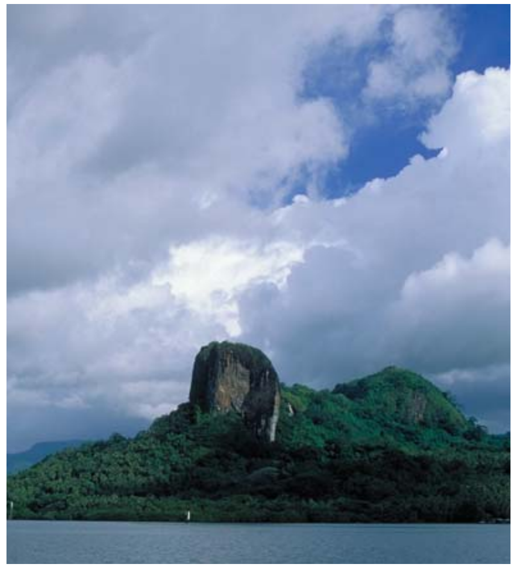


Table 7. Success at Meeting Conservation Goals: All Targets

Target Type	Total Targets	Progress Towards Meeting Conservation Target Goals				
		0-25%	25-50%	50-75%	75-100%	Goals Fully Met
Systems						
Terrestrial	7	0	2	2	3	3 (43%)
Marine and Coastal	4	0	0	0	4	3 (75%)
Freshwater Aquatic	1	0	0	0	1	1 (100%)
Total Systems	**12**	**1**	**2**	**2**	**8**	**7 (58%)**
Communities						
Terrestrial	6	1	1	3	1	1 (17%)
Total Communities	**6**	**1**	**1**	**3**	**1**	**1(17%)**
Other Ecological Features						
Other Ecological Features	4	0	0	1	3	3 (75%)
Species						
Terrestrial	26	10	7	3	6	6 (19%)
Marine	3	0	0	0	3	3 (100%)
Freshwater Aquatic	2	1	0	0	1	1 (50%)
Total Species	31	11	7	3	10	10 (32%)
TOTALS	**53**	**13**	**10**	**9**	**21**	**20**

Table 8. Species with limited or no occurrences identified

Species With Limited Occurrences Identified	Species with no occurrences confidently identified
Arno skink *(Emoia arnoensis arnoensis)*	Caroline Island ground dove *(Gallicolumba kubaryi)*
Cicadabird *(Coracina tenuirostris)*	Chuuk flying fox *(Pteropus insularis)*
Kosrae flying fox *(Pteropus ualnus)*	Chuuk greater white-eye *(Rukia rukia)*
Micronesian swiftlet *(Collocalia inquieta)*	Chuuk monarch *(Metabolus rugensis)*
Pohnpei flying fox *(Pteropus molossinus)*	Chuuk poison tree *(Semecarpus kraemeri)*
Pohnpei Island skink *(Emioa ponapea)*	Giant Micronesian gecko *(Perochirus scutellatus)*
Polynesian sheath-tailed bat *(Emballoneura semicaudata)*	Gray duck *(Anas superciliosus)*
Pohnpei river goby *(Sicyopterus eudentatus)*	Micronesian pigeon *(Ducula oceanica)*
	Mortlocks flying fox *(Pteropus phaeocephalus)*
	Pohnpei mountain starling *(Aplonis pelzelni)*
	Pohnpei short-eared owl *(Asio flammeus ponapensis)*
	Pohnpei tree snails *(Partula guamensis and P. emersoni)*
	Polynesian sheath-tailed bat *(Emballoneura semicaudata ssp. sulcata)*

Opposite Page Left: Traditional Yapese meeting house in rural Yap Island

Opposite Page Right: Sokehs Rock on Pohnpei Island

5.1 CRITICAL THREATS

During the third experts' workshops held in the four states, participants were asked to assess the threats to each ABS. Threat assessments were combined with other biological and non-biological criteria to prioritize the various ABS for conservation action, as described in Section 4.4. The top three threats across both ecoregions are overfishing/overhunting, coastal erosion/ sea level rise, and water pollution (Table 9). Key threats to ecological systems conservation targets are summarized in Table 10. A complete list of threats to each ABS is provided in Appendix G.

Table 9. Major Threats summarized across all Areas of Biodiversity Significance

Threat	Number of ABS sites affected by threat									
	Yap		Chuuk		Pohnpei		Kosrae		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Overfishing/overhunting	28	88%	17	34%	9	26%	10	83%	64	50%
Coastal erosion/sea level rise	24	75%	4	8%	4	11%	1	8%	33	26%
Water pollution	16	50%	2	4%	0	0%	2	17%	20	16%
Destructive harvesting	5	16%	6	12%	2	6%	6	50%	19	15%
Burning	2	6%	9	18%	4	11%	3	25%	18	14%
Erosion/Sedimentation	5	16%	1	2%	5	14%	4	33%	15	12%
Incompatible commercial development	3	9%	1	2%	5	14%	6	50%	15	12%
Invasive species	5	16%	1	2%	4	11%	2	17%	12	9%
Dredging	6	19%	0	0%	1	3%	3	25%	10	8%
Landfill/dumping	0	0%	5	10%	2	6%	2	17%	9	7%

Overfishing/overhunting was identified as the most urgent and critical threat across marine and terrestrial ABS in all states.

Table 10: Selected ecological systems and key threats

Ecological System	Threats
Estuary	Dredging; Filling; Erosion; "Reclamation"; Channelization/ levees; Oil spills; Clorox fishing; Sea level rise; Invasive species (e.g. Tilapia)
Mangrove Forest	Incompatible coastal development & reclamation; Alteration of Freshwater Regime; Dredging; Pollution (oil spills); Acidification; Nutrification; Sea level rise
High Island and Atoll Nearshore Marine	Water Warming (bleaching); Nutrification; Siltation; Loss of Herbivores; Disease; Divers; Trawling; Blast, Clorox, and Cyanide Fishing; Dredging
Freshwater Rivers and Streams	Clorox fishing; Pollution (human and animal waste); Sedimentation
Coastal Freshwater Marsh	Filling in; Pollution; Nutrification; Redirecting streams; Changing patterns of water flow; Inundation by salt water; Quarrying; Trampling
Montane Cloud Forest	Sakau cultivation; Overhunting; Invasive plants/animals; Altered composition due to Climate Change; Recreational activities
Fern-Sedge Savanna	Burning; Invasive species

Overfishing/overhunting was identified as the most urgent and critical threat across marine and terrestrial ABS in all states. For the last three decades, population growth and a shifting economy from subsistence to cash, has put new pressure on FSM's already declining natural resources (see Section 2.3 for details on population growth). Over the last several years, a general slow-down of the local economy has been prompted by reduced U.S. funding to the FSM through the Compact of Free Association. While FSM added 1,800 new jobs/year from 1970 to 1995, employment figures from 1996 to 2001 showed virtually no growth, with a net gain of only 88 jobs (FSM DEA 2002a). The public reaction over the last five years has been two-fold. Since 1997, an estimated 2,000 FSM citizens per year have emigrated to Guam, Saipan, and the U.S. in search of jobs (Hezel 2002). At the same time, citizens residing in Micronesia have become more exploitive of natural resources (terrestrial and marine) to survive—dynamiting coral reefs in Chuuk for fish, clearing watersheds to plant sakau on Pohnpei, and cutting mangroves in Kosrae for firewood. The people—who have elected to remain in FSM when so many others have left—are by default the guardians of the land, but they are also its main despoilers.

The breakdown of traditional management systems throughout Micronesia has exacerbated the situation. Historically, resource use in the FSM was governed by complex land and sea tenure systems and a variety of other methods including social stratification, territorialism, resource apportionment, harvest limitations, and effective sanctions (Falanruw 1982). However, use of traditional practices is declining due to a changing context, growing desire for western material goods, and a general lack of awareness about environmental problems. With the move away from traditional subsistence lifestyles towards a cash-based economy, most FSM citizens are unaware that the inshore fishery can only sustain a continuation of subsistence practices, with some small-scale commercial fishing in certain localities (FSM 1999). The result is that many finfish and shellfish populations are declining, and certain species such as the giant clam (Tridacna gigas) have been almost completely eliminated in some parts of the FSM (FSM 1999).

The following deficiencies in national legislation also contribute to overfishing and overhunting (Harding 1992):

- There is no specific national legislation which considers the exploration of minerals or covers environmental problems arising from dredging or coral mining;
- The current Endangered Species Act dates from the Trust Territory era and is neither sufficiently specific nor inclusive;
- There is no provision for the establishment of protected areas.

In addition, the government framework for conservation is insufficient. Modeled after the structure of the former Trust Territory of the Pacific Islands, it provides just one conservation officer all of the FSM, Republic of Palau, Republic of the Marshall Islands and Commonwealth of the Northern Marianna Islands.

Coastal Erosion and Sea-Level Rise, including increases in storm surge and saltwater intrusion into freshwater ecosystems, are already being experienced across the FSM, especially in low coral atoll islands (FSM 1999). Some scientists believe these events are a precursor of climate change. Humans have aggravated

Above:
Clinostigma Palm Forest (Clinostigma ponapensis) at mid-elevation on Pohnpei Island

these effects by unwise construction of sea walls, jetties, and other poorly planned coastal infrastructure, mostly from the mid-eighties through nineties, when the Compact provided large amounts of money for infrastructure development. Anticipated impacts from climate change include (FSM 1999):

- Tendency towards more frequent typhoons during local summer and fall seasons;
- Gradual increase in dry season in the western two-thirds on the FSM (Yap and Chuuk), especially December-April, with concomitant fire hazards;
- Projected accelerated sea level rise of 0.15 (minimum) to 0.95 meters (maximum) by 2100.

Under the higher estimates of sea level rise, many coral atoll islands in the FSM may become uninhabitable to humans and natural terrestrial ecological systems. Climate change induced sea-level rise is likely to have significant impacts to marine biodiversity (Buddemeier 1993; Wilkinson 1999) —effecting Turtle Nesting Beaches, low-lying Seabird Nesting Areas, and Mangrove Forests.

Water Pollution from the improper disposal of both solid and liquid wastes, mainly from domestic sources are a serious threat to coastal and marine inshore areas. This is especially true for population centers where people live in over-crowded conditions with only minimal sewage treatment. Existing sewage systems are often poorly constructed and inadequate for the population in the fast-growing district centers; coliform contamination of surface and ground waters is common (Detay et. al. 1989; SPREP 1993). Outer islands are particularly vulnerable as the presence of water lens makes it unwise to use septic systems for waste disposal.

Inadequate disposal of solid waste and lack of suitable landfill sites are also a major pollution issue in urban centers, and to a growing extent, in rural areas. The adoption of western packaged food and beverages and other products (refrigerators, cars, air conditioners, etc.) on all islands has created concentrations of solid waste that are major eye-sores, sources of pollution, and breeding grounds for rats, flies, and mosquitoes. Existing dumpsites are not adequately maintained, nor do any sites, with the exception of Pohnpei, have specific areas set aside for the disposal of hazardous material. In rural areas, garbage is dumped along roads, in streams, and in lowland marsh areas. On some high islands, solid waste is dumped in the mangrove zone to create land for community or private use, causing human health hazards from water pollution and reducing the health of the mangrove forests and their function as fish nurseries and nutrient regulators.

Erosion/Sedimentation from land-based activities (incompatible commercial development, agriculture, and other activities) has degraded freshwater, coastal, and marine areas on all islands. Soils on Micronesian islands vary from thin mantle overlying volcanic rock (often on very steep slopes) through stony clays, clay silts, loam and loamy sands, peat and swamp soils to sand and coral rubble (Spengler et. al. 1992; Laird 1982; Laird 1983a&b; Smith 1983). The high volcanic islands are especially prone to erosion and landslides. Steep mountainous areas make up 70% of Kosrae, 61% of Pohnpei, and 73% of Chuuk.

Over the last two decades, Compact of Free Association funds for infrastructure improvements greatly increased dredging, road construction and to a lesser extent, home-site and agricultural clearing—the major causes of earthmoving and disturbance. Fortunately, with a projected reduction in funds under Compact II, we can expect reduced home construction and road building, and consequently less excavation and access to ecologically fragile areas. Urban development resulting from rapid large-scale economic growth, in the form of resort hotels, golf courses, and garment factories, are also likely to decrease. With the option to go abroad to earn a living, economic development will seem less urgent than it once did (Hezel 2002).

Destructive harvesting of all types is significantly impacting FSM's biodiversity, primarily, the mangrove and broadleaf forests, freshwater and marine fish, and coral reefs. The people of the FSM depend heavily on marine resources for subsistence and commercial sales. Nothing exemplifies this more than resort to dynamite fishing. On Chuuk, and to a lesser extent other islands, dynamite and poisons are used to harvest large quantities of fish at a time, especially where fish populations are low. Unfortunately, these practices are endangering marine biodiversity. Exploitation and unsustainable use of terrestrial resources is also a significant problem especially forests, which are cleared for sakau and other crops.

Invasive species, especially in terrestrial systems, are a growing threat (Space & Falanruw 1999, Meyer 2000, Cowie 2000, Atkinson & Atkinson 2000). The isolation of the Micronesian islands makes them highly susceptible to invasive plants and animals. Invasive species (e.g., grasses, shrubs, vines, rats, cats, and parasitic snails) are believed to have contributed to the decline in a number species and communities currently in peril.

In the last 150 years, over 457 new plants and animals have been introduced to the islands of the FSM (Falanruw 2001). The South Pacific Regional Environment Programme (SPREP) recently published Invasive species in the Pacific: a technical review and draft regional strategy, summarizing the status of invasive species in Micronesia. In all, the report documented 10 "significant invasive land vertebrates" and 25 "dominant" and "moderate" invasive plants in FSM. The threat of invasive species remains very high with daily air and sea connections to neighboring island nations and territories with well-documented invasive species problems (e.g., the brown tree snake on Guam).

Dredging of sand and coral, especially on the high islands in state centers, has seriously impacted coastal environments and coral reefs. Besides physically destroying the coral at the dredging site, it induces siltation, increasing turbidity, and smothering coral with a blanket of sediment deposits. These sediment deposits reduce the amount of light reaching corals, upsetting their natural processes and possibly killing them. Unfortunately, urban development spurred by the first Compact of Free Association agreement (largely during 1986-96), also fueled much of the coral and sand dredging. Reduced funding from Compact II may decrease dredging as demand for home construction and road-building decreases (Hezel 2002).

In the last 150 years, over 457 new plants and animals have been introduced to the islands of the FSM (Falanruw 2001).

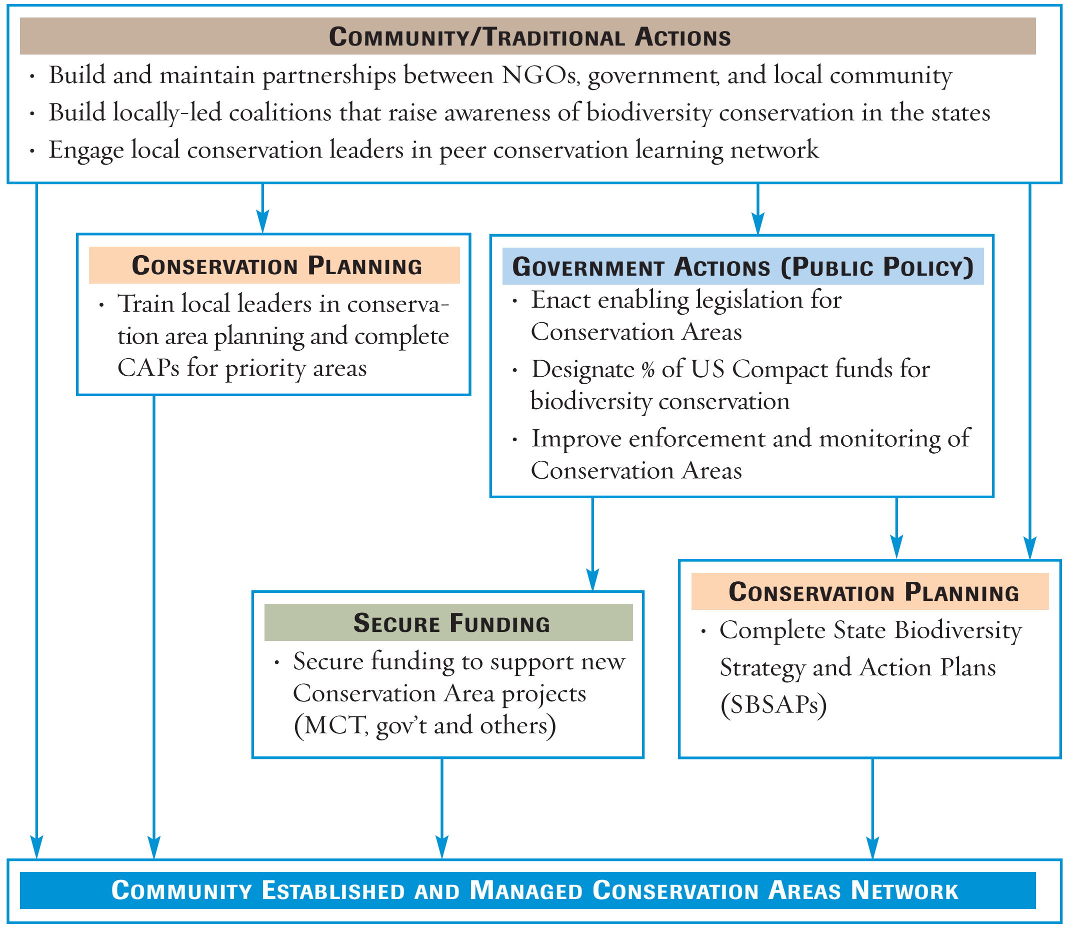
Opposite Page:
Rainbow over Yap Island

6.0 taking action: multi-area conservation strategies

This ecoregional plan describes a network of biologically significant areas that, if conserved, would ensure the continued viability of critical ecological systems, natural communities, and species in Micronesia. The planning teams believe a real opportunity exists to designate protected status (either legal or traditional) on some, if not most, of the Areas of Biodiversity Significance, and manage for sustainable uses there.

The highest priority multi-area strategy recommended by this plan to protect the FSM biodiversity is to create a government framework that enables local communities to establish and maintain conservation areas. Of course many actions will be required to support this overarching strategy, such as community-coalition building, securing funds, and conservation planning (Figure 5).

Figure 5. Multi-area Strategy Diagram



6.1 COMMUNITY/TRADITIONAL ACTIONS

6.1.1 Enhance organizational capacity

With few exceptions, limited institutional, technical, and financial resources hinder local institutions engaged in biodiversity conservation. The Conservancy and its partners will help organizations working in the 24 marine and coastal Priority Action Areas identified by this plan to assure that scientifically and culturally viable management strategies are developed, implemented, and monitored. The main strategy to accomplish this will be the Micronesia Leaders in Island Conservation Network (MLIC). Through MLIC, at least 40 leaders of Micronesian government and non-government resource management agencies and organizations will be engaged in an active peer learning network to increase the effectiveness of conservation programs in at least five Micronesian countries and territories (including the FSM, Palau, Republic of the Marshall Islands, Commonwealth of the Northern Marianas, and Guam).

6.2 GOVERNMENT ACTIONS (PUBLIC POLICY)

6.2.1 Build Coalitions to work on Improvements to Legislation

Coalitions of local partners are needed to improve public awareness of key threats and to recommend solutions to protect the FSM´s biodiversity. These locally-led state coalitions can improve biodiversity protection legislation by updating the National Endangered Species Law and

developing state-level comprehensive species protection acts focusing on inshore and forest biodiversity. Mutually supporting networks of state, municipal and traditional village-level organizations will work together to improve enforcement and compliance with all level of legislation. The private sector will be engaged to help develop biodiversity-friendly community solutions to unsustainable activities.

6.2.2 Enact Enabling Legislation for Conservation Areas

Enabling legislation is needed at state and municipal levels that support the establishment and management of conservation areas in each state. For example, Pohnpei's 1999 Marine Sanctuary Law enables designation of conservation areas that can be managed to sustain biodiversity. That law has allowed communities on Pohnpei to proactively designate new sanctuaries (MPAs) in marine and terrestrial environments.

Above:
Lowland sakau nursery on Pohnpei Island

Opposite Page Top:
Pohnpeian man carrying a sakau plant

Opposite Page Bottom:
Nan Madol ruins on Pohnpei Island

Within five years, the Conservancy and partners will begin to connect state Conservation Area Networks into a regional network.

6.2.3. Establish National and State Government Biodiversity Management Agencies

A national government agency within the Department of Economic Affairs is needed to oversee biodiversity preservation and management, and to coordinate outside assistance for this effort. State agencies are also needed to coordinate and support local biodiversity management.

6.3 CONSERVATION PLANNING

6.3.1 Conservation Area Planning (fine-scale conservation planning)

To encourage and guide the development of site-based management strategies for the Priority Action Areas, the Conservancy will introduce fine-scale Conservation Area Planning (CAP) to a cadre of at least 20 experienced FSM-based conservation professionals over the next five years. This process will help conservationists develop local strategies for the ABSs by establishing baseline and desired forest cover and coral reef health conditions, and by setting guidelines for monitoring.

Within five years, the Conservancy and partners will begin to connect state Conservation Area Networks into a regional network. Conservation area planning will be completed in at least three sites in each state, and will include the development of shared standards for MPA selection, design, and management, improvement of local and national policies on marine management (e.g., protection of spawning aggregation and turtle nesting areas, and improved compliance and decreased overharvest), and assessing connectivity between the FSM MPA network.

6.3.2 Complete State Biodiversity Action Plans

In April 2002, the FSM completed and submitted their National Biodiversity Strategy and Action Plan (NBSAP) to the Secretariat for the Convention on Biological Diversity to fulfill their obligations to the international community under the Convention. Currently, natural resource management authority is delegated to state governments, but state governments have yet to develop their own State Biodiversity Strategy and Action Plans (SBSAPs). The FSM Department of Economic Affairs needs to assist each state in developing a SBSAP. Each plan should specify local objectives and actions that ensure the long-term protection and management of biodiversity.

6.3.3. Ecoregional Planning: Replicating Success across Multiple Areas

Between 2004 and 2007, the Conservancy, with a suite of regional, national, and local partners and scientists, will undertake and complete ecoregional planning for other ecoregions in Micronesia. The Micronesian region covers an area of nearly 4.7 million square miles in the northeast central Pacific Ocean. It includes six countries (Palau, FSM, Guam, Commonwealth of the Northern Marianas, Republic of the Marshall Islands, Kiribati, and Nauru), five terrestrial ecoregions (Palau Tropical Moist Forest, Yap Tropical Dry Forest, Marianas Tropical Dry Forest, Eastern Caroline Tropical Moist Forest, and Eastern Micronesia Tropical Moist Forest), and as yet an undetermined number of marine ecoregions.

The Conservancy proposes to add a full-time Conservation Planner/GIS analyst in the FSM Country Office the next 1-2 years for ecoregional database management. This person could maintain and update tabular and spatial ecoregional databases, integrate these data with ecoregional data from Palau, and work with local and regional partners to periodically update occurrence, viability, and threat data.

6.4 SECURING PUBLIC FUNDS

6.4.1 Secure funding from US Compact II for the Environment Sector

There are two primary tactics to this strategy:

1) Implement the FSM NBSAP by securing Compact Environment Sector funding for state-level biodiversity conservation programs.
2) Mainstream biodiversity conservation into all levels of government decision-making to complement other environmental objectives.

Develop effective coordination and implementation of NBSAP, including securing funding from U.S. Compact II for the Environment Sector. Currently, the states are under no obligation to allocate U.S. Compact II funds to the environment. The primary strategy is to educate state representatives about the ongoing efforts of biodiversity conservation in the FSM, including the Ecoregional Plan. Increased education will facilitate better understanding about biodiversity conservation and its implications for the long-term health and well-being of FSM's citizens, and will in turn encourage states to dedicate sufficient funds in their respective budgets to support it.

6.4.2 Micronesia Conservation Trust

The Conservancy will assist the Micronesia Conservation Trust (MCT) to promote and support effective biodiversity conservation in FSM by maintaining a capable and committed Board of Directors, developing effective operating procedures, engaging skilled staff, implementing successful grant programs, and raising $20 million in capital (including pledges) by 2023. The primary focus is to raise $600,000 a year—$300,000 of which would support the creation of a $20,000,000 endowment, and $300,000 of which would support biodiversity conservation activities of the trust each year. The Conservancy's FSM Office will assist the Board of MCT in building a sound financial institution, including technical assistance in networking (at all levels national, state, and local), fundraising, organizational management, and awarding grants. MCT funds will be channeled to support priority action areas identified by this plan.

This Page:
Kapingamarangi (Pohnpei outer island) preparing a mangrove wood fish carving for the local tourist trade

Opposite Page:
Scientists visiting the Clinostigma Palm Forest (Clinostigma ponapensis) on Pohnpei Island

7.0 addressing data gaps looking toward the next iteration

The lack of comprehensive data on nearly all the conservation targets was a serious constraint to developing an ecoregional conservation plan that will ensure the long-term viability of the FSM´s native ecological systems, natural communities, and species. The Nature Conservancy's FSM Conservation Planner will work with partners to proactively address key data gaps encountered during the development of the first iteration of this plan.

7.1 GEOGRAPHIC DATA GAPS

Outer islands. The islands of FSM are dispersed over thousands of miles of ocean. Transportation and communication are sporadic and unreliable, except on the main islands. Because of this, the planning team depended primarily on local knowledge or resource agency partner staff that had recent personal experience with the outer islands. As a result, occurrences were mapped very generally, and the viability data is questionable--use of this data should be treated with caution. As opportunities arise, the team recommends biological inventories be conducted on all outer islands.

7.2 CONSERVATION TARGET DATA GAPS

Freshwater aquatic systems. Due to the lack of a freshwater expertise on the planning team and amongst partners, only a few general freshwater aquatic conservation targets, including Freshwater Streams and Rivers, Swamp Forest, Coastal Freshwater Marsh, Montane Perched Freshwater Marsh, and Terminalia/Nypa Swamp Forest, were mapped and used in this analysis. All other freshwater elements are grouped within the Freshwater Rivers and Streams conservation target. This remains a significant data gap. The FSM Planning Team will work with the Conservancy´s Freshwater Initiative to develop a more comprehensive classification and map the FSM´s freshwater aquatic systems to inform the second iteration of this ecoregional plan (currently anticipated to begin in FY05).

Open ocean. The Pacific Ocean itself is the largest system in the FSM, and was not identified as a conservation target due to a serious lack of data. There are several features of the territorial ocean waters of the FSM that make this system worth including in the plan. The Marianas Trench, the world´s deepest ocean trench at -35,000 feet, is located within the FSM's 200 mile Exclusive Economic Zone (EEZ)/territorial waters. Numerous and extensive submerged reefs, important to the nation´s fishing fleets, are located throughout Micronesia, but their biological health is largely unknown. The FSM government should work with regional and international science community to improve our knowledge of the ocean and its´ biodiversity and this information, once available, needs to be integrated into the nation´s biodiversity conservation actions.

Terrestrial vegetation.
Vegetation maps for the FSM are largely outdated. Most terrestrial occurrences were mapped from vegetation data derived from twenty year-old aerial photographs produced by the Trust Territory Government and the US Forest Service. The FSM desperately needs updated vegetation maps, similar to those produced from The Nature Conservancy´s recent efforts in Pohnpei, where aerial photographs produced new vegetation maps for 1995 and 2002.

Savanna/grasslands. The savannas of western Micronesia contain a variety of native and even endemic species. Further studies are needed to better understand the origin, dynamics and role of fire in these systems in order to develop appropriate conservation strategies.

Low-elevation broadleaf forests.
Previous botanical work on Pohnpei (Glassman 1952) suggests the existence of a discrete form of low-elevation broadleaf forest separate from the Mixed Broadleaf Forest. Due to extensive human modification of the island´s lowlands, only a few remnants of this forest type remain. This plan does not recognize the low-elevation broadleaf forest as a separate target largely because the planning teams lacked vegetation maps to distinguish it from the higher-elevation broadleaf forest. Consequently, several native and endemic species limited to lower elevations may not be protected by this plan. Additional work is required to characterize, map, and protect this rare forest type on Pohnpei.

Marine ecological systems. The Local Experts and Stakeholder Teams that focused on marine ecological systems were continually confounded by a lack of biological data for lagoons, coral reefs, and sea grass beds. To convey a sense of generality consistent with the lack of data, marine systems were classified into two categories High Island Nearshore Marine and Atoll Nearshore Marine. Nation-wide biological surveys are needed to demarcate marine communities, understand their relationships and dynamics, and determine their health and viability.

Chuuk broadleaf native forest.
Chuuk´s remnant native forests are limited to a few ridges on four of the lagoon islands and are by far the most endangered ecological system that are identified by this ecoregional plan. There is an urgent need for rapid fieldwork to assess the extent and viability of these remnant patches.

Flying foxes. Six distinct endemic species of flying fox (Genus Pteropus, also known as fruit bats) are found within the FSM, but very little is known about their habitat needs or current population condition and trends. Since data on flying foxes is so sparse, the planning teams were forced to rely on roosting sites within healthy forest as a surrogate indicator for population occurrence and viability. Clearly, more research is needed on the biology, current status, and recommended actions for these species.

This Page:
Traditional Pohnpei dancers performing

Opposite Page Top:
Kepirohi waterfall in Pohnpei

Opposite Page Bottom:
Young Micronesians at their home in Pohnpei

7.0 addressing data gaps looking toward the next iteration

Pohnpei short-eared owl. Little is known about the very rare Pohnpei short-eared owl (Asio flammeus var. ponapensis), a Pohnpei endemic subspecies that inhabits savannas. Lacking specific population data, savanna was used as a surrogate indicator to map populations. Serious concerns exist for the stability of the owl population on Pohnpei. Immediate work is needed to understand the biology, population status, viability, and threats to this species.

Arno skink (Emoia arnoensis). Little is known about this species, thus far recorded only in the Marshall Islands, Kosrae, and Nauru.

Giant Micronesian gecko. Thus far, the giant Micronesian gecko (Perochirus scutellatus), believed endemic to the FSM´s outer islands, has been found on only two atolls at opposite ends of the country. More work needs to be done to confirm species distribution and viability.

Other reptiles. Biological surveys for reptiles are scarce on all islands except Pohnpei. There is a strong likelihood that new endemic reptiles will be identified in ongoing work. Studies are needed to identify species present, their distribution, life histories, and viability.

7.3 ECOREGIONAL PLANNING PROCESS GAPS

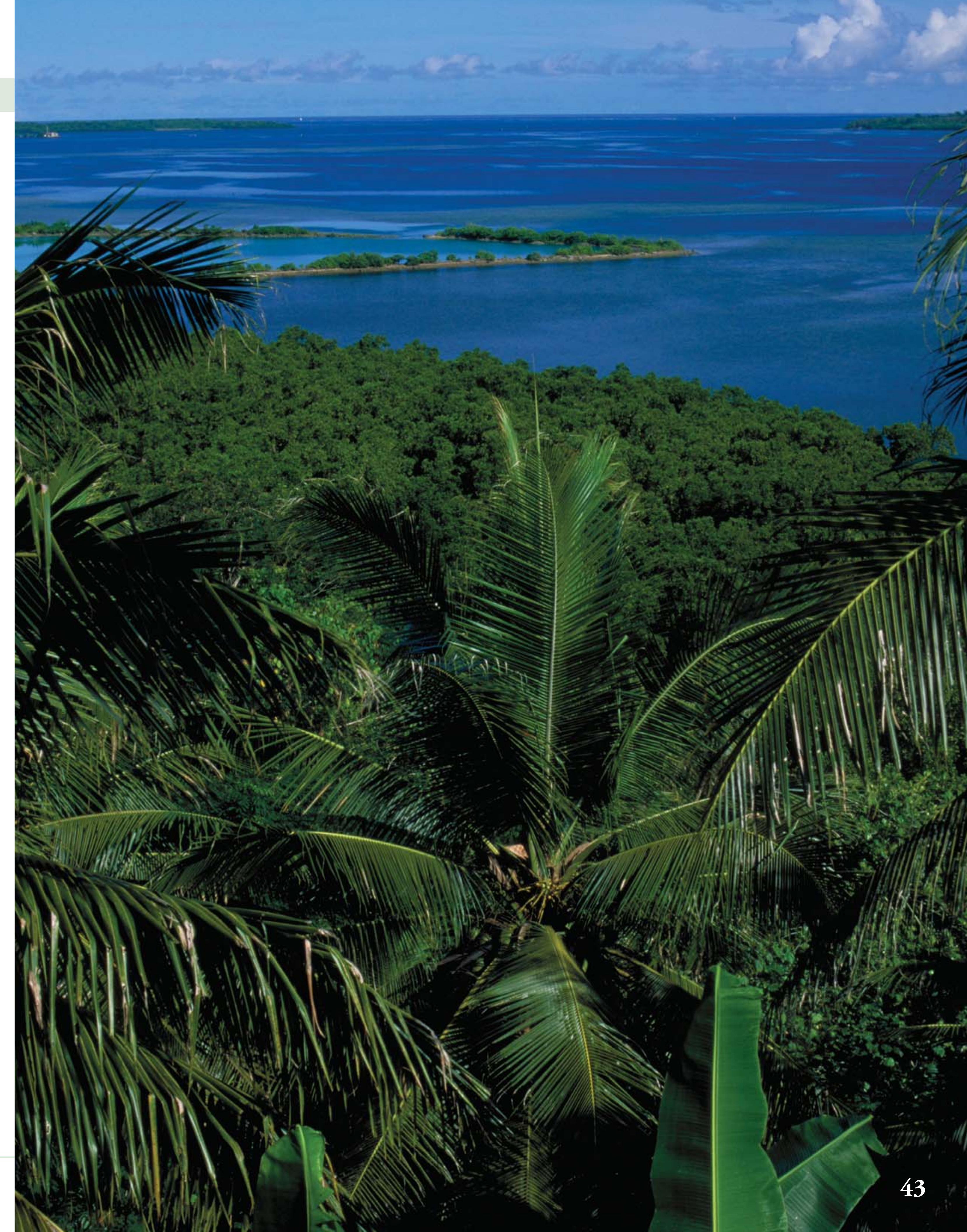
Viability Assessment and Goal Setting. Determining a conservation target's viability and conservation goals was a tremendous challenge to the planning teams. The general lack of data, especially for species, made it extremely challenging to determine viability and set meaningful conservation goals with confidence. The team had very little to draw on in terms of guidelines and examples from similar ecoregions, and as such, we recognize the very tentative nature of the first iteration of this plan. In future iterations of the plan, the viability assessments and goals will need to be revisited and updated by newly available data.

7.4 CONCLUSION

This conservation blueprint is by no means an exhaustive study on all that is known biologically about the islands and waters of the Federated States of Micronesia. However, as far as we know, it is the first effort to capture the collective biological knowledge of regional scientists and local experts and turn that knowledge into mapped focal areas for biodiversity protection. There is much work to be done, especially in understanding more about the size, distribution, life history requirements and health of the FSM's flora and fauna. Hopefully, future iterations of this conservation blueprint will be enhanced by new and ongoing studies on the region's biodiversity. Perhaps most importantly, this plan provides a place to start—where those concerned about the special places in Micronesia can collectively focus their efforts. A place to begin.

Hopefully, future iterations of this conservation blueprint will be enhanced by new and ongoing studies on the region's biodiversity.

This Page:
Stone money along a path in a rural Yapese village



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