

South Pacific Regional Environment Programme

Proceedings of the

**Fourth
South Pacific Conference
on Nature Conservation
and Protected Areas**

Volume II: Papers -
Keynotes, Themes and
Case Studies

Held at Le Lagon Resort,
Port Vila, Vanuatu

4 - 12 September 1989

IUCN
The World Conservation Union

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SOUTH PACIFIC REGIONAL
ENVIRONMENTAL PROGRAMME

Held at the Le Lagon Resort
Port Vila, Republic of Vanuatu

4 - 12 September 1989

Foreword

The Fourth South Pacific Conference on Nature Conservation and Protected Areas held in Port Vila, in 1989, continues the series of "National Parks and Reserves" conferences held in New Zealand (1975), Sydney, Australia (1979), and Apia, Western Samoa (1985). The decision was made at the Apia conference to change the name to its current title, to better reflect the importance of the wider issues of biological diversity conservation to the region. Tonga has offered to host the Fifth Conference in 1993.

The theme of the Fourth Conference was "the role of protected areas in sustaining Pacific island societies". The principal objectives were, in summary, to facilitate appropriate action in the region to conserve biological diversity; and, specifically, to review and revise the Action Strategy for Protected Areas in the South Pacific.

This is Volume Two of three volumes which comprise the full conference report. It contains key note papers, theme papers and case studies presented. Volume One summarises the sessions and records the highlights of the papers presented, principal points of discussion and the resolutions and decisions. Volume Three contains the remainder of the theme papers and case studies presented.

Copies of the three volumes of this conference report, the Action Strategy for Nature Conservation in the South Pacific, and any other SPREP publications, are available from the South Pacific Regional Environment Programme, P.O. Box 240, APIA, Western Samoa.

Since this conference, a number of events have confirmed the importance of biological diversity conservation (or nature conservation) to the region and to the world:

- Both the SPREP and Apia Conventions have come into force after having been ratified by the required number of countries.
- The South Pacific Biodiversity Conservation Programme, a 5-year, US\$ 10 million concerted effort to protect the biological diversity of the region, is being created. This is funded by the Global Environment Facility, established by a group of industrialised and developing countries in 1990 to assist developing countries to address environmental issues of global concern; and jointly administered by the World Bank, the United Nations Environment Programme and the United Nations Development Programme.
- The developed and developing nations negotiated an international Convention on Biological Diversity, now ready for signature. Nine Pacific Island countries have already signed.
- The United Nations Conference on Environment and Development, held in Brazil in June 1992, represents the largest ever gathering of world leaders meeting to discuss environmental issues. The Pacific Island Countries made a significant contribution to this process.

In the light of these, the foresight of the Pacific Island countries in holding these regular nature conservation conferences is to be commended. The conferences enable the region to discuss common issues relating to the conservation and sustainable development of natural resources, in particular in relation to the difficulties facing small island countries as they struggle to meet the needs of their people at the same time as conserving biological resources for now and for the future. Such conferences also enable the region to speak with one voice on the world stage - a contribution whose value is greater than the small numbers of people and area of land would suggest.

Vili Fuavao

Director, South Pacific Regional Environment Programme

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Part 1

Keynote Addresses

Theme: The Role of Protected Areas in sustaining Pacific Island Societies

**Key Note Paper: RESOURCE CONSERVATION AND BIOLOGICAL DIVERSITY:
HOW THEY CONTRIBUTE TO SUSTAINABLE DEVELOPMENT**

P.H.C. (Bing) Lucas
Commission on National Parks and Protected Areas
I U C N - The World Conservation Union

1. GIANT PANDA, BRAZILIAN RAINFOREST, THE EARTH

This decade has seen a rapid evolution in thinking on resource conservation issues. Public perception of resource conservation has moved from justified concern about the survival of endangered species to concern about endangered ecosystems and, now, endangered earth.

It is typified by China's giant panda, the Brazilian rainforest and recognition that life on earth is endangered.

The giant panda has been and remains a global symbol of endangered species. As the symbol of WWF, it has given wildlife conservation a high profile with emphasis for many years on attractive species like the giant panda or dramatic species like the Royal Bengal tiger. Much effort and scientific study has gone into saving species like these with the clear answer that their survival outside captivity depends on protection of their habitat.

Today Prince Philip as President of WWF is saying this:

"WWF's prime concern has always been to ensure that wild species of plants and animals are not driven to extinction by human interference. We have also always known that the survival of individual species depends on the survival of all the other inter-related species within their habitats and on undisturbed and unpolluted climatic conditions."

Now the pressure of development on the Brazilian rainforests is gaining world headlines, as the focus of concern moves from individual species to ecosystems. The conflicts which surround what National Geographic in December 1988 called "Brazil's Imperilled Rain Forest" highlight on a tragically grand scale what has already happened in many other societies. The clash between indigenous subsistence people and new settlers seeking a better life away from crowded cities and the conflict between preservation of ecosystems and economic development are not new issues. But greater awareness of the critical importance of sustainable development, the scale of the changes and their implications are today making front page news of the Brazilian rainforests and the conservation and environmental issues they raise.

TIME magazine's cover for January 2, 1989 featured "Planet of the Year - Endangered Earth". It identified four key problems in extinction, global warming, waste, and overpopulation. TIME's cover story in that issue said that as we head into the last decade of the 20th century, we find ourselves at a turning point: the actions of those now living will determine the future, and possibly the very survival of the species. It said that "every individual on the planet must be made aware of its vulnerability and of the urgent need to preserve it. No attempt to protect the environment will be successful in the long run unless ordinary people... are willing to adjust their lifestyles... We owe this not only to ourselves and our children but also to the unborn generations who will one day inherit the earth."

Concluding its lead article, TIME called for "a universal crusade to save the planet." It said that "unless mankind embraces that cause totally, and without delay, it may have no alternative to the bang of nuclear holocaust or the whimper of slow extinction."

2. THE WORLD CONSERVATION STRATEGY AND OUR COMMON FUTURE

This means that, as the decade ends, concerns about sustainable development and resource conservation have moved from the backrooms of the scientific and conservation community to the front pages of the world's press.

This means, too, that the rest of the world has caught up with South Pacific thinking on nature and human responsibility for it. That thinking is well expressed by the Maori of Aotearoa, (New Zealand) in the saying:

Papatuanuku (Mother Earth)
how proud we are to be your trustees during our lifetime.
Just as our tipuna (ancestors) gifted you to us,
so may we gift you to future generations,
that they may share with you and care for you.

It was in 1980 that the World Conservation Strategy (WCS) was launched as the product of a great deal of preparatory work and consultation within the network of IUCN. It carried an impressive list of collaborators and endorsements - UNEP and WWF, FAO and Unesco.

It made some fundamental statements which incorporated what it called the ethical imperative that echoes the Maori philosophy of each generation's responsibility for the taonga (treasures) of Papatuanuku (Mother Earth). The way the WCS put it was that

"we have not inherited the earth from our parents,
we have borrowed it from our children."

The principles of the WCS are being picked up and applied in numbers of countries through national conservation strategies. The challenge for a "global agenda for change" moved into the world political arena in 1983 when the General Assembly of the United Nations set up the World Commission on Environment and Development (WCED) "to propose long-term environmental strategies for achieving sustainable development by the year 2000 and beyond."

That Commission, chaired by Gro Harlem Brundtland, took the concerns raised by science, and identified the need for political action. It was well equipped to do this, with Mrs. Brundtland herself Prime Minister of Norway and, among its membership, ministers and senior political leaders from Italy, Zimbabwe, Cte d'Ivoire, the Federal Republic of Germany, Indonesia, Nigeria, and Yugoslavia.

The Commission's report, published in 1987 under the title "Our Common Future", said that "the time has come to take the decisions needed to secure the resources to sustain this and coming generations."

3. LIVING RESOURCE CONSERVATION WITHIN SUSTAINABLE DEVELOPMENT

The WCS linked the conservation of living resources with human survival. It pointed out that "earth is the only place in the universe known to sustain life", and pointed out that "human activities are reducing the planet's life-supporting capacity at a time when human numbers and human consumption are making increasingly heavy demands on it." The strategy said that "humanity's relationship with the biosphere will continue to deteriorate until... sustainable modes of development become the rule rather than the exception. Among the prerequisites for sustainable development is the conservation of living resources."

The Strategy identified living resource conservation as having three specific objectives:

- to maintain essential ecological processes and life-support systems
- to preserve genetic diversity
- to ensure the sustainable utilisation of species and ecosystems.

Each objective contributes significantly to sustainable development.

The maintenance of ecological processes and life-support systems provides for soil regeneration and protection, the recycling of nutrients, and the cleansing of waters on which human survival and development depend.

The preservation of genetic diversity protects the range of genetic material found in the world's organisms and is the basis for breeding programmes for the protection and improvement of cultivated plants and domesticated animals. It is the basis for much scientific advance, technical innovation and medicines, and provides security for many industries using living resources.

Ensuring the sustainable use of species and ecosystems in the form of fish and other wildlife, forests and grazing lands supports millions of rural and island communities as well as major industries.

Clearly then, apart from the moral and ethical basis for the stewardship of creation, there are very sound economic and social reasons for conserving living resources.

Recognition of the fundamental need to conserve living resources for their intrinsic worth and as a basis for human survival has provided a strong focus for the future direction of conservation effort. The many links between biological diversity and human economy have been highlighted in an IUCN publication by Jeffrey A. McNeely, "Economics and Biological Diversity. Developing and using economical incentives to conserve biological resources".

This is both a most valuable source of argument for conservation of living resources and also a key guide to programmes to safeguard biological diversity.

4. BIOLOGICAL DIVERSITY

More and more is being said and written today about biological diversity or, in shortened form, biodiversity. Simply stated, biological diversity is the variety and variability among living organisms and the ecological complexes in which they occur. A recent WWF International publication says that "biological diversity means the wealth of life forms found on earth: millions of different plants, animals and micro-organisms, the genes they contain and the intricate ecosystems they form." The same publication identifies three components of biological diversity:

- Genetic Diversity represents the subtle variations that occur with some genes: the biochemical packages passed on by parents that determine the physical and biochemical characteristics of their offspring with consequent differences in size or colour, susceptibility to disease. This genetic diversity allows species to adapt to changing conditions in the wild, and has made it possible for human intervention to develop new breeds of crop plants and domestic animals.
- Species Diversity represents the variety of living organisms on earth as distinct from a single species which can interbreed and produce fertile offspring. Species diversity gives character and variety, for example to the wildlife of Africa and Australia.
- Ecosystem diversity represents the variety of communities of plants and animals and the non-living elements of their environment such as water, soil, minerals and air. The complex relationships within the living communities create interdependence among the various elements.

Efforts to conserve genetic and species diversity must therefore be directed to conserving the ecosystems of which they are a part. Consequently, programmes for the establishment and management of protected areas are a primary means of achieving biological diversity and contributing to sustainable development.

5. BENEFITS OF BIOLOGICAL DIVERSITY

The importance of biological diversity to human society was highlighted by the President of Costa Rica, Oscar Arias Sanchez, when he spoke at the 17th IUCN General Assembly in February 1988. He said that destruction of biological diversity can have serious repercussions by irrevocably altering the basis of the planet's vital processes. He spoke of the significant ethical and aesthetic reasons for preserving diversity as well as the tragic economic consequences of loss of habitat and diversity of species.

Later in 1988, at Fontainebleau, France, when the IUCN commemorated the fortieth anniversary of the foundation there, it issued the Declaration of Fontainebleau and a statement of its goals and objectives for World Conservation. Pride of place was given to biological diversity with the goal, "the conservation of the biological riches of the world". Under this heading, tropical forests, coastal areas and islands were identified as priority areas.

Clearly, the preservation of biological diversity is seen as important, with coastal areas and islands having a particularly important place in global priorities.

But what are the potential benefits to small island societies of conserving natural resources rather than exploiting them?

Spiritually and culturally, the benefits are considerable. There is a strong conviction in many societies of the Earth and the Sky as parents of all life. This carries with it a responsibility to respect the values they represent and the life they support, and to treat them as a sacred trust to be safeguarded and handed on to succeeding generations.

The flora and fauna are an essential part of the sense of place and community identity of people - of what the Maori call the turangawaewae - which gives an individual authority and a sense of belonging, and a society its broad identity. Many islands and island groups gain much of their uniqueness from the species or subspecies which are found there and nowhere else.

Maintenance of biological diversity is often built into the social customs of societies. The concept of tapu areas associated with land or reefs gives spiritual and cultural benefit in maintaining traditional customs, and is of flow on economic advantage in providing the area concerned with relief from exploitation to enable its regeneration and restocking to occur naturally.

The cultural benefits of preserving biological diversity extend beyond these to ensuring the sustained availability of plant and animal species for traditional cultural uses. The New Zealand Maori Rangatira can no longer have his chiefly mana respected by a feather cloak from the huia, for that bird species became extinct so a part of Maoritanga was lost. However, today concern for traditional wood products for canoe building and for cultural artifacts, for weaving, for natural dyes is a strong force for conservation of the species used in these activities. A revival of interest in traditional medicines and remedies is similarly leading to an extensive review of their plant sources and their conservation status. This, in turn, is leading to initiatives to protect remaining natural sources of supply, and to supplement these by propagation of these specially valued species.

Sadly, with some species like the huia it is too late. But it is never too late to stem the tide of losses, and to protect what remains.

Biological diversity provides sustenance for many people.

In looking at the value of biological diversity to a country's social and economic development, it has been said that biological resources are in one sense beyond value because they provide the biotic raw materials that underpin every major type of economic endeavour at its most fundamental level. Historically, small island societies were classic examples of this.

6. THE VALUES OF PROTECTED AREAS

At this conference, with its focus on protected areas, it is appropriate to review the benefits they bring, in addition to the very important but intangible spiritual and cultural values already discussed.

This has been covered very well in the IUCN book on "Economics and Biodiversity", from which I draw the list of the main economic benefits of protected areas. It is clear from the list that, spiritual, cultural and inspirational values apart, protected areas play a vital part in preserving biological diversity, and contributing to the social and economic well-being of societies:

- Stabilising hydrological functions.
Run-off is slower and more uniform than on cleared land, and this assists in safeguarding water supplies for a variety of purposes including human consumption, irrigation and hydro-electricity. Venezuela's Canaima National Park was trebled in size to protect a critical catchment feeding hydro-electric development, while large national park areas in Panama safeguard the canal which links the Pacific and Atlantic Oceans.
- Protecting soils.
Good soil protection by natural vegetation in a protected area can reduce the risk of landslides, safeguard coastlines and riverbanks, and prevent the destruction of coral reefs and freshwater and coastal fisheries by siltation. The Rapti River in Nepal forms the boundary of Royal Chitwan National Park. Its south bank in the park with good vegetation cover is stable, but monsoon rains and high water levels erode the overgrazed fields to the north.

- **Contributing to climatic stability.**
Growing evidence suggests that undisturbed forest helps maintain local rainfall and provides a better environment for agriculture and human comfort.
- **Conserving harvestable renewable resources.**
While protected areas are not established to provide for a harvest of renewable resources, some can contribute in this way without detriment to them and with great benefit to nearby communities. Again using Royal Chitwan National Park as an example, a two-week period is set aside each year when local villagers can harvest thatch grass from the park. The annual crop is estimated to have a value of US\$1 million, and it provides almost the only remaining source of this traditional roofing material.
- **Protecting genetic resources.**
Protected areas are of great value as "in situ" genebanks, and improvements in tropical agriculture and silviculture depend largely on their preservation. People are known to make use of some 15,000 species of wild plants and animals for foods, medicines and utilities, many to a commercially important degree.
- **Preserving breeding stocks, population reservoirs and biological diversity.**
Protected areas may safeguard crucial life stages or elements of wildlife populations that are widely and profitably harvested outside their boundaries. In India, for example, a partially protected mangrove forest produced some 110 kgs prawns per hectare per year while an unprotected mangrove produced just 20 kgs per hectare per year. As already emphasised, protected areas also act as "refugia" where biological diversity can be maintained.
- **Maintaining the natural balance of the environment.**
The existence of a protected area may help maintain a more natural balance of the ecosystem of a much wider area. A protected area may give sanctuary to breeding populations of birds which control insect pests in agricultural areas. Bats, birds and bees based in protected areas pollinate fruit trees and crops in surrounding areas.
- **Supporting tourism and recreation.**
At the national level, tourism frequently brings in valuable foreign exchange and at the local level can stimulate profitable local industries and provide employment opportunities. The expectations should be realistic, however, and the developments and services sensitive to the physical and cultural environment. Accommodation, food and transport, and guiding services, souvenirs and handicrafts are all ways of providing local benefits, but need to be handled sensitively and in a manner which provides benefits to local people. There should, of course, be direct benefit to local people from the recreational facilities and from associated services.
- **Creating employment opportunities.**
Employment opportunities come from managing the protected area and from providing for the associated tourism services. In some places (Sagarmatha National Park in Nepal), local people have been recruited and trained for protected area management while one nature tourism company in Nepal directly employs some 5,000 people.
- **Providing facilities for research, education and monitoring.**

Protected areas provide excellent living laboratories for studies of potential value to tropical agriculture especially to find the secrets of high stable productivity on poor soils. They provide opportunities for comparison with other areas under different land use, and are important as reference areas. Protected areas are valuable in education for school children, and for tertiary institutions in biology, ecology, geology, geography and socio-economics. They are valuable resources for public education. Research can bring direct benefits through researchers purchasing supplies locally and using local support staff.

A STRATEGY FOR ACTION

Much more will be heard of the need to preserve biological diversity - for example, IUCN is developing a new international convention to encourage nations to commit themselves to support the concept, and to adopt mechanisms to share the cost of preservation as equitably as possible.

Protected area managers know the value of parks, nature reserves and the like in the cultural, ethical, social and spiritual senses, and increasingly their economic values are being identified. But there is still a long way to go before the world's decisionmakers are prepared to make the hard decisions in favour of protection, in spite of the substantial evidence that protected areas are vital to sustainable development.

What, then, needs to be done to ensure that biological diversity is conserved to sustain Pacific Island societies? Here are five general kinds of activities which can be adapted for each particular situation.

1. Convince governments that conservation pays. Build recognition that conservation is a fundamental part of development. This can include demonstrating the economic viability of protected areas, ensuring that the true costs of depleting biological resources are known to planners, and building public opinion in support of decisive conservation action.
2. Help influence national policies for managing biological resources. Most countries do not have national objectives for conservation. High-level politicians need to be encouraged to go on record as stressing the importance of natural values for the national interest, and to back their statements up with the necessary resources and policy changes. Non-government organizations can help set the national agenda for conservation, both directly through lobbying efforts, and indirectly through public information.
3. Design new approaches for managing biological resources. While resources in strictly protected areas are usually under government protection, biological resources outside them are very vulnerable to pressures, and can become grossly depleted. New structures of responsibility need to be established or revived among communities. It is often easier to make products such as firewood, game meat and sea foods available to local communities through letting them manage the harvest. Use rights can often provide a sound economic base for communities as well as an incentive to conserve.
4. Help strengthen protected area authorities. Few South Pacific countries - or countries anywhere for that matter - have fully effective authorities responsible for their protected areas. Such areas are the most outstanding natural areas of the countries concerned, and with appropriate management could bring far greater benefits to the country and to the world. Since few government conservation agencies have sufficient budgets, innovative funding mechanisms need to be developed includ-

ing debt swaps, lobbying the major development agencies to build conservation components into their projects, and seeking support from international conservation organisations.

5. Provide on-the-ground support to conservation projects which implement the principles outlined. Many governments already accept the need for conservation but need practical, on-the-ground assistance. International agencies and NGOs can often provide the necessary direct support through such actions as:

- focussing rural development projects on known areas of high biological diversity (for example, adjacent to existing national parks or other protected areas);
- supporting field demonstration projects for managing biological resources, including direct action in protected areas and in the adjacent lands and waters; and
- providing support to indigenous peoples seeking to manage their own biological resources on a sustainable basis.

CONCLUSION

You, who are at the cutting edge of conservation, can learn from what is being done elsewhere and IUCN and its Commission on National Parks and Protected Areas will endeavour to communicate experience - successes and failures - so that all can benefit from experience. In January 1992 IUCN and the Commission are planning to bring together parks people from around the globe in the IV World National Parks Congress.

As you build strategies for conservation based on scientific principles and which take account of the South Pacific conservation ethic and culture, you can show participants in the World Parks Congress how you are conserving biological diversity in your part of the Pacific.

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**Key Note Paper: THE CHALLENGE OF SUSTAINABLE DEVELOPMENT
IN THE SOUTH PACIFIC**

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The term "sustainable development" has become popular in recent years. Most of us know that it means development that can be sustained or continued on into the indefinite future, and there is general agreement that it is a desirable goal. Yet, while it is easy to understand the concept as an abstract idea, we seldom take the time to look at all of its implications, or to ask how, in fact, we should be trying to apply it in our own countries and in our daily lives.

The best general description of sustainable development can be found in the report of the World Commission on Environment and Development (often called the Brundtland Commission after its chairwoman, the Prime Minister of Norway), published under the title "Our Common Future". This report, commissioned by the United Nations General Assembly, demonstrated that development would only bring lasting benefits if it respected the long-term requirements of the environment, and maintained the productivity of our planet's resources.

Basic principles of sustainable development

To understand the concept of sustainable development, it will help to go back to some basic ecological concepts, those of open and closed systems. An open system is one in which materials freely pass into and out of the system. An animal is an open system because it takes in food from, and discharges wastes to, its environment. A closed system is cut off from its surroundings so that most exchanges are not possible. Scientists can make a simple closed system by putting some air, water, algae and small fish in a sealed bottle. The algae grow, making food and oxygen from carbon dioxide. The fish eat the algae and use oxygen to produce carbon dioxide and fertilizer. If properly balanced, such a closed system can continue almost indefinitely. Note that this system is closed for materials but not energy. Sunlight shining through the bottle is needed to provide energy to drive the system. The energy is used, and then lost as waste heat. It is impossible for a system to be completely closed to energy.

An open system must be in balance with its surroundings in order to survive; that is, it must take in as much as it puts out. If it takes in more, it will grow larger; if it loses more than it receives, it will get smaller until it eventually disappears. A system may be open for some things and closed for others, but the same principles apply to each component of the system. An open system may in fact be a part or sub-unit of a larger system. An animal is part of an ecosystem which may consist of many animals and plants, or be as simple as one animal and one plant. However, at some point, the largest system is generally a closed system. For us it is the earth itself that is the closed system. What we have on this planet we must live with and cannot escape from.

Sustainability is thus determined by the nature of the system and its state of balance. Sustaining a closed system means maintaining the processes that keep the system working so that it does not run down or collapse to a simpler or less productive state. Sustaining an open system means keeping the inputs in balance with the outputs, as well as keeping the internal processes functioning. Open systems are inherently dependent on outside processes, and are thus more vulnerable. Closed systems tend to have greater stability within certain limits.

The most elaborate systems we know are natural systems. Over the millions of years that life has been evolving on this planet, these systems have become very complex and highly productive, but they have always respected the principles of sustainability. An organism, species or ecosystem that cannot sustain itself will disappear.

The coral reef ecosystem is a good example of what such natural systems can do. A coral reef can maintain high productivity and a high density and diversity of living things despite a limited environment that is poor in resources. It is able to sustain this richness because of a high level of recycling of scarce materials and high efficiency in the transfers within the system, which make it possible to develop some of the characteristics of a closed system.

Sustainability of island systems

It is worth paying some attention to these basic principles underlying sustainable development because of their particular importance for islands such as those in the South Pacific. Islands by their nature are closer to closed systems. Whether it be the coral reef separated from other coral reefs by expanses of deep water, the island biota cut off from other areas of land, the traditional culture that evolved its own special island characteristics, or the island economy that is handicapped by the high cost and difficulty of exchanges with the outside world, all have tended to be closed in on themselves and able to maintain a certain stability. In island systems the limits are much closer and the relationships generally simpler and on a smaller scale than in larger systems. The stability that these island systems have evolved over the centuries is thus more vulnerable to being upset by new outside pressures and influences. The management is inherently more delicate.

In general, the smaller the island, the simpler the system it can maintain. Small islands have fewer species than larger ones. The older and more isolated the island, the greater its uniqueness and the more vulnerable it tends to be to new outside influences. Old isolated islands generally have the most endemic species.

Threats to sustainable development

These characteristics of islands make sustainable development even more important to attain, but they also make it more difficult. As the technological developments of modern civilization integrate the island countries more and more into the global socio-economic system, they introduce many threats that leave the future of many islands seriously in doubt.

One of the greatest world-wide threats to sustainable development is the degradation of soils. This is particularly critical on islands where the land is already so limited. Good soils are built up by slow processes of weathering and the addition of organic matter by the overlying vegetation. Most good soils have been made by forests. When the forest is cut down and the land developed, soil building slows down or is even reversed. Exposed soils are subject to erosion in heavy rains or to wind-blown erosion during droughts.

Traditional development allowed fallow periods for the soil to recover. Today modern farming techniques favour high immediate productivity over long-term sustainability, and the future of the basic soil resource of many islands is in doubt.

Water is generally one of the most limiting resources on islands. The freshwater-storage capacity of many islands is limited. Water use is increasing, often beyond the rate at which rainfall can replenish the supply. Increasing pollution and salinisation from overpumping are threatening existing supplies. Water supplies will be one of the greatest constraints to develop in the South Pacific in the years to come.

The rate and extent of degradation of coastal resources in the Pacific Islands is alarming. Pollution and sedimentation from land-based sources, development of facilities for transportation and tourism, overfishing and the use of destructive fishing practices, all are damaging the productivity of the coral reefs, mangroves, seagrass beds and other resources on which so many islanders depend.

On the land as well, development has steadily reduced the areas covered by forest and other native vegetation. Many species are also selectively removed by hunting or logging. As the natural areas get smaller, they become less viable and can support fewer species. Many unique island species have already become extinct, and many more are threatened as development continues.

On top of these pressures, man has introduced many new species which are often more aggressive than island species. These invasive species are preying on or crowding out many native plants and animals. Large island areas have been turned into wastelands by feral animals, or covered with tough and largely useless scrub or grasslands. The ability of the islands to support either natural or human populations has dropped accordingly.

Another threat to sustainable development that is particularly evident on islands is the improper disposal of wastes. Modern material civilization involves the production of enormous quantities of wastes, many of which are difficult for the natural systems of islands to absorb or recycle. Some are produced on the island, but most are imported, and they tend to accumulate, becoming a steadily increasing problem. Resistant materials such as plastics, metals and glass are problems because of their physical presence and bulk. More dangerous for the island system are chemical wastes, both fertilizers and toxic chemicals, which can easily contaminate the limited island water supplies, soils and coastal waters, upsetting natural systems and rendering food and water unfit for human consumption.

All of these problems are aggravated by the growth of the human population on many islands. Sustainable development is not possible if the population surpasses the carrying capacity of the island; permanent dependence on outside assistance is the inevitable result. In some cases it is less the total capacity of the island to support the increase so much as the rate of growth that is the problem. Too fast a growth rate can outstrip a country's capacity to provide schooling, work, and even food and water in adequate amounts.

Island strategies for sustainable development

There is no single strategy that can apply to all islands, since each is a special case with its own particular characteristics. However certain general principles should be part of any island strategy for sustainable development.

Islands, apart from the very largest, need to be managed as a single integrated system. The interactions between forests, soil, water and coastal resources are too great to be able to treat each of them in isolation. Yet the sectoral divisions between different government ministries or departments make such integrated management difficult. Many cases of unsustainable development result from decisions about the use of one resource being taken without considering the effects on other resources that are some other department's responsibility. The creation of broadly-based co-ordinating or planning bodies, and the use of environmental impact assessment techniques for all major development projects can help to avoid these problems. The adoption of a national conservation strategy or environmental strategy can also define the framework within which sustainable development is possible.

The problem of nature conservation is particularly acute on islands. Any development reduces the area available for natural communities. Since the number of species an island can support is dependent on its area, any reduction in area will eventually lead to some loss of species. To minimise this effect, nature conservation needs to be planned as an integral part of the sustainable use of island resources. Protected areas are essential, but they should be linked where possible by corridors of natural vegetation to increase their effective area and permit interchange. Some active replanting of species important for food or shelter for threatened species can also increase the available habitat. Some species do not mind human presence, and developing suitable habitat along roadsides and in gardens can both beautify the human environment and give those species more room to survive.

It is clear that man has so interfered with nature that most natural systems will not be able to survive for long without some human interference and management. This is particularly true for island endemics that have lost their competitiveness in the face of more aggressive invaders. The active elimination of introduced species, the propagation of rare native forms, and the substitution of human efforts for natural processes that have been lost with development are all measures that can be taken to sustain natural systems.

Ultimately, man should become an integral part of the natural system, modifying it as necessary to produce the products and raw materials he needs, and passing on his wastes for recycling within the system. Many island problems will only be solved when human society there is structured more like a closed system. The island should produce as much as possible of the water, food, energy and materials needed by the human population without human impacts diminishing their long-term productivity. Obviously some goods will always have to be imported, but sustainability of the island system will require control of the materials allowed on the island and provision for their safe disposal or export as necessary.

Given the small size and fragility of island systems, sustainable development will require some selectivity in the types of development permitted. For instance, powerful pesticides may be useful in agriculture, but on a small island under tropical conditions, they may represent too great a risk to the island and its inhabitants. A single accidental spill could poison the island water supply or destroy a major part of its coastal fisheries.

It should not be assumed that because the island system is limited, growth and development are not possible. Just as the coral reef system is able to maintain its great richness despite a limited environment, so can island societies hope for continued improvement. However, to be sustainable, any development must be based on the careful development of underexploited resources, or on improvements in the efficiency of, use of and recycling within the existing system.

Sustainable development in a changing world

One challenge for sustainable development in the South Pacific will come from the expected changes in climate and the associated rise in sea level due to human impacts on the global environment. A special effort will be needed to ensure that the islands can continue to meet human needs and to preserve their natural diversity and productivity under the stress of rapid changes.

On atolls and in coastal areas, coral reefs will need protection from all damaging influences, and reef growth may need to be stimulated, so that the reefs can keep up with rising sea level, and can produce enough sand and rubble to maintain the land areas. Encouraging increased calcification on reefs is doubly desirable because it not only builds the land but also removes carbon dioxide, one of the principal causes of global warming.

Those islands in the cyclone/typhoon belts will need to plan for a possible increase in the frequency and force of cyclones. Building standards will have to be raised. Cyclone-resistant trees will need to be planted to protect forests and crops. Agricultural techniques may need to be modified to reduce the costs of storm damage. Erosion control and flood protection measures will have to be reinforced.

Water supplies will be particularly vulnerable to the effects of climate changes. Not only may rainfall patterns change, but low-lying ground water supplies will be subject to increased salinisation with sea level rise. Islands where fresh water supplies are already marginal will face a particularly difficult future.

Nature conservation will be a special challenge under changing conditions. For island species already reduced in numbers and restricted to fragments of their former habitat, a single cyclone might be enough to push the species to extinction. Protected areas will need to be planned on different parts of the islands with different exposures to reduce the risks of such catastrophic extinctions.

The challenge of sustainable development will not be an easy one to face in the South Pacific. It will require a broader perspective on the state of each island environment and the needs of its essential resources. It will demand changes in the structure of governments to co-ordinate and integrate actions more efficiently. Above all it will require the political and public will to control the present threats to sustainable development and to be more selective in the kinds of development approaches and lifestyles the islands can afford. In return, Pacific Islanders will gain human dignity and self reliance, and the assurance that they will leave for their children not a degraded shadow of their former island paradise, but a future of hope and promise.

Part 2

Planning for Sustainable Resource Management

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Introduction

Conservation and development are fundamentally linked by their dependence on living resources. Both conservation and sustained development require an attitude of stewardship, to provide for today's need as well as to conserve the stock of living resources for tomorrow. Governments and international organisations have tried many different approaches in their efforts to integrate planning for resource conservation and sustainable development. Whilst different approaches have met with varying degrees of success, one approach, the National Conservation Strategy (NCS), has shown particular promise as a mechanism for achieving the integration of conservation and development.

This paper examines how an NCS can be used to integrate conservation and development planning, and comments on the way in which an NCS has been developed and implemented in Australia.

Why a National Conservation Strategy

The environment ultimately sustains all life. The world's resources are finite, and ecosystems around us have a limited capacity to regenerate after damage. Yet human activities are progressively reducing the planet's life supporting capacity at a time when rising human numbers and consumption are making increasingly heavy demands on it.

Most governments put a high value on economic development and growth, so that everyone in the community can enjoy a better standard of living. A "no growth" policy may have attractions for some who are fortunate enough to already enjoy a comfortable standard of living. It is not a policy favoured by those who have difficulty in meeting their basic needs, and it is clearly not an option for poorer countries. Poverty itself is a major source of environmental problems.

Fortunately we do not face a stark choice between economic growth and preservation of the environment. A number of authorities, most recently the World Commission on Environment and Development (the Brundtland Report), have pointed out that we have the ability to make development ecologically sustainable. Ecologically sustainable development means economic growth that does not jeopardise the future productive base: renewable resources are managed so that they are not permanently depleted.

In 1980 the World Conservation Strategy (WCS) was prepared by the IUCN, with cooperation and financial assistance from UNEP and WWF and in collaboration with UNESCO and FAO. Its aim is to help advance the achievement of sustainable development through the conservation of living resources. The WCS

1. explains the contribution of living resource conservation to human survival and to sustainable development;
2. identifies the priority conservation issues and the main requirements for dealing with them;

3. proposes effective ways for achieving the strategy's aim.

The WCS represents a consensus of policy on conservation efforts in the context of world development and provides both an intellectual framework and practical guidance for the conservation actions necessary. In particular it identifies the actions needed both to improve conservation efficiency and to integrate conservation and development.

The WCS shares the limitations of every global analysis; it is obliged to make global generalisations, to aggregate and simplify a host of diverse local phenomena and to ignore a multitude of local problems. These drawbacks were recognised in its development, and a principal recommendation of the WCS is that every country review the extent to which it is achieving conservation, and develop national and subnational conservation strategies to meet its requirements.

The purpose of a National Conservation Strategy is to focus attention on the relevant priority requirements for conservation, to stimulate appropriate action, to raise public consciousness, and to overcome any resistance there may be to taking the action needed. National and subnational strategies are seen as a means of focussing and coordinating the efforts of government agencies, together with non-governmental conservation organisations, to implement the World Conservation Strategy within countries. An NCS is to provide nationally agreed guidelines for the use of living resources so that the reasonable needs and aspirations of the society can be sustained in perpetuity.

Preparing a National Conservation Strategy

A framework for national and subnational conservation strategies is provided in the World Conservation Strategy. This suggests strategic principles which should be adopted, the main obstacles which should be considered and the steps to be taken in preparing a strategy. Briefly it proposes that every strategy should

- determine the priority requirements for achieving the objectives;
- identify the obstacles to meeting the requirements;
- propose the most cost-effective ways of overcoming those obstacles.

An important consideration is determining priorities, as it is essential to be sure that the available resources and effort are applied to the highest priority requirements first. Criteria recommended for determining conservation priorities are significance, urgency and irreversibility.

Considerable importance is attached to the process of developing an NCS as it provides a major opportunity for building environmental awareness. The WCS notes that although the planning and execution of conservation strategies is primarily the responsibility of governments, non-governmental organisations should be fully involved to ensure that all the resources available to conservation are deployed coherently and to the full, and thus accelerate the achievement of conservation objectives. Consultation, cooperation and involvement of all levels of government, private industry and the community are seen as essential elements of the process of developing and implementing a Strategy. The WCS itself was the product of an extremely thorough consultation process involving over 700 scientists throughout the world.

Widespread public consultation was undertaken in preparing the NCS for Australia, involving more than 20,000 people over a two-year period. The main steps in this process included:

- a) preparation of specially commissioned papers on aspects of living resource conservation;
- b) discussion of the papers at a National Seminar;
- c) preparation of a discussion paper released for public comment;
- d) consideration of over 550 written submissions on the discussion paper;
- e) preparation of a Conference Draft Strategy and associated background papers; and
- f) the convening of a National Conference attended by more than 150 delegates at which a consensus was reached on the NCS for Australia.

Similar processes have been used by State governments in Australia in preparing their conservation strategies. The process inevitably results in a compromise: amongst conservationists who may differ on the relative importance of particular problems; and between conservationists and developers, who may differ in their emphasis on maintenance on the one hand and production on the other. This is recognised, but is considered less important than the need to develop an agreed statement of conservation requirements and priorities around which conservationists and developers alike can rally.

Main elements of a National Conservation Strategy

The essential elements of any Conservation Strategy are:

- a) the Definitions of developments and living resource conservation;
- b) the Objectives of living resource conservation;
- c) the Principles; and
- d) a set of Priority National Requirements and Actions.

Definitions of development and living resource conservation are provided in the WCS. These have been adopted for the national and subnational strategies. Similarly three main objectives of living resource conservation are identified in the WCS:

- to maintain essential ecological processes and life support systems
- to preserve genetic diversity
- to ensure the sustainable utilisation of species and ecosystems.

These are appropriate for adoption in a national strategy, but particular countries might also wish to add further objectives in developing their own strategies. Australia chose to add 'to maintain and enhance environmental qualities' as an objective in its National Strategy. The State of Victoria chose to add two further objectives to its strategy

- to ensure the wise use of non-renewable resources
- to protect and manage natural systems and their diversity for the non-material needs of society.

The WCS also proposes four strategic principles which should be taken into account in strategies:

- integrate conservation and development

- retain options for future use
- mix cure and prevention
- focus on causes as well as symptoms.

Again, countries may wish to add to these in their National Strategies. Australia added two further principles:

- educate the community
- accumulate knowledge for future application.

The most important element of any strategy is that in which priority requirements are identified, and actions to address these requirements are detailed. Whilst the earlier elements of a strategy establish the policy framework, the actions section should identify specific measures which are to be taken to achieve the objectives of the strategy. Actions should address mechanisms, such as legislation, planning procedures and organisations, as well as natural environmental management and resource conservation issues such as marine living resources, water resources and agriculture. National priorities should be established, and policy objectives, immediate actions and long term directions set to address each priority.

Implementing a National Conservation Strategy

Strategies are means, not ends in themselves. It is vital that the broad objectives are translated into day-to-day decision making. The commitment of government at all levels, and the active involvement of the community is needed for successful implementation. In Australia the objectives of the NCS have been used to develop guidelines for Ministers and for its recently established Resource Assessment Commission, and are intended to underlie all government decisions on resource-use issues:

- there should be an integrated approach to conservation (including all environmental and ecological considerations) and development, by taking both conservation and development aspects into account at an early stage
- resource use decisions should seek to optimise the net benefits to the community from the nation's resources, having regard to efficiency, resource use, environmental considerations and an equitable distribution of the return of resources.
- Commonwealth decisions, policies and management regimes may provide for additional uses that are compatible with the primary purpose values of the area, recognising that in some cases both conservation and development interests can be accommodated concurrently or sequentially, and in other cases choices must be made between alternative uses or combinations of uses.

Although most conservation progress is to be won within government bodies and other organisations concerned with development and conservation, the measure of such progress will be improvements on the ground and in the water. The status of ecosystems needs therefore to be closely monitored and strategies adjusted in light of any change.

Conclusion

The development of national conservation strategies has been shown internationally to be a useful mechanism for achieving the integration of resource conservation and ecologically sustainable development. The process by which a

strategy is developed, is itself usually of value, as it can inform and educate, develop participation in and support for decision making, change attitudes, and help to foster a conservation ethic. The success of an NCS will depend on continuing government and public support, on establishing ways of evaluating its implementation, on ensuring that it continues to be updated, and on involving the community in its further development and application.

**CASE STUDY: DEVELOPING A NCS FOR VANUATU - A MODEL NCS FOR THE
 SOUTH PACIFIC**

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Introduction

The concept of a National Conservation Strategy as proposed here differs from any that has been undertaken elsewhere within the globe in its emphasis on public education and participation and local-level conservation planning. The small population of Pacific Island nations makes such an approach possible, the peoples' strong attachment to their limited land scattered over many small islands makes it necessary. It is hoped that the Vanuatu National Conservation Strategy will be implemented as a pilot activity, and, as the IUCN/SPREP regional programme on National Conservation Strategy, be prepared throughout the region with the assistance of IUCN and the South Pacific Regional Environment Programme.

During the last 20 years it has become apparent throughout the world that there are serious problems with the management of the human environment and the natural resources on which we depend for life. Some of these problems come from development and from using technologies without understanding all their side effects; others come from lack of development and the pressures from the increasing numbers of the poor on the limited resources available to them.

The response to these problems at the world level has been marked by the United Nations Conference on the Human Environment (Stockholm, 1972), the subsequent creation of the United Nations Environment Programme, the adoption of the World Conservation Strategy in 1980 and the recent report of the UN-sponsored World Commission on Environment and Development, which emphasised that sustainable development was essential to our common future.

In the South Pacific regional environmental activities began at the South Pacific Commission in 1974, included the signing of the Convention on the Conservation of Nature in the South Pacific at Apia in 1976, and led to the South Pacific Regional Environment Programme (SPREP). The SPREP Action Plan was adopted at the Rarotonga Conference on the Human Environment in 1982, and the SPREP Convention was signed in 1986. Today SPREP provides technical and educational support for a wide variety of environmental and conservation activities in the region.

Many countries have created governmental structures responsible for the environment, and these have been helpful in responding to immediate environmental problems. However, responding to problems is more expensive and less effective than avoiding them. It has been harder for governments to take a broad view of environmental requirements as they touch all areas of government activity, and to adjust development programmes to ensure that they bring sustainable benefits without creating environmental problems. This is the goal of a National Conservation Strategy.

Vanuatu became independent in 1980, and it has thus been able to incorporate environmental concerns from the beginning in the foundations of its national life. It has made great progress given the limited resources available, and a desire to go further is apparent throughout the government. The development of a national conservation strategy for Vanuatu was the next logical step and

the Ministry of Foreign Affairs and External Trade officially requested technical assistance from the International Union for Conservation of Nature and Natural Resources (IUCN) in November 1986 for the preparation of a Vanuatu National Conservation Strategy. It has taken some time to arrange funding for that request, but the project is now underway.

A National Conservation Strategy (NCS) is a way for a country to spell out how it is going to meet its objectives for sustainable development. Since conservation concerns everyone, it should be developed through consultation with all points of the community, from school children to ministers, from village councils of chiefs to central government departments. Decisions affecting the environment are made at many levels, from the individual farmer clearing land for a garden, to the Council of the Ministers. The NCS will only be achieved by everyone participating in its formulation.

The NCS should represent a national consensus on how the people want their country to be in the future. This Consensus should be recorded in a document, the National Conservation Strategy, that should be endorsed at the highest levels of government. It should serve as a guide for planning and development in the same way as a national development plan or a physical plan. It is complementary to these plans in that it takes a long-term view of the requirements for sustainable national development. It sets a framework for the continuing series of government development plans.

OBJECTIVES: EXISTING POLICY FOR ENVIRONMENT AND CONSERVATION IN VANUATU

The Constitution of the Republic of Vanuatu spells out the guiding principles for the nation. Article 7(d) states:

"Every person has the following fundamental duties to himself and his descendants and to others:

- (d) to protect Vanuatu and to safeguard the national wealth, resources and environment in the interests of the present generation and of future generations."

The Second National Development Plan (1987-1991) aims to achieve sustainable development for Vanuatu. Two of the six National Development objectives are specifically directed to that end.

The third objective is to:

- "increase productive utilisation of the country's natural resource base as a means of generating viable and sustained economic growth".

This is explained as the exploitation of land, fishery, forestry and mineral resources at a pace and in a manner which neither compromises development in the future nor leaves present opportunities untouched. Use of resources such as the forest cover, which is only renewable in the long-term, will be carefully planned to ensure that benefits are not only maximised, but also equitably disturbed as between generations. Other resources, such as the natural science society, the marine resources and land, are not over-exploited to ensure that they are not destroyed in the process.

The sixth objective is to:

- "ensure that Vanuatu's unique environmental and cultural heritage is not damaged in the process of economic development and change".

The process of economic development will generate new aspirations, attitudes and values. In pursuing development the environmental and cultural effects will be considered to avoid detrimental effects. The objectives will be to conserve all that is positive in the many diverse cultural traditions of Vanuatu, and to ensure that the environment of the country is not damaged in the pursuit of growth and development.

The aim of the Vanuatu National Conservation Strategy is to help implement these objectives.

THE CONCEPT OF A NATIONAL CONSERVATION STRATEGY.

Conservation has been defined in the World Conservation Strategy to mean "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations". Thus conservation is positive, aiming at the renewable use of living resources. Conservation, like development, is for people. We develop resources to meet human goals; we conserve them to ensure that such use can continue. These are the same objectives spelled out in DP2.

METHOD : Preparation of the National Conservation Strategy

The preparation of the Vanuatu National Conservation Strategy (NCS) will involve a carefully co-ordinated series of activities designed to achieve the maximum possible participation of the people of Vanuatu in building a consensus for conservation. The aim is to achieve the three key principles of NCS:

- Sustainable development
- Conservation of the national heritage
and
- Self-reliance.

Governmental Activities - Sectoral Strategies

Each Department and Unit concerned will need to prepare a brief sectoral description of their policies and programmes as they relate to conservation and implementation of the sustainable development objectives of DP2.

<u>Topic</u>	<u>Responsible Department</u>
Agriculture	Agriculture
Forestry	Forestry
Fisheries	Fisheries
Mining	Geology
Water	Geology
Energy	Energy Unit
Tourism	National Tourism Office
Population	National Planning and Statistics Office
Health	Environmental Health Unit
Education	Education
Custom	Cultural Centre/Malvatumaauri

It will be particularly useful in these sectoral reports to bring out information on the following conservation-related problems: change in forest cover, protection of water supplies and water catchments, soil erosion, vulnerability to natural disaster such as cyclones and volcanic eruptions, storage and handling of potential pollutants (petroleum products, pesticides, fertilizers, other toxic chemicals), subsistence versus commercial use of resources, conservation of species and critical habitats, relations with custom waters and fisheries and projected development over the next 10, 20 or more years.

Regional Environmental Planning Base Maps

In preparation for consultations at the regional and area level, it will be necessary to prepare sketch maps, or overlays for the standard 1: 5000 base maps, showing:

- important water catchments and water supplies;
- susceptibility to erosion (slope);
- forest cover, commercial potential, subsistence uses;
- agricultural areas and crops;
- land use potential;
- important coastal fisheries areas or critical habitats;
- areas of nature conservation interest;
- villages, facilities, roads, transport infrastructure;
- tourism areas, scenic sites, recreation potential;
- custom, cultural and historic sites;
- sites of known or suspected mineral resources;
- facilities with potential pollution risk;
- data on environmentally-related health problems;
- population size, growth rate, 25/50/75 year projections;
- leased and alienated land;
- land available to resettle displaced or excess people;
- climate, rainfall, vulnerability to cyclones;
- coastal risks from erosion, flooding, sea-level rise.

Much useful material for these maps now exists or is being collected in NPSO, ORSTOM, 1983 Regional Development Programmes Research Reports, Geological and land use maps, VEDP Research Report, Marine Resources Survey, 1983 Agricultural Census, 1989 National Census, and various planning workshops carried out by various governmental and non-governmental organisations.

Education Materials

The following educational materials will need to be prepared for use in the NCS campaign and afterwards.

A simple audio-visual programme, posters, and illustrated manual in Bislama presenting the basic principles of conservation and sustainable development at the village level, and giving an introduction to local planning. The SPC film "Story of an Island" could be used as a complement to this programme where possible, particularly if a new soundtrack can be prepared in bislama.

Educational materials for the upper primary school level on the philosophy of conservation and sustainable use, describing basic resource use problems and their solutions. A poster on the NCS to be put up in all the classrooms would be excellent. The SPREP slide/tape programme, "Problems in the Pacific Islands Environment" with narration in Bislama should be useful in upper primary and secondary school as well as with the general public. Educational programmes and materials on the National Conservation Strategy for secondary schools. Much general material already exists at Malapoa College and other

secondary schools which could be related to the NCS theme. A set of training materials in rural environmental management can be borrowed from SPREP; many of the units could be easily adapted for secondary school use in Vanuatu.

Basic reference on the natural history, geology, fauna, flora and marine life of Vanuatu for school use and for the general public, with trilingual text and ample illustrations.

Conservation materials for radio broadcasts (some materials should be available from SPREP, but they will probably need translation and adaptation).

The educational materials for schools will be distributed through official channels. They will need to be introduced to teachers through the Education Department's network of advisers and through short teacher-training visits or workshops during Environment Unit trips to the Local Government Council regions, as well as through the Vanuatu Institute of Education.

Training of the National Conservation Strategy

Since the NCS will require the active participation of many groups of people in and out of government, it will be necessary to ensure that key groups are adequately informed about the basic issues of sustainable development and conservation - such as regional planners, agricultural extension officers, school principals and other planned meetings, local government councils and their secretaries.

Legislation and Controls

A project is now underway to review the legislation concerning conservation and environment and to recommend modifications or additions.

Public Activities

A public information campaign to be launched to make the National Conservation Strategy as widely known as possible, and encourage participation in its development,

- an opening event;
- radio programmes;
- participation by local leaders, both government and non-governmental organisations, churches, schools and private organisations
- school activities - competitions etc..

WORKPLAN - PHASE 2

The following is the workplan and tentative timetable for the preparation of the National Conservation Strategy, assuming that approvals and outside financial support can be obtained rapidly. Some activities will require consultant assistance, but most can be done with resources in Vanuatu within government or through subcontracts.

Approval of National Conservation Strategy Prospectus for phase 2 by National Development Committee and Council of Ministers (December 1988)

Pre-phase 2 preparations (October 1988-March 1989)

- Assemble data for planning maps
- Begin development of educational materials
- Prepare sectoral strategies within government

Government activities (April-May 1989)

- Complete and duplicate planning maps
- Draft and publish educational materials
- Produce supporting audio-visual materials in Bislama
- Prepare broadcast scripts
- Workshop for LGC secretaries and regional planners
- Survey conservation areas (consultant)
- Prepare environmental legislation (consultant)

Public activities (June-November 1989)

- Public launching of NCS
- Weekly radio broadcasts
- Meetings with all LGCs and Area Councils for development of local strategies and planning maps
- Meeting of Malvatumauri on heritage conservation
- Conference on religion and conservation
- Consultation with representatives of private sector
- School activities on NCS, including competitions
- Public hearings on NCS in Port Vila and Luganville
- National Conservation Day

Compilation (November-December 1989)

- Make copies of agreed planning maps for national and local use
- Prepare final NCS document and annexes
- Make video version of NCS for general circulation
- Submit NCS to Council of Ministers for approval
- Print final NCS

BUDGET (US Dollars)

The following budget details the outside support essential to the completion of the Vanuatu National Conservation Strategy. It does not include the considerable contribution in staff time to be provided by the Environment Unit and other government departments, as well as supporting office services.

	US\$
- Consultation for NCS compilation at end of phase 2 1 m/m (fee, subsistence and travel)	12 500
- Sub-contracts for drafting school curriculum materials (in Vanuatu)	4 000
- Local travel for local strategy preparation (2 trips to each area, airfares and subsistence)	10 000
- Workshop for LGC secretaries/regional planners	2 000
- Drawing and copying of planning maps	5 000
- Aerial photos and mosaics	500
- Posters	3 000
- Production of school curriculum materials	3 000
- NCS presentations: flip charts, albums	1 000
- Video-cassettes of SPREP films (incl. dubbing)	1 000
- Outside translating and typing	1 000
- Printing of NCS documents	5 000
- Miscellaneous & contingency	2 000
- IUCN Technical and Management Support	8 000
	58 000
TOTAL	58 000

The following additional consultant support and educational activities would speed up the preparation of the second phase, increase the effectiveness of the educational outreach of the NCS among the population, and facilitate its implementation.

- Consultant assistance for materials preparation 1 m/m (fee, subsistence and travel)	12 500
- Outside translating and typing	2 500
- National conservation day	2 000
- Sub-contracts for preparing natural science guides	3 000
- Printing of natural science guides	10 000
- T-shirts for school competition awards	1 000
- Video-cassette on Vanuatu NCS	14 000
- Photocopier for map and document production (Planning maps, conference proceedings, pamphlets for churches, field workers, etc..)	5 000
- IUCN Technical and Management Support	8 000
	58 000
TOTAL	58 000

Information on terrestrial biological resources is sorely lacking, requiring a survey of areas of conservation interest.

- Consultant for conservation areas survey 2 m/m (fee, subsistence and travel)	25 000
	25 000
OVERALL TOTAL	US\$ 141 000

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CASE STUDY: ENVIRONMENTAL MANAGEMENT FOR SUSTAINABLE DEVELOPMENT
PROGRAMME

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PAPUA NEW GUINEA

1. Problem statement.

Papua New Guinea's Fourth National Goal deals with "Natural Resources and Environment" stating that:-

"We declare our fourth goal to be for Papua New Guinea's natural resources and environment to be conserved and used for the collective benefit for us all, and to be replenished for the benefit of future generations."

We accordingly call for:

1. Wise use to be made for our natural resources and the environments in and on the land or seabed, under the land and in the air, in the interests of our development and in the trust for future developments;

and

2. the conservation and replenishment, for the benefit of ourselves and posterity, of the environment and its sacred scenic and historical qualities;

and

3. the necessary steps to be taken to give adequate protection to all our valued birds, animals, fish, insects, plants and trees."

This is the basis of Environment and Conservation Policy.

Concerns expressed by people who attended workshops and meetings include:

"The environment is being destroyed...lack of awareness...poor environmental management...pollution from industry...noise from aircraft...serious effects of mining...legislation not tight enough and not enforced...impact studies are not taken seriously...limited approach to wildlife conservation...need for national parks and wildlife areas...poor environmental assessment...soil erosion...inadequate waste disposal...effluence from factories...poor post-logging management: inadequate resource replenishment...exploitation by foreign companies..."

National Objective 40, the basis of this (Programme Identification Document), derives from those concerns:

"To use with responsibility the nation's resources for the well-being of present and future generations, by minimising environmental pollution and ecological damage."

In the past there have been some major environmental problems which have occurred in Papua New Guinea, such as those resulting from the continued burning of the Markham Valley and much of the Eastern Highlands which has severely degraded the ecology and productivity of the area and more recently such as the problems caused by the tailings from the Bougainville Copper mine.

Despite these issues, by and large, with its relatively sparse population and with limited pressure on its relatively abundant natural resources, Papua New Guinea has not until recently faced extensive environmental problems.

Now, however, the pressures upon the country's natural resources are increasing dramatically, from both within and without. From within, a growing population, particularly in certain areas such as parts of the Highlands, the Maprik and the Gazelle Peninsula, combined with increased expectations by the population for better economic opportunities, are resulting in extra pressures particularly on the land resource. From outside, the desire to exploit the country's rich minerals, forests and marine resources is also applying substantial new pressures.

Minerals exploitation is localised and, with new measures being introduced for new projects, the problems should be readily manageable. In other more extensive activities, such as forestry, the situation has been slipping out of control, as has been vividly highlighted by the Forest Inquiry.

To ensure that the country's resources are developed in a manner which will be in the true long-term interests of the nation, it is necessary to have clear guiding principles; to incorporate those principles in planning and to enforce them in practice. Environmental legislation in Papua New Guinea is wide-ranging, but the Government's capacity to ensure that policies or legislation are pursued has fallen severely behind the rate of development.

This is the result of inadequately specified policy direction, poor coordination between agencies, inadequate staff experience, insufficient training and sparse resources for the task. This task ultimately requires additional financial and other resources for a range of activities, particularly for Department of Environment and Conservation activities. However, much can also be achieved through better institutional coordination on an inter-departmental basis.

2. Programme Strategy.

This programme recognises the need for:

- integration of government activities to fulfil sustained development;
- strengthening the DEC and other departments in order to improve environmental management; and
- a sustainable development policy to guide all areas of government thinking and action.

The strategic principle is that development should be pursued on the basis of SUSTAINABLE DEVELOPMENT, which is defined as development which is environmentally acceptable and which allows future generations to also meet their needs.

The main principles of sustainable development as set out in the submission being presented to National Executive Council are that:

- 1) it should equally apply to urban, rural and subsistence development activities, taking into account the social, economic, environmental and cultural aspirations of the population.
- 2) non-renewable resources (i.e. mining) should provide the revenue to finance the development, monitoring and management of the renewable resources (agriculture, forestry and fisheries) plus related activities (e.g. processing, tourism etc.).
- 3) a proper consultative process should at all times be followed in planning and monitoring all resource-based development projects. The concept of the development forum, currently used with mining projects, should be extended. This would prevent discretionary decision-making (e.g. in forestry, fisheries or lands). An ad-hoc judicial system should be established to consider appeals.
- 4) planning should be long-term oriented. For sustained-yield management of renewable resources, long-term security especially of land tenure is essential, and should be agreed at the planning stage. Short-term exploitative projects should not receive approval.
- 5) adequate data is required for planning, and this data should be readily accessible to relevant interested parties. This also requires adequate inter-departmental cooperation and resource sharing.
- 6) there should be greater participation by the local people, including equity and spin-off activity in any renewable resource development. This will involve public education to develop awareness in the landowners of their responsibilities and of the long-term damaging impact of non-sustainable land use practices (such as with logging projects or dynamite fishing etc.).
- 7) in any planning for development population growth should be a major consideration. Current subsistence-land-use practices will need to change in the face of increasing population. Special attention should be given to areas with greater population pressure, including research in land management, in agriculture, agro-forestry etc..
- 8) projects should be adequately monitored on the "user pays" principle, and involve adequate external checks. Until adequate data is available, an acceptable plan prepared, and monitoring and enforcement capacity is established, projects should not proceed. This would imply, notably, a moratorium on any new forestry projects until these requirements are adequately met (as has been announced by the Prime Minister in Parliament on 19 July of this year).

These principles are reflected in this programme; it is recognised that some (e.g. 7: Population) will be focussed upon through other programmes.

3. Programme Goal and Purpose

The programme goal is Objective 40 focussing upon minimising environmental pollution and ecological damage. This is fully compatible with the World Conservation Strategy. It is understood that activities within this programme will interact with, and must achieve a proper balance with, activities responding to objectives related to economic management.

The purpose of the Environmental Management and Sustainable Development Programme is to mobilise resources to clarify, inform, monitor and enforce measures that facilitate and ensure "development which is environmentally acceptable" and which "meets the needs of the present without compromising the ability of future generations to meet their needs."

The elements of the programme, apart from its management and internal administration, will be as follows:

- * Policy...National Conservation Strategy...nationwide consultative process...international obligations...guidelines for allocation of human and other resources;
- * Legislation:
- * Integrated Information Base...inventory of resources...mapping...research and impact studies;
- * Conservation Activities...national parks...water catchment...marine parks...endangered species...soil erosion;
- * Awareness...education...public involvement;
- * Assessment of proposals...basic environmental planning;
- * Monitoring and audit studies...environmental indicators; and
- * Enforcement.

4. Programme Output

Indicators at the goal and purpose levels will be based upon a set of baseline data covering physical and social attitude and awareness indicators. Examples might be air quality, water quality, wildlife counts, soil erosion, public knowledge... The list will be agreed upon by March 1990 and annual assessments would be made from July 1990.

Indicators in respect of each element within the programme are:

POLICY

- * Programme Management Group to have been established by 1st January 1990.
- * 'Guidelines' reviewed, rewritten and endorsed by NEC by March 1990.
- * 'Strategy for Sustainable Development', of comparable scope and standard to those produced in other developing countries, approved by NEC by December 1992.

LEGISLATION:

- * All relevant legislation reviewed by March 1990.
- * Drafting and re-drafting in accordance with Programme Objectives completed by mid-1990.
- * Enacted by December 1992.

INFORMATION:

- * Existing sources of information reviewed, March 1990.
- * Agreement on (cartographic) database and access, December 1990.
- * Effective (publications and research) database in operation, December 1990.
- * Establishment of (cartographic) database, June 1990.

ACTIVITIES:

- * Agreement on 'ideal' percentage of land to be designated for environmental purposes, March 1990: Targets.
- * Progress towards targets assessed on annual basis.
- * Soil erosion: percentage of land affected, yearly.

AWARENESS:

- * Clarify working arrangements with Prime Minister's Department, Education etc., March 1990.
- * Prepare schedule for NEC (lead publicity activities, World Environment Day, publications, broadcasts), March 1990.

ASSESSMENT:

- * Clear guidelines established, March 1990.
- * Environmental impact studies received for all projects within guidelines.
- * Average turn-around time not exceeding 6 months.

MONITORING:

- * Review existing capacities for monitoring, March 1990.
- * Monitor all projects, and conduct general environmental monitoring, so that no breach of legislation or conditions goes undetected.

ENFORCEMENT:

- * All offences dealt with appropriately.

5. Programme Inputs

As far as possible, the programme will be implemented through the better use of existing resources. While Department of Environment and Conservation (DEC) and the other involved departments do need some additional expertise, they should seek external sources of donor and possibly concessional funding eg. the World Wide Fund for Nature (WWF), UNEP, IUCN, World Bank/ADB, SPC or bilateral programmes. Particular needs are for legal experts, scientific and technical workers and trainers. Department of Agriculture and Livestock (DAL) requires additional staff to provide detailed resource surveys. Details are to be worked out, but the programme will require the employment of additional technically professional staff. Support staff should be provided through Technical Assistance, and the programme also envisages the more effective use of existing staff employed in other government and non-government organisations (such as extension officers etc.).

Laboratories are amongst the existing resources to be assessed and rationalised; many good facilities are unused or underused. Private operations, e.g. mining and forestry companies, should contribute to the ongoing costs of any additional facilities.

Non-government organisations will be used more, and also funded to provide various services in the area of resource planning, management and education. There is clear evidence in PNG and overseas that NGOs are consistently more cost effective than government or commercial operations for a wide range of tasks.

There will need to be substantial financial expenditure in the implementation of the programme, though most of the burden should be taken up through non-government multilateral and bilateral assistance (including from non-governmental agencies). As stated, the financial burden of monitoring and enforcement should, where possible, be on the "user pays" principle.

Some additional expenditure by the government will, however, be a necessary cost if the nation is to improve the sustainable management of its resources. Detailed costings will need to be worked out as part of the initial support to the D.E.C. and other Departments.

6. Assumptions

For the Programme to be effective it is assumed that:

- * Perception of the need for conservation/sustainable development will continue and grow.
- * The government resources available will continue to grow at a reasonable rate in Papua New Guinea.

7. Programme Implementation

All of the involved Departments have the institutional capacities to implement this Programme. This has been evidenced by the competence and cooperation in the formulation of this proposal. Those participating include DAL, DF, Fisheries, DME, UPNG, VOT, Wau Ecology Institute, Melanesian Environment Foundation, Hanns Seidel Foundation, Prime Minister's Department, Mines, Health, and the Provinces.

An early step will be to establish an inter-departmental EMSD Committee chaired and serviced by DEC to develop the national EMSD policy and act as a Programme Management Committee.

The programme should commence immediately after approval of its concept by NEC and run indefinitely with the addition of projects as necessary and as resources are made available.

The implementation of the principles necessitates a redirection of policies and practices of most national and provincial ministries and their departments and other agencies. The determination and enforcement of standards related to environmental management applicable to Papua New Guinea must be established and enforced.

Programme Management Structure

PROGRAMME MANAGER
FAS, Environment, DEC

EMSD Committee

PROVINCES

- * All participating Departments
- * Universities, NGOs

Policy	Information	Awareness	Monitoring
Legislation	Activities	Assessment	Enforcement

(Each element will involve, and be driven by inter-Departmental teams, with Provincial and NGO participation.)

The Department of Environment and Conservation and appropriate national and provincial departments must be involved throughout the planning, implementation and monitoring of all projects. This requires an immediate and long-term commitment to strengthening the capacity of DEC and also ensuring more rational utilisation of domestic manpower and other resources (e.g. in Departments of Forestry, Agriculture, Fisheries, Education, Health, the Universities and of non-governmental agencies etc.).

8. Monitoring and Evaluation

Procedures for both monitoring and evaluation are implied and implicit in Section 4, above.

ANNEX - REFERENCES

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CASE STUDY: DEVELOPING A COASTAL RESOURCE MANAGEMENT PLAN FOR KOSRAE
STATE, FEDERATED STATES OF MICRONESIA

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Background

Kosrae is a high volcanic island at the extreme eastern end of the Caroline group and lies roughly 350 nautical miles north of the equator. It is one of the four states in the Federated States of Micronesia. Kosrae State, unlike the other three states in the FSM, does not possess any outlying atolls. The island is relatively small (approximately 42 square miles) (fig.1.) and sparsely populated (less than 7 000 inhabitants).

The island's environment can be divided into four general zones (fig. 2.). The mountainous and heavily forested interior is a zone of upland and dwarf or cloud forests. The lowland zone on the relatively flat coastal plain is comprised of lowland forest, agricultural and residential areas and an unusual freshwater swamp forest ecosystem commonly dominated by the valuable lumber species *Terminalia carolinensis*. The swamp forests transist into mangrove forests. Mangroves are to be found along most of the coast, but along the east and south coasts barrier islands stand between them and open reef flats. The north coast is an exception. Here a mangrove stand marked by extraordinarily large and majestic examples of the mangrove species *Sonneratia alba* is found at the inner margin of the flats. Mangroves and reef flats are in the transition zone, an area within the reach of the tide's rise and fall. Wide reef flats are found on the north, east and south coasts. The seaward margin of the reef flat is the inner boundary of the fourth zone, ocean and coastal waters. The fore reef slope extends out a few hundred metres to where the outer reef slope rapidly drops off into the deep ocean waters that surround the island.

Kosrae also possesses a number of unusual archaeological sites. The largest and most well known is found on the near shore island of Lelu. Here numerous megalithic structures were built on a base of coral fill over the reef flat. The modern village of Lelu, a population centre on the island, is built over this largely man-made island (USACE, 1988).

Kosrae, despite its small size, is environmentally heterogeneous and complex. Thus the integrative approach embodied in coastal resource management (CRM) should have particular application. However, all of a small island's resources are coastal; one is really talking about generally improving a government's resource management capability. CRM represents a group of strategies that should be especially effective in this regard.

The Effort to Develop a CRM Program in Kosrae

An initial management plan for Kosrae is currently being drafted. This is one step in a chain of events that began some years ago and is continuing. The decision on the part of the Kosrae State Government to consider changing its management approach can be traced to a number of traumatic impacts resulting from recent infrastructure development. Happily, this concern also coincided with interest on the part of a number of outside agents in helping to develop

a coastal management plan for the island. The United States Army Corps of Engineers completed a coastal atlas and resource inventory in 1988 (Ibid). It was their intent to follow up these atlases and inventories (which have been prepared for a number of U.S.-affiliated islands) with the preparation of coastal resource management plans. This was the case for the first atlas and inventory completed, for Pohnpei State (FSM). In this context the Governor of Kosrae approached the Sea Grant Extension Service at the University of Hawaii (which had worked with the USACE on preparation of the atlases and inventories) about the possibility of obtaining advice on how to deal with development related impacts. This evolved into an interest in developing a CRM plan. Funding was made available to Sea Grant in early 1989 for this purpose.

The author had been aware of, and marginally involved in, the earlier dialogue between Sea Grant and Kosrae State relating to this project. Once the project was funded, he began working with the State Government to prepare for the development of the plan. It was Sea Grant's intention to bring a "team" of consultants to Kosrae, representing a range of coastal-resource-related specialties. They would help gather the information necessary to formulate a CRM plan. The author was concerned that the effort not be one perceived as, or in fact be, primarily the product of a group of outside consultants. The goal of a management plan is to map out how the bureaucracy should change its approach to resource management. Secondly, it must generate the necessary political support from a variety of sources (lawmakers, the public, diverse elements of the bureaucracy, etc..) for instituting these changes. Thus plan development must be something that relevant elements of the bureaucracy plan a part in. It must also have effective political support.

The second of these conditions had been met. The Governor was broadly supportive of plan development, and equally as important, the Director of the Department of Conservation and Development (D.C. & D.), a key department, was strongly interested and supportive. As a result, a "Coastal Resources Committee" was formed by the Governor to see the process through (preparation of a plan and, hopefully, implementation of a programme). The Director of D.C. & D. sits as committee chairman. Agencies represented include Marine Resources, Agriculture/Forestry, History and Culture, Environmental Health, the Environmental Protection Board, Construction and Engineering, Economic Planning and the municipal governments. This Committee was responsible for answering questions about how a CRM programme should be structured and what in general terms it should do. The committee was the primary point of contact for the consultants. In addition it has done much of the work necessary to formulate a CRM programme for the state.

The consultants worked with the Committee in developing the outline of the proposed programme. At the same time they gathered information related to their specialty. Armed with this information they are preparing reports that will be forged into a CRM plan. This team of consultants covered a number of relevant disciplines: programme administration, resource economics, coastal engineering, mangrove ecology and forestry, inshore fisheries, and coastal recreation and tourism.¹

1. The team members are: Dr. Jan Auyong, Tourism and Ocean Recreation Specialist, Hawaii Sea Grant; Shannon Cripe, a student in coastal processes and engineering with the Department of Ocean Engineering at the University of Hawaii, Kim DeRoches, completing graduate studies in inshore artisanal fishing, at the Department of Geography at the University of Hawaii; Dr. John Dixon, resource economist with the East-West Centre; Mr. Michael Ham, Administrator, Guam Coastal Management Programme; and Dr. Padma Lal, a mangrove expert who received her Doctorate at the East-West Centre.

The consultants visited Kosrae for periods of one or two weeks during the months of June and July. The author, as project leader, stayed on Kosrae from mid-May until early August working with the CRM Committee and coordinating the visits of team members.

The author is currently drawing together the work of the CRM committee and the recommendations of the consultants into a plan document. In preparing the document emphasis will be put on a format that is usable by the CRM Committee in its efforts to implement the recommended programme. To this end, a very short summary document is being prepared; this will be followed up by a longer report onto which the consultants' reports will be appended. The summary currently under preparation is viewed as a "sales" document. That is, it will be used primarily to develop public and legislative support for the implementation of recommended strategies. For this process highly detailed information is not necessary. Rather, the emphasis is on a document that is accessible and understandable to a general readership.

Once this support is gained the next phase of the process, implementation, may be begun. During implementation the detailed information of the consultants' reports, integrated into a larger plan document, can be used by those individuals within the government charged with drafting and implementing legislation. This document can also be used as a reference document during programme initiation.

Information Necessary to Formulate a Management Plan

The CRM Committee was charged with initially answering some broad questions necessary to formulate a management programme. Kosrae's coastal zone had to be defined. In other words, what will be the physical scope of the management programme? The Committee recognised that the island is an integrated system and thus recommended the broadest possible scope. All of the island and its surrounding waters are included in the coastal zone. This renders the term coastal zone somewhat meaningless and thus it was decided that a broader term, "Kosrae Island Resources Management" be used in reference to the proposed management programme.

For a management programme to be effective and implementable, it should be "issue driven". That is, it should respond to specific management issues. Placing coastal resource issues in the forefront assures that a programme will in fact be responding to real problems. In addition it is more likely that proposals will generate needed support if they are seen to address local concerns. Thus a second task of the Committee was to try and identify some of the major resource issues. Quite a few were identified. Broadly they may be lumped into four conceptual categories: construction and road alignment, resource extraction, economic development and coastal erosion.

Within these categories are more specific issues, usually defined by some human activity that has an impact on the environment or natural resources. For example, Kosrae is building a circumferential road; the alignment of the road will generate primary impacts during construction and secondary impacts resulting from increased resource use as areas are made more accessible. Thus there are a variety of road alignment issues, ranging from the impacts of land clearing to its impact on tourism development.

Resource extraction covers a suite of activities and impacts relating to the harvest of renewable resources such as timber and fish. Economic development is primarily a government activity because the state government possesses the largest single chunk of available capital. It is investing or planning to invest in both basic infrastructure and commercially related infrastructure such as fishing boats, lumber-processing facilities and hotels, all of which are

likely to have a significant impact on the natural environment. Private sector development will also most certainly increase. Tourism is seen as a possible development sector and would be an area more likely to attract private capital. Finally, coastal erosion is a natural phenomenon that will affect the kinds of human activities summarised in preceding issue areas. A road or hotel built along a rapidly eroding shore may be threatened. Coastal structures such as groins, piers and seawalls affect local sand transport, often exacerbating local erosion.

The use of these broader issue areas is one way to focus attention on the major activities that affect the environment. It can also help to prioritise the issues. Simply put, there are relatively few big issues in Kosrae. These range from coral dredging (which falls under the road alignment and construction issue area) to harvest for export of mangrove crabs (resource extraction).

Policies and Strategies

Once these issues had been identified, the CRM Committee formulated a set of policies and objectives that generally address the issues. These tend to be "mom and apple pie" statements of the direction the programme should take. However, they are not platitudinous. Issues and policies can act as performance standards for a programme. For example, the first objective is to "prevent earth moving activities from resulting in significant siltation of rivers, streams and coastal areas". The effectiveness of a programme can in part be determined by the degree to which water quality is maintained.

The programme itself can be characterised as a set of strategies to deal with the coastal resource issues. As was mentioned, one of the advantages of a CRM approach is its integrative nature. It can formalise dialogue among government agencies about coastal concerns. For example, if Public Works plans to build a causeway there should be some way for the Marine Resources Division to assess its impact on fishing and inform the Public Works agency. In the same way, development projects should be reviewed in a comprehensive manner so that the concerns of a variety of interests are expressed in the review process. This second integrative aspect is philosophically allied with environmental impact assessments and in fact EIA can be a primary strategy for coastal resource management.

This kind of project review is a central strategy proposed for Kosrae. At the same time, the administrative structure for the programme is tied to this review process. Projects fulfilling certain criteria (generally, those that will have a major environmental impact) would be subject to a two-phase review. Initially a Development Review Committee with representatives from relevant government agencies would assess the project. Their recommendations would go to a "Kosrae Island Resource Management Commission" which would have independent permitting authority. The Commission would be an appointed body charged with the duty of weighing the interests of the government, expressed through the Review Committee's recommendations, against those of the developer and the general public. Permits could be conditionally issued. That is, conditions are set in issuing the permit that may require changes in the project to reduce environmental impacts. Essentially the "Development Review Committee" and "Kosrae Island Resource Management Commission" institutionalise an environmental impact assessment process. The process becomes more effective because the Commission, through its permitting power, can compel the developer to adhere to the EIA's recommendations. Ideally the Commission would have a full-time staff (the Commission itself would only assemble to review permit applications and issue--or deny--permits). There are two alternative ways the Commission could be staffed. An existing agency, the Division of Environmental Health and Sanitation, could become its staff or new positions could be

created under the Commission. This choice is essentially a political and budgetary one, and will be ultimately decided in the drafting of implementing legislation.

The second major strategy consists of a variety of recommendations that may all be brought together under the term land-use planning. This strategy may be of most interest to conference participants since marine park and reserve areas are among the recommended land-use designations. Land-use planning can achieve a wide variety of resource management goals. At the same time it is important to realise that on Kosrae, as in many places, common approaches such as standard Euclidean zoning are not feasible. The sanctity of private property is a strongly held notion. One must respect the importance of land ownership and the freedom of action it implies while gently arguing for the common benefits of some system of planning and limited control. Land-use planning recommendations are made somewhat more feasible in Kosrae because, legally at least, areas below high tide (which includes mangrove forests) are in the public domain. Land-use recommendations are of three main types: land use districts, areas of particular concern and protected areas.

Land-use districts are areas designated for specific activities such as industrial development, hotel construction or agriculture. In the first two districts other kinds of development, such as residential and small-scale commercial construction, are not precluded; rather, the specified activity is confined to that area. An agricultural district would be established to prevent loss of prime agricultural land to other uses. In this case construction that threatened this land might be subject to the review process outlined in the first strategy.

Areas of particular concern (APCs) are areas where development is subject to some form of regulation because of ecological, environmental, public safety or socio-economic considerations. On Kosrae the mangrove forest would be the easiest (because it is publicly owned) and most logical area to be designated an APC. Freshwater swamp and steep sloped upland areas might also be designated APCs. In practical terms APC designation requires that any development activity within the area be subject to the review process outlined earlier. Thus conversion in some parts of the mangrove forest, sustainable logging of *Terminalia* in the freshwater swamp or construction on steep slopes is not totally precluded. But a careful and comprehensive review of the activity is required.

Finally, some parts of the island would be more strictly protected. A marine reserve and a park are proposed. Because of the island's small size, it was suggested that there be a single contiguous area for each of these designations. The proposed marine reserve encompasses roughly two miles of coastline and would extend from the reef margin into the mangroves. Ideally, adjacent stands of freshwater swamp forest could be included, but practically this may be impossible as this swamp is recognised as private land.

This area has a number of advantages that lend it to reserve designation. The reef has been designated a sanctuary for topshell (*Trochus niloticus*) for some years, and enforcement has been quite effective. A small boat basin, to be attended by Marine Resources Division personnel, is planned in the area. This should make enforcement of related monitoring easier. The mangroves in this area are magnificent; in fact, the largest examples of *Sonneratia alba* in the Caroline Islands are found in this area. Finally, a range of environments could be represented within the relatively limited scope of the park.

Conversely, there are some disadvantages. Primary among these is the location of the island's port facility in close proximity and generally up-current of the site. Thus there is a greater likelihood of major impacts from port related activities. A fish-processing plant is being proposed for the port. If

built, it may affect water quality in the area. A still more remote concern is a proposed cross-island road which would pass through the watershed behind the reserve area. This road could lead to increased land clearing, also degrading water quality. Hopefully, these kinds of concerns could be dealt with through the review process outlined.

The reserve would serve a number of purposes. First, it may be a fairly simple way to manage inshore fishing effort. The concept of a "natural fish hatchery", a reserve as an area that can replenish fish stocks in adjacent areas, is an attractive idea to the islanders. Second, recreational and tourist-related use of the reserve would be allowed. Obviously, these would be non-extractive uses, and might be in some way supervised. The existence of a reserve should support the promotion of certain kinds of tourism, and might be effectively employed in promotion of the island as a tourist destination. Third, the reserve will protect representative examples of Kosrae's unique ecosystems. Finally, the reserve could serve as a general baseline to assess the impacts of human activities, in particular resource extraction, in other areas. Monitoring and applied research could be conducted within and outside the reserve in an attempt to gauge these impacts.

A park is being recommended for part of the south coast of the island. This area, lying west of the village of Utwe and stretching to edge of a small community on the western tip of the island, would be a focus for recreational and tourism-related activities. Habitat protection would be a second objective while subsistence resource use would be allowed. The area is comprised of mangrove forest lying behind a narrow barrier island. There are a number of inter-connected shallow lagoons within the mangroves that would be suitable for certain tourist related recreational activities such as wind surfing and kayaking. A narrow channel winds through the mangroves from the western end of these lagoons in the western tip of the island. Canoe rides on this channel is an activity promoted by the government tourism office. The mangrove forest here is distinct from the system that would be encompassed by the reserve. Here *Rhizophora* species and *Nipa* palms (*Nipa fruticans*) dominate.

Habitat protection would be the main management goal of the park area. This is not incompatible with subsistence resource use if a satisfactory and practical method of defining subsistence use can be developed. As in other places the subsistence economy is not "pure"; the resource user may harvest for consumption and sale simultaneously. A workable definition of subsistence use remains to be developed. In fact, such a definition is likely to evolve out of efforts to manage the area rather than being specifically formulated in the overall Island Resource Management Plan.

There are a number of secondary strategies in addition to the two outlined here. As mentioned earlier, government planning initiatives have been the basis for most major development on the island. Thus it is important that environmental considerations be integrated into the existing planning cycle. The state planner has been an active participant in the CRM process thus far. In addition, it is recommended that he sit on the Kosrae Island Resource Management Commission as a non-voting member. EIS principles should form a useful basis for developing the necessary procedures within the existing planning process.

Management of harvest pressure on renewable resources, while supported by a CRM programme, is typically a line agency function. In Kosrae there exists neither the management regime nor the necessary legal framework for the management of inshore and mangrove resources. Because the island has been sparsely populated, harvest pressure has not been great. In addition it is typically very difficult to apply standard effort controls to diffuse subsistence fishing or wood cutting. However, the island's population is growing rapidly, and certain fisheries, mangrove crab fishing in particular, are becoming increas-

ingly commercialised. Line agencies should at least have the regulatory authority to respond to changes in the resource and harvest strategies. Thus it will be recommended that comprehensive legislation be instituted to give management agencies greater regulatory authority.

Finally, community involvement and public education are linked strategies that are essential to an effective programme. Resource users may have informal rules about resource use,² and they are usually quite knowledgeable about the condition of local resources since they are regular and intimate observers. Therefore, they can be a useful source of information for making management decisions. More important, if the users have a sense that they can in some way participate in management decisions they should be more supportive of the management programme. Just as resource users should be consulted so too they should be informed about management decisions, new rules concerning resource use and, more generally, the effects of certain activities on natural resources. For example, because of a public education programme a farmer may become more careful in clearing steeply sloped land because he knows that erosion and siltation can affect the reef resource. On a small island it is likely that the farmer is also a part-time fisherman, so he has a direct interest in minimising damage to the coral reefs.

Observations

Coastal resource management is a "holistic" approach to management. It seeks to coordinate government activities related to an integrated natural system that includes a number of linked ecosystems. A CRM programme should establish procedures that allow those entities that have management authority to both comprehensively manage current resource use and plan development so that environmental impacts are minimised.

Parks and protected areas are a particularly effective strategy because they achieve a number of goals, ranging from control of fishing effort to critical habitat protection, that are part of the purpose of a CRM programme. But they are one of a variety of strategies that a CRM programme may use. It may be useful for advocates of parks and protected areas to employ CRM concepts as a way of generally improving government's resource-management capability. This in turn should make it more feasible to establish protected areas. Since these protected areas are part of a comprehensive and integrated programme they may be more effectively managed.

In Kosrae there has been some general interest in establishing a marine park for some years. The development of the Island Resource Management Plan could serve as a catalyst to bring a marine park and a marine reserve into being. This entails, as much as anything, developing both an understanding of the concept and its management implications among the public and support by decision makers.

Developing a CRM program is typically a multi-year effort. In Kosrae this is still in its early stages. Hopefully, the plan will lead to the creation of some sort of management programme. The author does not expect this programme to encompass all of the recommendations that have been generated during this planning phase; even if only a fraction are implemented, he will consider the effort a success. Certainly, the creation of an effectively managed marine protected area in Kosrae will be viewed as a major achievement and a solid foundation on which to rest future management initiatives.

2. In Kosrae they are informal; elsewhere in Micronesia formal and elaborate systems to regulate resource use exist.

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CASE STUDY: THE DEVELOPMENT OF NGERUKEWID MANAGEMENT PLAN

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INTRODUCTION:

The Ngerukewid Islands Wildlife Preserve was established in 1956 by Palau National Congress (then known as the Palau District Legislative). Its purpose was to preserve and retain a certain group of rock islands in its primitive and undisturbed condition. Also known as the "Seventy Islands", this preserve is located within the southern boundaries of Koror state, and is also among the limestone islands popularly referred to as "the Rock Islands".

Encroachment from boating and fishing activities as well as poaching of turtle and megapod eggs, including taking of other wildlife in the preserve, brought concerns to the government of Palau. In trying to mitigate the situation, the Ministry of National Resources was faced with the absence of any clear mandate or plan to guide the activities.

Therefore, in 1985 IUCN and SPREP were requested by the Palau government to provide assistance in the development of a management plan for Ngerukewid.

While establishing the scope of the project, it became clear that very little was known about Ngerukewid and the resources within. Local knowledge that was available was not documented. The project was divided into two phases: phase I, to inventory resources and identify issues, and phase II, to utilize the findings in the preparation of the plan.

Resource Survey:

With SPREP providing the coordination, a scientific team led by Dr. Charles Birkeland and Harley Manner conducted the field survey in January 1988.

The findings are documented in the "Resource Survey of Ngerukewid Islands Wildlife Preserve, Republic of Palau", edited by C. Birkeland and H. Manner, 1989. The executive summary of the report highlights the findings of the survey as follows:

- although the marine area is not outstanding as compared with other areas of Palau, it was established that all seven species of giant clam occurred in the preserve.
- 163 of 1200 species of fish present in Palau were observed in the preserve, as were 14 of 32 reptile species and 28 of 146 bird species.
- the preserve also contains rare, endangered species and also a sizable amount of birds endemic to Palau, as well as the endemic palm.

The preserve was determined to be relatively pristine, and provides a good representation of other areas of Palau.

The Management Plan (Proposed)

Following the completion of the resource survey, a team composed of Peter Thomas and Paul Holthus from SPREP and Noah Idechong, Division of Marine Resources, Palau, developed and put the plan together.

Purpose:

The plan "recognizes the high biological, physical, scenic, and education values of the reserve and aims to provide a management strategy for the maintenance of these values in the future". Specific attention is paid to:

1. providing an effective legal and institutional framework for management;
2. indicating site-management requirements;
3. development of a public awareness and education programme;
4. development of a scientific research and monitoring programme, and
5. providing resources necessary for effective management.

Goals:

Four broad goals were developed for the plan:

1. To protect and preserve in perpetuity, as a representative example of Palau's Rock Islands, the indigenous flora and fauna, physical features and natural ecological processes of the Ngerukewid Islands.
2. To expand scientific understanding of the ecosystems and ecological processes of the Preserve in order to aid future management, and add to the body of scientific knowledge of tropical Pacific ecosystems.
3. To expand public awareness and understanding of the Preserve and its values, and to foster interest in, and support for, Palau's natural heritage.
4. To develop an effective institutional framework for the management of the Preserve and the overall expansion of nature conservation activities and capabilities in Palau.

Legal Status:

The provisions of Palau National Code, Title 24, Chapter 30 (which establishes the Preserve) needs to be amended in order to give legal status for the plan, and to provide for its implementation. The plan is to cover a five-year period, and provides allowance for review and amendment.

The Role of International Institutions:

The development of Ngerukewid Preserve management plan is one good example of a successful involvement of international bodies in assisting with solving local conservation problems. IUCN, WWF and SPREP all combined resources to help Palau make this important step towards conserving its natural beauty.

Part 3

Protected Area Systems for Oceania

Theme Paper: THREATENED SPACES AND MISSING LINKS:
 PROTECTING THE BIODIVERSITY OF OCEANIA

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Abstract

Initiatives to promote a system of nature conservation areas in Oceania have been underway for over 20 years. The rudiments of a representative network of reserves exist but there are many gaps and opportunities for the establishment of many new protected areas. This paper discusses a range of factors that are considered in the selection process and reviews the conclusions in IUCN's Review of the Protected Area System of Oceania. Major potential for growth is seen in the establishment of marine reserves. It concludes with a list of 400 sites of nature conservation importance in the South Pacific that currently have no formal protected status.

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Annex - Sites of Nature Conservation Importance in the Oceanian Realm

THREATENED SPACES AND MISSING LINKS: PROTECTING THE BIODIVERSITY OF OCEANIA

1. Background

In the world today 485 million ha of land, some three per cent of the earth's land surface, have been put under special protected status. One hundred and twenty four countries have established 4,545 national parks and other types of reserves, with 1,900 of these in the world's tropical regions.

But in terms of representative coverage of samples of biological diversity, the world's "park system" is not yet complete. As the World Conservation Strategy (IUCN, 1981) outlined in a general way, there are certain biogeographic provinces that are greatly under-represented in the system. With only 0.15 per cent of its land area formally protected, Oceania was and still is one of the priority areas in the world that the WCS identified for establishment of protected areas.

Protected area experts meeting in Bali in 1982 at the once-a-decade World Congress on National Parks recognised the need for action in filling these gaps and encouraged countries to expand their individual systems to a target level of 10 per cent of total land area. Objective I of the Bali Action Plan thus read:

"To establish by 1992 a worldwide network of national parks and protected areas to cover all terrestrial ecological regions."

And Objective II:

"To incorporate marine, coastal and freshwater protected areas into the worldwide network."

Both UNEP and the Brundtland Commission have subsequently endorsed the "ten per cent target" figure calling for a major expansion in the size of the world network of protected areas.

The question then followed: where are the gaps, and how many more areas need to be established to ensure that samples of all the earth's biodiversity can be maintained? These questions were discussed at regional working sessions of IUCN's Commission on National Parks and Protected Areas (CNNPA) and during the Third South Pacific National Parks and Reserves Conference. The Action Strategy developed at this conference called for a review of the protected area system of Oceania to provide the overall framework and to promote national action. The review was conducted by Arthur Dahl for IUCN with funding from UNEP, and published in 1986. Further assessment of the marine aspects were subsequently compiled by IUCN in "Coral Reefs of the World" (vol. 3 Central and Western Pacific) published in 1988. Before discussing the findings of Dahl's review of the protected area system in the region, an outline of site selection methodology is presented.

2. Selection of Sites for Protected Areas

2.1 Biogeographical Assessment

Assessment of the global coverage of reserves is undertaken primarily on a biogeographical basis. The universal framework for classifying terrestrial ecotypes is provided by Udvardy's map of the Biogeographical Provinces of the World. Oceania is one of the world's eight biogeographical realms under this scheme within which Dahl (1980) recognises 19 biome types and 20 provinces which subdivide this realm.

The practice of dividing the world into distinct biogeographical units, and giving adequate protection to representative samples of each, is relatively straight-forward, but it has its difficulties and is not always easy to apply. For instance, data on distribution of plants and animal species are often missing or imperfect, and arbitrary division lines through transition zones tend to be artificial. The relation between terrestrial and marine divisions has yet to be agreed upon and this presents an additional constraint when assessing Oceania which is predominantly a "water realm".

Despite these problems the biogeographic approach is the most useful when undertaking large-scale (e.g. 1:1 million) regional assessments of protected area coverage. Using this method, selection will favour larger natural areas that are expected to contain habitats richer in species, endemism or distinctiveness. Ideally there should be at least one large protected area in each biogeographic sub-division with as many ecological communities as possible within it. Omissions and variations would then be included in smaller satellite reserves. Further, there is a need to safeguard against the loss of biodiversity through natural catastrophe (floods, earthquakes) or as a result of global climatic warming. Such "insurance" is provided if the full range of living biological resources are protected in more than one country or area, and if various design elements suggested by conservation biologists are incorporated (altitudinal variability, corridors, buffer zones).

2.2 Species Considerations in Selecting Sites

Complementing the biogeographic approach in selecting protected areas is selection based on the presence of key species. It is well known that biological diversity is not uniform, and "hot spots" can often be recognised where particular concentrations and existence of local endemism are known. The identification of pleistocene refugia in the Amazon, for example, was a major consideration in designing the protected area system in Brazil.

An important aspect in Oceania is the special attention required for the needs of migratory species. An inventory of nesting, breeding, and feeding sites is of particular importance in identifying "reserve networks" for such species such as marine turtles, seabirds, and marine mammals (see for example SPREP, 1985). Other species groups that are of particular value in identifying biologically important areas due to their high level of local endemism in the Pacific are vascular plants and land molluscs.

When selecting protected areas on species criteria, the approach taken has usually been to focus on the spectacular (e.g. redwoods, seabird nesting areas), the threatened (rhinos, turtles), the attractive (pandas, koalas), or the economically useful (waterflow, medicinal plants). The advantages of focussing on species in one or more of these categories is that they provide a focal point and a public appeal that can win both sympathy and support. And, as species do not occur in isolation from others, a range of associated plants and animals and the habitat in which they live will concomitantly be protected.

2.3 Watershed Protection Consideration in Site Selection

Water supplies and productive soils are so vital to human life and to agriculture and industry that protection of the water and soil regulatory functions of natural vegetation is usually always more important than any other alternative use. In tropical countries where, as a whole, 90 per cent of farmers cultivate the valley bottom lands, protection of upstream catchments is particularly critical. This is also true for urban populations who are supplied with water from upland catchment reservoirs.

Many protected areas around the world are justified on their watershed protection values. Their selection depends on four main considerations:

- o susceptibility of the catchment to erosion;
- o susceptibility of the river to flooding;
- o seasonality of water availability; and
- o socio-economic importance of the watershed.

Case studies indicating this usually undervalued function of protected areas can be found in the Proceedings of the Third World Congress on National Parks (MacNeely and Miller, eds. 1984) and in Hamilton ed. (1983).

2.4 Geographic and Cultural Aspects in Site Selection

In most countries there exist a number of geological features (caves, fossil sites, beaches, scenic vistas) and cultural/historic sites (archaeological sites, forts) that, by themselves, merit protection as part of the national patrimony. Other reserves have been established due to locational factors such as remoteness or inaccessibility. Irrespective of the biological component of such areas, consideration needs to be given to the use of geographical features (steep ridges, rivers, coastlines) when deciding on protected area boundaries.

2.5 Practical Factors in Site Selection

In no country or continent does an ideal protected area system, based on biogeographical criteria, exist. (Perhaps only in Antarctica would this be possible!) Various practical realities such as human pressures, military uses, political instability or government priorities will all intervene in the selection process. Some countries may wish to maintain an uninhabited security zone along their frontier so military planners will sometimes influence protected area location. Other factors that also affect the selection process are potential uses for tourism, educational, recreational or research purposes. Resource planners will also give special attention to "environmentally sensitive areas" (esa's) such as wetland and mangrove habitats which almost always merit some form of conservation regime (see Asian Development Bank, 1989).

2.6 Summary of Selection Criteria

As evident in the above five sections, there is an interplay of factors to be aware of when planning a protected area system for a biogeographic realm or for an individual country. The overall realm assessments which have been prepared by IUCN and UNEP for three of the tropical realms (Oceania, Indomalaya and Africa) are based only on biological criteria. National level system plans consider additional criteria with much finer resolution. These have been prepared by countries as diverse as India, Sweden, Chile and Fiji.

Collectively all those efforts add up to define the extent of the global protected area network. This network is described in periodic versions of the United Nations List of National Parks on Protected Areas (the 1989 edition is currently in press). But as land use options for conservation are reduced, and as samples of relatively undisturbed marine environments decrease, each passing decade reduces chances for major new protected areas to be added to complete the network. Conservation professionals thus need to devote special effort to identify the "missing links" in the global network before the options are foreclosed.

Table 1 presents a summary checklist of selection criteria that can provide some practical assistance in the process of identifying additional sites. This is taken from IUCN's manual on Managing Protected Areas in the Tropics, while 34 guidelines to consider in marine settings are available in the companion volume Marine and Coastal Protected Areas: A Guide for Planners and Managers. What is most evident in reviewing this checklist is the basic need for a sound systematic inventory of natural features, habitats and species distribution as a pre-requisite to site selection.

3. The Protected Area System in Oceania

The Third South Pacific Parks Conference in 1985 generally agreed that the existing 95 protected areas in the region were an insufficient number, and called for a major initiative to establish "at least one protected area in each country and territory of the region and to establish an additional 50 protected areas in the region as a whole" (Action Strategy for Protected Areas in the South Pacific Region). As SPREP will note elsewhere during this conference, this target was an ambitious one and progress in adding to the system over the past four years has been very limited.

One of the constraints in moving ahead to expand the protected area system in the realm has been the lack of adequate inventories of natural features, ecosystems and habitats, and the assessment of their potential for protected area status. This conference will review case studies from three island groups where efforts at the national level are underway. The objective in this paper is to summarise the findings of the regional inventory conducted by Dahl and reported in his Review of the Protected Areas System in Oceania (IUCN, 1986).

First, it should be noted that regional reviews such as Dahl's must necessarily be "broad-brush" treatments. The review thus indicates priorities on an international and regional level but it does not consider factors that would be important in national-level assessments (e.g. tourism, education, and cultural sites). The systems review, however, does set the stage for and encourages national reviews which provide finer resolution.

Second, Dahl's review focussed on the 226 main islands of the region and did not attempt to review the marine environment except in the immediate coastal zone of each island.

Table 1

CRITERIA FOR CONSIDERATION WHEN SELECTING PROTECTED AREAS

1. **Size:** The conservation value of an area is a function of its size. In principle, the area must be of a size and form sufficient to support entire ecological units or viable populations of flora and fauna. As a general rule, an area's conservation importance increases with size.
2. **Richness and diversity:** Richness and diversity of species is usually linked with diversity of habitat. Ecological gradients (catenas, ecotones, altitudinal transition zones, should be represented because of the important transitional communities they support.
3. **Naturalness:** There are few places on earth that have not been modified through the influence of man. Areas where this influence is minimal, or which have potential for restoration are particularly valuable.
4. **Rarity:** One of the most important purposes of many national parks and conservation areas is to protect rare or endangered species and communities. Rarity of a species may be related to extremely specialised habitat requirements or to direct human pressure (trapping, collecting, hunting, poaching) or indirect human influences (destruction of habitats, pollution).
5. **Uniqueness:** For the purposes of selection an area may be unique because the biome it represents is not adequately represented in the national system, or because it exhibits particular natural processes.
6. **Typicalness:** In addition to unusual features it is important to represent typical areas of common habitats and communities of the biogeographic unit.
7. **Fragility:** Fragile habitats, species and communities have a high sensitivity to environmental changes (wetlands, coastal dunes).
8. **Genetic conservation:** Richness and diversity usually reflect genetic diversity but there may be other genetic considerations that justify protection (e.g. the occurrence of wild forms of domesticated plants and animals).
9. **Historical records:** If an area has been studied and monitored for a long period of time, its value for research objectives is greater than a comparable unmonitored area, and this value would be reduced if studies did not continue.
10. **Position in an ecological unit:** Include within a single large area as many as possible of the important and characteristic formations, communities and species. Such areas will be more valuable than those representing a single formation or community.
11. **Indispensability:** An area may deserve protection because it protects a vital watershed catchment or because it is indispensable at a higher level of biogeographic subdivision, e.g. bottom lands in a major river valley, or represents a seasonal habitat component of a migratory species.

12. **Potential value:** Areas once known to be of exceptional quality but which have been recently damaged could, with appropriate management and protection, regain the former quality.
13. **Intrinsic appeal:** Some features have more appeal to humans than others. Birds and larger mammals are more interesting to most of the public than invertebrates. Similarly, orchids arouse more enthusiasm than sedges and grasses. While science may view all creatures as equal, in nature conservation it is realistic to give more weight to some groups than others.
14. **Cultural Diversity:** Some areas support populations of indigenous people who have developed mechanisms for living in balance with natural ecosystems. Their continued presence in certain categories of protected areas is thus desirable, and reinforces conservation of biodiversity as well.
15. **Opportunities for conservation:** The socio-political climate is highly relevant in determining conservation priorities. Often a lack of support and perhaps even resentment toward park development by local peoples results in limited conservation success and even complete failure, despite the richness or value of the wildland. Conversely, some second-choice areas have been so enthusiastically supported that, despite less than optimal resources, they have been rousing successes as parks.

Adapted from: Mackinnon, Child and Thorsell (1986).

A third constraint of the System Review is that since 1985 steps have been taken to refine data collection and analysis, using remote sensing and computer data processing. The results in Dahl's review, then are to be treated with some caution as better information and techniques for processing it become available.

Some basic findings in Dahl's report are as follows:

o Less than 20 per cent of the region's ecosystems are represented in the existing protected area system. The majority of species and ecosystems in the South Pacific therefore is not formally protected, and unless action is taken, the permanent loss of some of the rich natural heritage of Oceania is inevitable.

o Of the 20 provinces in the realm, three have no protected areas (Tuvalu-Tokelau, Kiribati-Nauru, and Cook-Austral). The Society Island province has only one marine reserve and 15 provinces have only small reserves. Only two provinces (Norfolk-Lord Howe-Kermadec, Phoenix-Line-Northern Cook) can be considered adequately protected).

o In terms of size, of the 50 islands with protected areas only five have reserves larger than 100 sq.km.

o Regional priority rankings for "conservation importance" are given for the five types of islands found in the region. The top three for each type are:

- Continental islands: New Caledonia, New Guinea, Viti Levu
- Volcanic Islands: Lord Howe, Norfolk, New Britain
- Atolls: Kiritimati, Ninigols, Ouvea
- Low Islands: Talele, Baker, Jarvis
- Raised Coral Islands: Guam, Rennell, Henderson

o Islands were also ranked by numbers of endemic species. New Guinea exceeds all other islands combined on this parameter, followed by New Caledonia. These two islands stand out as the two main "hot spots" for biodiversity, not only within the region but on a worldwide scale as well.

o Of the 226 islands examined, 77 were identified as priorities for protected area establishment. Combined with recommendations made in the Action Strategy and with further information in the Coral Reef Directory, Annex 1 presents a list of more than 400 sites of nature conservation importance in the region that have no formal protected status. This list, incomplete and imperfect as it is, is still indicative of the known potential of significant sites for nature conservation in Oceania. Hopefully, participants at this Conference can add and subtract to this list as appropriate, and identify which of these sites merit protected area status. It would then be useful to produce a map of the region indicating what the potential protected area system might consist of.

4. General Observations

4.1 Discussions on the topic of a system of protected sites for nature conservation in the South Pacific began in the 1930s. Various initiatives have been made since then through the International Biological Programme (see Mueller-Dombois, 1973) and the Pacific Science Congresses (see Elliott, 1973). Still, much remains to be done before Oceania's protected area system can be considered an adequately representative one. Although regional and national data bases need to be better developed, enough data are currently available to identify over 400 sites where protective actions are warranted.

4.2 In the Pacific an alternative to conventional methods of achieving protection in other parts of the world is through the traditional customary controls on resource use common throughout the region. Where these are still applied, parks and reserves will rarely be needed. Moreover, many new protected areas will not be suitable for national park or strict nature reserve status as they will have resident human populations, and be subject to controlled resource utilisation. Use of other categories of protected areas such as the "biosphere reserve" or "protected landscapes and seascapes" would be most appropriate to many of these situations.

4.3 A majority of the conservation values of Oceania are found in the marine environment and much of the potential for protected area establishment is found on certain reefs, atolls, and in coastal settings. In his Micronesian Reef Fishes Myers (1989) recognises this potential on which Paul Holthus will also focus in another theme paper. Special attention to the effects of sea level rise on maintenance and management of these habitats is an urgent research priority. Protected areas in the open seas and in ocean trenches are another "frontier" that needs to be addressed, particularly as a new regional ocean regime is emerging (see Cicin-Sain and Knecht, 1989).

4.4 The protected area network for Oceania will only be achieved through the action of individual countries in the region. Each nation's efforts in ensuring protection of its biological diversity will cumulatively lead to a regionally representative system. One mechanism to stimulate and coordinate action could be the addition of a "protocol on protected areas" within the Apia or SPREP Conventions.

4.5 The evolution of protected area systems begins with selection of sites and moves through legal establishment and then to effective management. This paper has concentrated on the selection phase but mere establishment is not enough -- the challenges of site management are where actions are also needed. Efforts to protect the region's natural heritage will be never-ending, and recall an old Norwegian proverb: "The work is not yours to finish but neither are you free to take no part in it!"

5. Conclusion

At the time of the last South Pacific Parks Conference, ornithologists on the island of Kauai, after an exhaustive search, sighted the once common "oo" bird (Meho braccatus). The haunting call of this lone male met with no response. It is thought that this solitary "oo" was the last of its species, and it thus would join 44 other native Hawaiian birds that have become extinct since the arrival of man on the islands. Similarly, the forests on Guam have grown silent, with the extinction of 9 bird species (5 endemics) due to the predatory activities of the recently introduced brown tree snake.

There will undoubtedly be more reductions in biodiversity which will incrementally subtract from the "nature of the Pacific" before the fifth parks conference. Natural area managers face an ever more urgent task in pursuing a representative system of protected areas, as one tool in reversing the trend to environmental degradation, and maintaining the rich and irreplaceable biological heritage of the South Pacific.

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Annex 1

SITES OF NATURE CONSERVATION IMPORTANCE
IN THE OCEANIAN REALM (no protected status)

(* Denotes areas of regional and international importance)

	<u>Resource Features</u>
American Samoa	
-- Ofu Island Reef with Papaloloa Pt. and Nu'utele	R, B, O
-- Mt. Lata Forest	F
* -- Tutuila and Goat Is. Reef	R, F, O, B, T
-- Pala lagoon	R
-- Southern Ta'u	R
-- Swain's atoll	R
Cook Islands	
-- Kakerori Reserve - Rarotonga Island	F
-- Black rocks (Tuoro)	G
-- Takutea wildlife sanctuary	B, T
-- Natural habitat remnants on Mangaia and Mitiaro	G, O, W
-- Mauke, Atiu, Aitutaki, Pukapuka and Manuae	B, T, R
-- Manihiki	T
Fiji	
-- Natadola Bay	R, F
-- Tai-Elevuka	R
-- Mamanuoa islands (3)	R
-- Sigatoka sand dunes	G
-- Samambula and Rewa R. mangroves	W
-- Cikobia lagoon, North Astrolabe Reef	R
* -- Areas on Viti Levu, Vanua Levu, Kadavu	F, B, W, O
* -- 42 small islands, atolls and reefs	R, T, B, O
-- Extensions to Garrick Reserve	W, F
French Polynesia	
* -- One major terrestrial reserve on Tahiti and Moorea	F, R, B, O, G
-- Portions of Raiatea, Huahine, Tahao Island	F, W, O
-- Rimatara and Raivavae Islands	F, G
-- Mangareva	F, R, O
-- Matureivavao, Niau, Napuka	T, B
-- Portions of Nuku Hiva, Hiva Oa, Ua Pou	F, B
-- Makateu atoll	R, B
* -- Rapa Is.	F, B, O
* -- Clipperton Is.	F, O, B
-- Tahuna Iti, Tiahura, Temae, Faatema, Tupai, Maupihaa, Motu One, Anuanuraro, Anuanurunga, Apataki, Hereheretue, Kauehi, Matureivavao, Napuka, Nukutipipi, Pukapuka, Tekokota, Toau, Manui, Motu-Teiko, Ua Huka, Ua Pou	R, T, B
Guam	
* -- Natural forest remnants on Guam	F, B
-- Hilaan	F, B

-- Cocos lagoon	R
-- Umatac Bay (n)	R
-- Ajayan Bay, Anse Is., Cetti Bay	R,T,W
Kiribati	
* -- Butaritari and Nonouti	B
* -- Teraina Island	W,B
* -- Enderbury, Teirio, Caroline, Flint and Kenton	T,B
-- Caroline and Malden islands	B,T
-- Bogs and lake on Tabuaeran	W,B
Marshall Islands	
* -- Bikar and Bokaak atolls (upgrading)	R,B,T,O
-- Taka, Jemo, Wotho, Rongerik, Erikub atolls	R,F,B,T
-- 9 other small islands and atolls	R,B,T
Micronesia (Federated States)	
* -- Portions of Pohnpei, Kosrae, Yap and Tol	F,B
-- E. Fayu	B
-- Woleai	R,F
-- Truk lagoon (portion)	R,B,G
-- 10 other small islets and reefs	R,B,T
New Caledonia	
-- Chesterfield Islands	B
-- "Plaine des Lacs"	G
* -- Isle of Pines, Mare, Ouvea, Hunter, Lifou and 6 other small islets	F,B
-- D'Entrecasteaux reefs	T,B,R
-- Beautemps-Beaupr	R,B
Nauru	
-- Remaining forest areas	F
-- Buada Lagoon	R
Niue	
-- Fatiau Tuai reef	R
-- Makapu caves	G
-- Hio cave and beach	G
-- Limu caves and marine pools	G,R
North Marianas	
* -- Asuncion and Rota Islands and reefs	R,B,F
-- Parts of Saipan and Tinian	R,B,T,F
-- Marine sanctuary in Sarigan/Maug/Pagan Is.	R
-- 6 small islets	R,T,G
Palau	
* -- Portions of Babeldaob and Cheibacheb Islands	R,F,G
-- Marine reserves at Ngemlis and 5 other reefs	R
-- Helen Island and Reef	R
Papua New Guinea	
* -- Ninigo and Luf Islands	F,B,R
* -- Portions of New Ireland, Manua, Fergusson, New Britain, Goodenough, Bougainville	F,B,O,G
* -- Bowutu Mts, Owen Stanley Range	F,B,O,G

* -- Catchments of Fly, Strickland & Sepik Rivers	F,B,O,G,W
-- Huon Peninsula	F,B
-- Tuluman Is.	F,B
-- Manus, Milne Bay, Calvados and 11 other island groups	R,B,T,O
-- 29 wetland sites & 61 marine parks (proposed in WCMC, 1989)	W,R
Pitcairn Group	
* -- Ducie and Oeno atolls	B,R
Solomon Islands	
* -- Oema atoll and Oema Island	R
-- Mts. Austin and Galego	F,B
-- Arnavon Island	R,O,T
-- Lake Te Nggono	O
* -- Portions of Rennel, San Cristobal, Guadalcanal, Malaita, Kolombangara, Vanikolo, Choiseul, Santa Isabel, New Georgia, Rendova, Tetepare, Ghizo, Bougainville, Malaita	F,B,G,O,W
-- Manning Strait reefs	R
Tokelau	
-- Portion of Nukunonu	F
Tonga	
-- Muhopohoponga coastal reserve	R
* -- 'Eua proposed national park	G,R,F
* -- 'Ata island and reef	F,T,R,B
* -- Portions of Niuafo'ou and Kao	G
-- Forest reserves on Tafahi	F,G
-- Seaward extensions to existing marine reserves	R
-- 3 reserves on Vava'u	R,W,B
-- Nuku	B
Tuvalu	
-- Kosciusko Bank	R
-- Funafuti and Vaitupu marine reserves	R,W
Vanuatu	
* -- Portion of Espiritu Santo	F,B
* -- Kauri Reserve, Erromango Island and reef	F,B,R
-- Vanua Lava (portion)	O,B
-- Portions of Tanna, Anatom, Pentecost, Malakula, Efate	F,O,B,W,G
-- Mele reef, Hat Is., Paul Rock	R
* -- Malakula and Maskelynes	T
-- Anatom reefs, Cook reef and Reef islands	R,T
Wallis and Futuna	
* -- Alofi Island	F,R
* -- Forests on Futuna	F,B

Western Samoa

- | | |
|--|------------|
| * -- Forests on Savai'i (Tafua and Mt. Silisili) | F, B |
| * -- Aleipata and Mu'utele islands | F, R, B, T |
| -- Satuimalufilufi/Fuailoloo'o reef | R, W |
| -- Fusi/Tafitaola reef | R, W |
| -- Aganoa and Salamumu coastal reserves | R, O |
| -- Nu'usafe island and reef | R |
| -- Leanamoea reef | |

Legend to Resource Features:

- F - Forest, vegetation
- R - Reef, marine environment
- W - Wetlands, mangroves
- G - Geological/geographical feature
- T - Turtle nesting
- B - Bird habitat/rookery
- O - Other wildlife

Action Plan Additions

Kiribati

- Consider protection measures for important avifauna sites on Butaritari, Nonouti, Teraina as well as bird and turtle nesting areas on Enderbury, Teirio, Caroline, Flint, Kanton and Malden islands.
- Review conservation status of the lake and bogs on Tabuaeran Terrain.

Nauru

- Give protection to remaining areas of native forests.
- Consider marine reserve status for Buada lagoon.

Niue

- Review measures for protection of caves at Makapu, Hio and Limu.
- Consider marine reserve potential at Fatiau Tuai reef.

Pitcairn

- Upgrade conservation status of Ducie and Oeno atolls.

Tuvalu

- Establish marine reserves at Kosciusko Bank, Funafuti and Vaitupu.

Wallis and Futuna

- Protect remaining national forest remnants on Alofi and Futuna.

Case Study: A SYSTEM OF REPRESENTATIVE NATURE RESERVES FOR
 WESTERN SAMOA

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East-West Center
Environment and Policy Institute
HONOLULU
Hawaii

and

The Nature Conservancy
HAWAII and WASHINGTON, D.C..

Introduction

The process of selecting lands for public conservation of biological diversity has historically been driven by some combination of factors that could be grouped under the headings, constituency, opportunity, and inventory.

The National Parks system in the United States is an excellent example of a system where the selection of individual areas is largely driven by constituencies. Regular efforts are made to inventory system needs, especially as regards ecosystems representation (Crumpacker *et al.* 1988), and opportunity does play an important role in the acquisition process. Nonetheless, the Congress designates National Parks, and the Congress is ultimately responsive to the voices of its constituents.

Opportunity is the difference between conservation projects which are feasible and those which are not feasible for what ever reasons. Like constituency, opportunity is a critical factor in most conservation decisions, but it is sometimes given too much importance.

Inventories of potential nature reserves are generally based on scientific criteria. The most common criterion for inventory, especially at the global level, is representation of ecosystems in some set of biogeographic subdivisions. UNESCO and IUCN have adopted the goal of representation, in protected areas, of the major ecosystems in the biogeographic provinces first proposed by Ray Dasman in 1972 and revised by Miklos Udvardy in 1975 and 1984. Jeremy Harrison, Kenton Miller, and Jeffrey McNeely (1984) reviewed the state of biogeographic province representation in reserves as of 1982 for the World Congress on National Parks in Bali. The process of assessing representativeness is reviewed by Austin and Margules in their chapter in Michael Usher's 1986 volume on Wildlife Conservation Evaluation.

In Art Dahl's 1980 survey of the tropical Pacific, representation of individual ecosystems was evaluated for each of 20 biogeographic provinces. Dahl's 1988 survey is an inventory based on evaluation of individual islands for conservation. Taken together, these two surveys comprise a comprehensive approach to regional inventory with ecosystem representation as the dominant criterion. The Action Strategy for Protected Areas in the South Pacific Region states that one of its five major goals is "to establish a representative network of protected areas within the South Pacific Region" (SPREP 1985, p. 7).

Within the last several years, national inventories based on representation have been completed in many Pacific island countries, e.g. those developed for Fiji (Dunlap and Singh 1980, Royal Forest and Bird Protection

Society 1988), Kiribati for the Phoenix and Line Islands (Garnett 1985), Papua New Guinea (Specht, Roe, and Boughton 1974), and Solomon Islands (Pacific Regional Tourism Development Programme 1988).

Beginning in 1987, I participated in discussions with staff of the South Pacific Regional Environment Programme (SPREP) on the possibility of conducting an inventory of terrestrial ecosystems in Western Samoa leading toward revision of the existing national parks and protected areas plan (Holloway and Floyd 1975). The project had been requested by the Government of Western Samoa in 1986. The goal was to develop a plan for a representative system of protected areas in the country. By October 1988 agreement had been reached, and the project began officially on the first of January 1989 under the auspices of the East-West Center Environment and Policy Institute (EWC). The project is currently ongoing, with approximately half of the field work completed.

The current contract between EWC and SPREP calls for a definition of the main terrestrial vegetation types for Western Samoa, a set of maps at 1:20,000 showing the mappable units of native vegetation, and revision of the 1975 national parks and protected areas plan to form a proposal for a representative system. The contract also provides for a preliminary inventory of rare and threatened plants in Western Samoa, and this work is also ongoing, but the remainder of this paper focusses on terrestrial ecosystems.

Basic Choices

"Representativeness does not refer simply to some notion of typicalness but rather that a reserve or system of reserves should contain biota which represent the range of variation found within some (biogeographic) region" (Austin and Margules 1986, P. 46). In other words, a representative system will contain and sustain a region's biological and ecological diversity. With this as a fundamental criterion, several basic choices had to be made in Samoa. These were:

1. What system of land-unit classification would best capture the range of variation in the biota of Western Samoa?
2. How best could these land units be inventoried, described and mapped?
3. Which land unit classes should have examples protected in a system of protected areas?
4. How should individual areas be evaluated for inclusion in a system of protected areas?

Land Classification

According to Dahl (1980, pp. 56-57), Western Samoa is part of South Pacific Biogeographic Province IX. Samoa -- Wallis and Futuna. This province includes 20 forest and approximately 15 non-forest terrestrial types. Dahl differentiates these types through dominant genera, so that ecosystems are characterised as genera-dominated vegetation formations. Based on this precedent, on papers by Holloway and Floyd (1978), Ollier *et al.* (1979), Uhe (1974), Whistler (1976, 1987, 1980, 1983a, 1983b), and Wright (1963), and on extensive personal communication with experts such as Ray Fosberg and Art Whistler from 1987 to the present, I prepared a three-tiered hierarchical classification of the terrestrial vegetation of Western Samoa (attached).

Inventory, Description, and Mapping

Aerial photographs of Western Samoa were provided by SPREP. These were 1:50,000 panchromatic photos taken in 1987, supplemented by 1:20,000 panchromatic photos from 1981 where cloud cover precluded the use of 1987 photos. These photos were stereoscopically inspected at one and ten power magnifications, and lines were drawn around areas of uniform texture (polygons). The 1987 photos and their acetates were enlarged to a scale of 1:20,000 using a flat-bed camera. Polygons were then traced onto 1:20,000 topographic maps provided by the Samoan Department of Agriculture, Forests, and Fisheries. The process of tracing polygons onto the maps required a certain amount of adjustment or "rubber-sheeting" to compensate for errors created by variations in the relative altitude of the airplane. Coastlines were used as references. Two precautions were taken to insure that the inventory would be scientifically honest: no attempt was made to develop correspondence between the traced polygons and land-cover as shown on the existing topographic maps; and no attempt was made to classify polygons prior to visiting them in the field.

Art Whistler and I spent four weeks in Western Samoa during July and August 1989. During that time, we visited virtually all the polygons on the Western halves of Savai'i and 'Upolu. Dominant species and other characteristic species were recorded for every polygon where it was possible. The degree of and the agents of disturbance were also recorded for individual polygons where appropriate.

During the field review, the preliminary ecosystem classification was extensively revised, and a dichotomous key to the asexual characters (e.g. leaves, bark, wood, growth form) of Samoan forest trees was begun. Another month of field work is planned for November and December 1989 with additional field work possible in early 1990.

Polygons visited in the field will be reevaluated under the stereoscope, and then redrawn. Each polygon will be labelled with basic location and classification codes:

Sheet Number: Polygon Number: Class Code (/d)

where Class Code is the outline number for the vegetation type (see attachment), and where the optional /d indicates a disturbed ecosystem. The polygons will be reviewed by government officials in Samoa, and then the overlays will be redrawn with ink on mylar sheets so that blue and black-line prints can be made.

A data base will be established with a record for each polygon or unit of vegetation, the data base will include the basic label data plus information on rare plant occurrences, ecosystem disturbance, patchiness, etc..

Selecting Vegetation Classes for Conservation

Once the vegetation units of Western Samoa are mapped, the next task will be to determine which vegetation classes are rare and/or threatened. The undisturbed, disturbed, and total areas for each class will be determined. The undisturbed, disturbed, and total numbers of individual polygons (occurrences) for each class also will be determined. A model will be developed to use this information to estimate degrees of rarity and threat. The estimates will be subjectively revised based on experience in the field. Rare and/or threatened vegetation classes will be selected for conservation, and the selection process will be documented.

Selecting Sites for Conservation

Once vegetation classes are selected for conservation, it will be necessary to select appropriate sites for each class. The following criteria will be employed (in order of priority) (IUCN 1987; MacKinnon *et al.* 1986; Margules and Usher 1981; Schonewald-Cox and Bayless 1986; Smith and Theberge 1986, 1987; Soule and Simberloff 1986; Usher 1986).

1. Naturalness (lack of disturbance);
2. Presence of rare and/or threatened plants and/or animals and the relative sizes of their populations;
3. Area-specific threats (utilisation, surrounding land-uses, opportunities to establish buffers and secure boundaries); and
4. Relative size and shape (larger and rounder sites preferred).

Note that the inventory process has included definition of classes or elements (the universal set of ecosystem types for Western Samoa), selection of classes or elements for conservation (rare and/or representative Western Samoan ecosystem types) and selection of the best sites for each selected class (proposed nature reserves). Selected sites will be presented to the Government of Western Samoa. The government will then have the opportunity to evaluate the recommendations relative to the additional criteria of constituency and opportunity. Finally, a set of recommended sites for conservation will be agreed on, and a revised national parks and protected areas plan for Western Samoa will be published.

Opportunities for the Future

The vegetation maps and data base will have important applications beyond those specified in the current contract:

The Institut franais de recherche pour l'exploitation de la mer (IFREMER) has generously agreed to provide SPOT satellite data for western Savai'i along with data classification services and training. These contributions will allow another, independent round of data testing and interpretation for the development of Western Samoan vegetation maps as well as for the methodological comparison of air photos and SPOT satellite data and their applications for vegetation classification.

The final vegetation maps will be digitised at the East-West Center using a personal computer version of the Arc-Info Geographic Information System (GIS). These files will then be transferred to the Government of Western Samoa where they can be loaded into a similar system currently installed at the Department of Lands and Survey. The Western Samoan GIS also will include a modern soil survey, current land-use maps, and land-capability maps (all currently under development by ANZDEC, a consulting firm in New Zealand, with support from the Asian Development Bank).

The opportunity to overlay the vegetation data with modern soils data will provide the ability to develop landscape ecology models (models of how ecosystems interact) for 'Upolu and Savai'i. Such models should prove to be very useful in developing land-use plans for ecologically sustainable landscapes accommodating both human uses and nature conservation in Western Samoa (e.g. Noss and Harris 1986). The University of Hawaii Geography Department has received support for the development of these models from the U. S. National Science Foundation.

Finally, the vegetation maps and data bases and the rare plant data that are being collected during this project may also be used as the data foundation for a Conservation Data Centre (CDC) for Western Samoa. A paper by Audrey Newman (*infra*) discusses how such a centre is organised. A Western Samoan CDC would be very useful for environmental assessment of development projects, formulation of national environmental policy, and long-term establishment and management of national parks and nature reserves.

Conclusions

It is, of course, too early to draw many conclusions from the data being collected in Western Samoa. At this stage in the project, we can say with confidence that Western Samoa has several very interesting wetland types, some of which certainly will be considered rare and threatened, one or two of which had not previously been described. There is very little lowland or coastal rain forest left, and these formations probably will be considered threatened in toto.

We are also learning something about the processes of classification, inventory and mapping. For example, the initial classification system (attached) is undergoing extensive revision in the field. A few classes which had been considered separate were discovered to be the same, and a number of classes which had not previously been considered were added to the classification.

Other changes were made to accommodate the mapping process. In the case of rain forest classes, it is not generally possible to identify dominant species without establishing plots, and dominance is generally a matter of a few percentage points. So these formations will be mapped without genus dominants, but with some discussion of species distribution gradients. In the cases of strand and littoral vegetation, these formations generally occupy such narrow strips of land that they are not mappable at 1:20,000. Instead, their presence or absence will be noted in the descriptions of all coastal polygons.

Many errors were discovered in the base topographic maps. Craters, peaks, streams, and ridges were discovered where none were mapped, and the map shading to indicate forest and scrub cover was seriously flawed.

The importance of field testing of assumptions, field classification of map units and de novo searches for rare ecosystems and species cannot be overstated. For example, virtually all rare plants documented during the field work were from new locations. Without field testing, an inventory should be considered to be a preliminary assessment, useful for initial planning and for action at fairly coarse scales.

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ATTACHMENT

DRAFT OUTLINE
ECOSYSTEMS OF SAMOA
Sam Pearsall
1989

1. LITTORAL ECOSYSTEMS
 - A. Sand Strands
 1. Ipomoea
 - B. Rock Strands (weathered or iron-bound rock coast above high tide)
 1. Lepturus-Fimbristylis
 - C. Littoral Shrublands
 1. Scaevola
 2. Wollastonia
 - D. Littoral Scrubs
 1. Pandanus
 - E. Littoral Forests
 1. Barringtonia
 2. Pisonia
 3. Calophyllum
 4. Hernandia
 5. Mixed

2. WETLAND ECOSYSTEMS
 - A. Seagrass Beds
 - 1.
 - B. Mangrove Forests
 1. Rhizophora
 2. Brugulera
 - C. Coastal Marshes
 1. Acrostichum
 2. Eleocharis-Cyclosorus
 - D. Freshwater Riparian Wetlands
 1. Hibiscus
 2. Barringtonia
 - E. Montane Meadows
 1. Carex

 - F. Montane Swamp Forests
 1. Pandanus
 - G. Crater Marshes
 1. Eleocharis-Ludwigia
 2. Paspalum

3. MOIST FOREST ECOSYSTEMS
 - A. Coastal Rainforests
 1. Diospyros-Syzygium
 - B. Lowland Rainforests
 1. Pometia
 2. Planchonella
 3. Dysoxylum-Myristica
 4. Dysoxylum-Hibiscus
 - C. Ridge Rainforests
 1. Syzygium
 2. Planchonella
 3. Canarium

- D. Montane Rainforests
 - 1. Dysoxylum
 - E. Cloud Forests
 - 1. Syzygium
 - 2. Spiraeanthemum
 - 3. Reynoldsia
4. SECONDARY, DISCLIMAX, AND SUCCESSIONAL ECOSYSTEMS (other than Littoral and Wetland)
- A. Lava Flow and Cinder Cone Communities (soil generally very thin or absent)
 - 1. Fragelea
 - 2. Metrosideros
 - 3. Mixed
 - B. Fernlands
 - 1. Dicranopteris
 - C. Grasslands
 - 1. Imperata
 - D. Scrubs and Thickets
 - 1. Leucaena Scrub
 - 2. Hibiscus Thicket
 - 3. Pandanus Montane Scrub
 - E. Secondary Forests
 - 1. Rhus
 - 2. Dysoxylum
 - 3. Cyathea
 - F. Managed and Abandoned Lands
 - 0.
5. ANIMAL DOMINATED ECOSYSTEMS
- A. Terrestrial Lava Tubes
 - 1.
 - B. Marine Lava Tubes
 - 1.
 - C. Ironbound Rock Coasts (below high tide)
 - 1.
 - D. Weathered Rock Coasts (typically with fringing reef; below high tide)
 - 1.
 - E. Reef Flats (including offshore, fringing, and atoll reefs inside the algal ridge)
 - 1.
 - F. Reef Slopes (algal ridge and seaward slope)
 - 1.
 - G. Coral Heads
 - 1.
 - H. Lagoon/Reef Pools (beach rock, coral sand, and rubble flats; inside the reef flat and below high tide)
 - 1.
 - J. Igneous Sand Slopes (below high tide)
 - 1.

A "1." followed by a blank line indicates that I have not identified one or more dominant genera for that ecosystem. Data base records have not been established for these ecosystems, and they will not be included in the inventory for SPREP. They may be included in the TNC data base and the revised national parks and protected areas plan, depending on available data.

A "0." followed by a blank line indicates that the characteristic genera are represented mainly by introduced species. Managed and Abandoned Lands will be inventoried as a single class.

This outline and the attached community descriptions are based on Holloway and Floyd 1975; Ollier et al. 1979; Uhe 1974; Whistler 1976, 1978, 1980, 1983a, 1983b; Wright 1963; unpublished outlines by Whistler 1978, 1986; and personal communications with Art Whistler and Fay Fosberg 1987-1989. The outline's basic structure is modified from Whistler 1986.

All errors are my own!

**Case Study: A REPRESENTATIVE NATIONAL PARKS AND
RESERVES SYSTEM FOR FIJI**

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1. INTRODUCTION

The essence of protecting, in the long term, the natural character of any country is to establish a system of national parks and reserves. Such a system also confers cultural and economic benefits, and almost all countries are today establishing parks and reserves as part of the process of sustainable development of their national resources.

The importance of setting aside examples of Fiji's tropical forests in protected areas has been acknowledged for some time by the government of Fiji. In Development Plan No. 7 (1975-80) the Fijian government first announced its intention to conserve and protect important elements of the country's heritage through the establishment of a comprehensive system of parks and reserves. In the current Plan, DP 9, the first listed environmental objective for the period to 1990 is "to protect and conserve unique features of Fiji's environment".

This government commitment to conservation extends to the Native Land Trust Board (NLTB), a statutory body which was established in 1940 to administer and control the use of all 'native' or Fijian-owned lands on behalf of the national landowners. The Fijian people communally own over 83% of all land in Fiji, the balance being held by Government (10%) and private individuals (7%). NLTB's Forestry Policy supports "the establishment of nature reserves in any forest on native land in suitable locations for the protection of species of flora and fauna".

NLTB is happy to facilitate such development through the Native Land Trust Leasing procedure as this is clearly to the benefit of the landowners and in the interest of the nation as a whole. In particular, NLTB is fully appreciative of the fact that, the important conservation and protection role of parks and reserves aside, these national treasures are fast becoming the international centres of nature-tourism development activity, and a focus of indigenous entrepreneurialism. Indeed the establishment of a manageable system of parks and reserves may provide the ideal means to control, develop and promote landowner tourism ventures, and to guide government and overseas investment efforts in secondary tourism and heritage protection.

The Ministry of Forests, likewise, through the proposed Development Plan of its Extension Division, plans for 15% of Fiji's total natural forest cover to be permanently protected.

It has recently become recognised that the need for protected areas action is urgent because of the relatively rapid and extensive degradation of rainforest on the Fiji Islands associated with logging and land

clearance for agriculture. Before key sites, forest types and wildlife species are lost, protected examples of Fiji's forest heritage will have to be established.

Acting on this concern, in June 1988 the Native Land Trust Board invited the Maruia Society, a conservation organisation of New Zealand, to assist the Board in designing a system of representative, scientifically selected national parks and reserves for Fiji.

It was agreed that a team of New Zealand scientists should be sent to Fiji to carry out a survey of the forest, with assistance provided by local personnel of the Fiji Ministry of Forests and the Native Lands Trust Board. The forest survey including initial discussions with land-owners took place in October and November, 1988 and a 132-page report with recommendations for action has been produced on the findings of this survey.

THE RATIONALE FOR NATIONAL PARKS AND RESERVES

There are two principal purposes behind developing a system of representative national parks and reserves. The first is centred on the need to secure the distinctive natural character of a nation's landscape while retaining traditional forest-based cultural knowledge. The second is to provide the basis for diversification of the tourism industry permitting village-based rural development.

Forests as a national heritage

The forest environment has played a key role in the development of Fiji's cultural heritage, as it has for most indigenous Pacific cultures. Since their arrival on the islands of Fiji, the Fijian people have looked to the forests to supply many of their living requirements. The forest remains an active part of the villagers' life today, providing supplement to their diet, building and weaving materials and, by protecting the catchments of streams and rivers, ensuring a constant supply of clean, un-sedimented water. The association of mataqali (landowning units) with their forests describes a link of heritage that draws history, mythology and traditions of land use into a living matrix.

The word "vanua" signifies the basis of Fijian attitudes to land and resources. It describes in a single word the interacting and indivisible link between land and its people, their culture, language, customs, religion, and values. Vanua is the building block of cultural interactions involving land and resource use, and the relationship between people and their forests is a key component of vanua.

The unique plants and animals found naturally within the forests of Fiji are to a large extent what gives these islands their distinctive identity, contributing to a sense of home and place for Fijian people. With the greatly increased rate and degree of forest modification occurring under modern conditions, the protection of forest in national parks and reserves becomes critical if a country's natural heritage and character is to be preserved. The practical, cultural, and historic attributes of the forests can turn national parks into a living representation of Fiji's ancestral cultural landscape, protecting a long association of people with their land and forest.

Coupled with the cultural importance of forests is the exceptional value to science that national parks and reserves have. The forests of the tropical South Pacific are distinctive for their great diversity of life, and for their numbers of unique plants and animals. They feature a myriad of primitive relict life forms - in Fiji these include ancient conifer trees such as the *dakua makadre*, *yaka* and *kuasi*, and the iguana. Each island acts as an ark, protecting its primitive natural cargo by the sizeable distances of water that separate islands from their nearest neighbours. Alongside this ancient component is found a rich diversity of life that has reached the Pacific more recently from that powerhouse of animal and plant evolution, southeast Asia. In addition, the isolation of the islands across the Pacific Ocean has led to the development of many plants and animals that are endemic (unique) to each island group. Much of the international importance of the South Pacific's natural heritage stems from the high degree of endemism in its biology. In Fiji 45% of the plants and 23% of the birds are found nowhere else.

There has so far been little study done on the ecology of the Pacific's tropical forests, and much information awaits discovery and understanding. It has been estimated that on the Fijian island of Vanua Levu alone, 100 species of vascular plants have yet to be identified and described by scientists. Representative national parks and reserves are designed to protect examples of this diversity and uniqueness of the land and forests, and to ensure that future knowledge and discovery is not foregone through modification by logging or clearance of the entire area of any distinctive forest type.

Tourism Values of National Parks and Reserves

The benefits of a national parks and reserve system extend beyond that of a biological and cultural resource. A reserves network is a major attraction for tourists, having potential to contribute significantly to the local and national economy. In countries such as Costa Rica, Nepal and Kenya where, like Fiji, tourism is the major foreign exchange earner, the tourism industry is based on national parks and nature tourism. At present tourism in Fiji is beach and reef based, and there is a need to diversify the base of visitor attractions if there is to be growth in the tourism sector.

North American and European tourists, attracted by the natural unspoiled qualities of southern hemisphere countries, represent the major growth sector of overseas visitors to this region. Beach resorts are less important to these visitors, for whom the beaches of the Caribbean, Mediterranean and North Africa are more accessible and less expensive. To attract this segment of the international tourist market, natural and scenic attractions other than more beaches are what need to be developed and promoted. And national parks and reserves are a proven international visitor attraction throughout the world. In New Zealand 71% of overseas tourists visit at least one national park, and in the Northern Territory of Australia, the figure is 81%. (Air New Zealand visitors' survey and Queensland Tourist and Travel Corporation pers. com.)

In Queensland the promotion of tropical rainforest national parks in the Queensland Wet Tropics World Heritage Area has given the state international prominence in the tourism market. The number of international visitors to Cairns (adjacent to a number of tropical forest national parks) has been increasing at 75% per annum, much faster than overall visitor numbers to Queensland, which have been increasing at only 15% per annum. The average direct expenditure of international visitors to Cairns in 1988 was A\$620 per visitor, adding A\$5.5 million to the local Cairns economy. (Queensland Tourist and Travel Corporation, pers com)

In Kenya's Amboseli National Park it has been estimated that about US\$40 is yielded per hectare per year from the park in net earnings mostly from tourism. The returns from tourism are 50 times higher than from agriculture on equivalent lands around the Park. (McNeely, 1988)

Nature tourism based on protected natural areas brings real benefits to local economies. In the South Westland region of New Zealand's South Island (the country's largest area of pristine forests, coastline and mountains) experience shows that the greatest growth sector in tourism has been in tourists travelling in rental cars and campervans. These tourists stay longer in the region and patronise local tours, walks, and boat and helicopter rides. Overall in New Zealand it has been estimated that every 20 overseas visitors create one extra job in the tourism and tourism servicing industries. Nature tourism effectively draws this growth into the remoter regions.

A real opportunity exists for the development of village based nature and adventure tourism in Fiji centred on a national system of parks and reserves. If a forest area supports an effective tourism industry, the financial benefits can be kept in a continuous supply over a long period of time without destroying the resource. Native forest logging, by contrast, provides short-time direct returns to local landowners and tax revenue to the Government while the major return is to the logging company. Most logging operations leave little opportunity for any further income from the mataqali lands for the present or the next generation.

Low-impact nature tourism based around national parks and reserves opens up important opportunities for Fijians living away from the coast to become more involved in this well-paying industry. Careful planning is needed to ensure that the industry is developed in a way that is compatible with the preservation of the indigenous culture. Landowners may be involved with guiding, demonstration of traditional crafts, and other activities, while at the same time offering visitors a uniquely Fijian experience in a natural setting.

Protected area establishment on native lands must however proceed through established leasing procedures to ensure that (NLTB 1988):

- (a) The landowners are fully aware from the outset as to the purpose of such areas and as to the benefits (socio-economic, environmental and otherwise) which will accrue to them through their lands being given park/reserve status.
- (b) The landowners are fully aware of the implications of protected area status as it affects customary land use rights.
- (c) Landowner benefits are maximised, not only in terms of lease premiums, income, and visitor receipts, but also with regards to employment and, if appropriate, training opportunities.
- (d) The lessee receives long-term security over the lands in question.
- (e) Should any dispute arise between the landowners and lessee, both sides have recourse to arbitration through NLTB.

It should be noted that to date, apart from the 43 ha Namenalala Island Nature Reserve (established 1984 through lease agreement between NLTB, the landowners and Namenalala Island Resort Limited), no protected areas have been established in Fiji through the Native Land Trust Leasing Procedure. All existing parks and reserves, excepting the National Trust's

Iguana Wildlife Sanctuary on Yadua Taba, the Sigatoka Sand Dunes National Park and Reserve, and The Garrick Memorial Reserve, are located within Forest Reserve and are therefore administered and controlled by the Forestry Department. The Yadua Taba Iguana Sanctuary Reserve and the proposed Waisali Forest Amenity Reserve, though located on native land, have yet to be made the subject of a formal lease agreement between the National Trust and the NLTB (Landowners).

3. SHARING THE COSTS AND BENEFITS OF PROTECTED AREAS

At least a portion of the forests in most reserves will include potentially merchantable timber. For the landowners the revenue they would receive from logging may be their only opportunity to meet the costs of basic health care and education for their families. It would be unfair to require landowners to bear the full cost of foregoing logging revenues to establish a parks and reserves system which is designed to benefit everyone. The owners will fairly seek a return from protection of their land that is equivalent overall to what would have been received from timber production.

Accordingly, a lease should be negotiated for protection of the forest with the costs of reserve establishment being shared between the Fijian government and developed country governments, particularly those around the Pacific rim, which feel able to make a contribution as part of their aid programmes to Fiji. Several donor countries have already expressed an interest in contributing to forest conservation and national park establishment. As well, development assistance funds could support the establishment of nature tourism in the parks, thus ensuring an ongoing source of livelihood from the protected forests.

Leases may be negotiated with mataqali from each forest reserve area, with payment taking account of the costs and benefits accrued from long-term protection of the owner's forests. The amount of production forest included in the reserve proposal, the future benefits of any nature-tourism development to the land owners, and the loss of potential agricultural land are all factors that may be taken into account.

It may be appropriate to establish a trust board to administer the funds received from the establishment and operation of each national park or reserve, and to ensure that in all cases the financial benefits of reservation are available to both present and future generations of landowners, so that there is a lasting commitment to the protection of the reserve.

These implementation issues, which arise from the forest survey report, are currently being considered by the Government of Fiji.

4. EXPERIENCE OF VILLAGE-BASED NATURE TOURISM

4.1 The NLTB and Protected Area Establishment

The NLTB first became actively involved in Protected Area establishment back in 1980 when, working in consultation with the Forestry Department and the National Trust for Fiji, the board drew up "A Proposal For A Forestry Amenity Area For Vanua Levu" or "The Waisali Forest Amenity Reserve" as it is now known. More recently the board, again working closely with government and the landowners, completed similar Forest Park and Reserve Plans for landowners on Viti Levu's "Coral Coast" and

on the island of Taveuni, that is, "The Waikatakata Archaeological Park and Forest Reserve" (1988), and "The Bouma Forest Park and Reserve" (1989), respectively.

The latter two plans, commercially oriented towards the exploitation of the (as yet untapped) domestic and overseas markets for nature-based tourism and outdoor recreation, and drawn up in accordance with recent government moves towards the establishment of a more resource integrated, locally responsive, and environmentally sustainable approach to rural development, may be seen as national pilot projects in Landowner Park/Reserve development and heritage protection. It is hoped that their successful implementation will pave the way for a network or system of similar such protected areas as envisioned by the National Trust for Fiji and the Maruia Society.

This paper briefly outlines the progress of "Waikatakata" and "Bouma" projects to date and, by doing so, attempts to provide an insight into NLTB's approach to park/reserve development, as well as to some of the key issues, problems and constraints relating to protected area establishment in Fiji.

Recent Initiatives in Landowner Park and Reserve Development

We now turn to recent NLTB initiatives in landowner park and reserve development, as provided for in the "Waikatakakata Archaeological Park And Forest Reserve Plan (1988)", and the more recent "Bouma Forest Park And Reserve Plan" (July 1989).

In essence both of these projects are commercially oriented forest park and reserve developments, firmly based on the "user-pays" principle, with provisions for landowner resort development built in. While the "Waikatakata" plan was instigated by the NLTB primarily as a national pilot project in Integrated Resource Development, Catchment Planning, and Landowner Tourism, the "Bouma" plan was drawn up in response to landowner wishes to expand existing tourist-related development on their lands.

The Waikatakata Archaeological Park and Forest Reserve

"Waikatakata" is Fijian for "hot water". The plan derives its name from the presence of a series of hot springs and associated archaeological sites located within the forested and mountainous terrain of Viti Levu's "Coral Coast", Fiji's premier tourism development region.

Having obtained the approval of the landowners (Mataqali Kawabu of the Yavusa Davutukia) in September, 1987, the Board commenced work on the preparation of an "Integrated Resource Development Plan" for the greater part of the Busa Drainage Basin, or the "Upper Busa/Waikatakata Catchment" as it is more commonly referred to. Prepared in conjunction with the landowners and relevant government departments/agencies, this plan provides guidelines for the area's future development in terms of forest-based recreation and tourism, nature conservation, environmental improvement (much of the catchment has been logged with subsequent erosion and siltation of stream courses developing into a serious problem), cultural site preservation, agriculture, and forestry (including reforestation). It also provides for the continuing customary use of the forest resource by the traditional landowners.

The "Waikatakata Plan" was prepared as an off-shoot to the "Integrated Resource Development Plan" in recognition of the catchment's rich natural and cultural heritage, which includes virgin rain forest, hot springs, waterfalls, and a series of well preserved Fijian archaeological sites (religious, agricultural, and fortified in nature), and in awareness of the catchment's proximity to the Suva-Nadi Highway and the Coral Coast Resorts.

The development of a recreation trail system is planned, complete with basic visitor provisions and environmental interpretation programmes, which will effectively link up and display the catchment's main heritage features. A small scale land-owner-operated tourism venture, together with provisions aimed at facilitating use of the catchment by schools and other educational institutions will also be incorporated into the final development. The area covered by the proposed park and reserve is 638 hectares.

Towards project implementation the board, on behalf of the landowners, has received aid funds to the tune of F\$11,410 from the Australian Embassy in Suva, together with a F\$500 grant from the Fiji Museum. Part of these funds have been used to undertake initial archaeological and ecological survey work. A special project account has been opened with the board's Trust Department to administer the balance.

Major problems encountered in project implementation include:

1. The lack of development funds (especially for improvements to road-ing access and provision of an extended recreation trail system);
2. impasse over the question of leasing and management arrangements;
3. landowner disputes concerning rights of access.

However the board, working closely with the Ministry of Fijian Affairs and other government departments, hopes to resolve these matters shortly and to proceed with the implementation of this important national pilot project.

4.4 Bouma Forest Park And Reserve

In July this year the Board completed plans for a forest-based landowner tourism venture for Mataqali Naituku (of Nakorovou Village) and the Vanua of Bouma, Taveuni. Mataqali Naituku's lands comprise some 3,543 acres, some 1,345 of which comprise part of the government's Taveuni Forest Reserve.

The development proposals outlined in the "Bouma Plan" are based on the premise that Mataqali Naituku's forests - including those lands located within the Taveuni Forest Reserve - are conserved, and where appropriate protected, for park and reserve purposes as outlined in the Tourism Development Programme for Fiji (UNDP/World Bank/Fiji Government, 1973) and the National Parks and Reserves System Plan for Fiji (IUCN/W.W.F/National Trust for Fiji, 1980).

In essence the "Parks and Reserves System" calls for the protection in perpetuity of the Taveuni forests, Lake Tagimaucia and those natural features contained therein. The "Tourism Development Programme", on the other hand, envisions the development of the forests for nature-based recreation and tourism. The park headquarters would be centred on Bouma

(Nakorovou Village) and forest-based recreation facilitated through the establishment of an extensive trail system linking Bouma, Lake Tagimaucia, Desvoeux Peak, Mt. Uluiqalau and Somosomo Village.

NLTB's plan for Bouma simply builds upon these recommendations by incorporating proposals for cultural resource protection and interpretation, providing for landowner resort development, and allowing for the integration of traditional and modern agricultural systems. In many respects therefore, the development envisioned for Bouma and Taveuni is similar to that proposed for the Waikatakata/Busa Catchment. The development objectives remain the same:

- the conservation, protection and enhancement of important and, in some cases, unique aspects of the Fijian natural and cultural heritage.
- the establishment of a first-class recreation and tourism asset for the benefit of local and overseas visitors alike; and
- the creation of local employment and income-generating opportunities for the landowners.

5. THE SCIENTIFIC BASIS FOR SELECTING RESERVES

The survey of Fiji rainforests sought to follow as closely as possible internationally accepted criteria for reserve selection and design.

The design of national parks and reserves should ensure that they possess the maximum chances of survival on a long-term basis. A badly designed reserve may fail to withstand the ravages of natural events such as hurricanes or landslides, or it may not be suitably protected against adjacent conflicting land uses such as logging or land clearance. A reserve design that follows established international criteria, however, can ensure not only that the biological and scientific values of the forest will be preserved but also that the economic importance of the intact forest (for tourism for example) can be sustained.

To achieve this there are accepted scientific criteria that should be met. Ideally, a reserve should be:

a. Ecologically representative

In accordance with modern developments in conservation, parks and reserves are designed around an ecosystem, a term which describes the inter-related living and non-living components of a distinct natural environment. Based on the ecosystem concept, a representative forest reserve system must encompass examples of forest growing on different soils and rock types (such as volcanic and sedimentary), in different climatic regimes (such as wet zones and dry zones) and at different altitudes. A nationally representative reserve system designed in this way has the best chance of including examples of all of the different kinds of natural forest, plants and animals that comprise the distinctive biology of a country.

b. **Comprised of complete ecosystem**

The object of a reserve is to maintain in perpetuity a living example of a chosen natural ecosystem. This can only be achieved by drawing the boundaries of a reserve around an area large enough to allow the natural processes of that community to continue unhindered. A fragmented forest remnant will not be as stable or viable in the long term as a larger reserve that encloses a complete self-sustaining landscape unit.

c. **A complete catchment**

A reserve bounded by catchment lines provides its own buffer against upstream disturbances.

d. **Unmodified**

Human-induced disturbances should be minimal, to ensure the reserve is not fragmented or the forest damaged.

e. **Bounded by natural features**

Usually this means ridge tops will form the boundaries of a reserve, ensuring easy administration and minimising outside disturbing influences.

6. **RESERVE SELECTION AND SURVEY METHODS IN FIJI**

Seven major forest reserves in Fiji were chosen by the Ecological Survey Team, selected primarily on the basis of their landform, geology, representative groups of forest types.

Initial investigations were carried out using the Fiji Forests Inventory and its forest-type maps. Initial selection of representative forested areas was then matched against geological survey and soil resources maps. Final reserves and their boundaries were delineated after landform features were taken into account. Aerial photographs and discussions with Fijian officials and landowners confirmed the current status of the forest cover within the proposed reserve boundaries.

In the field the team travelled extensively throughout the three main islands of Fiji. The aims of the field work were five-fold.

1. to gain a general overview of the distribution of forest types across the islands, and some insight into the relationship between the forest types and the physical environment.
2. to ensure that the initial reserve selections were indeed the most appropriate areas to protect particular forest communities.
3. to investigate each reserve proposal as fully as possible on the ground.
4. to conduct preliminary bird surveys in each proposed reserve for initial indications of species composition and abundance.

5. to initiate discussions with each mataqali, and village and tribal chiefs (especially those who may be directly affected by reserved forest), to gain their views on forest conservation, to learn of potential land use conflicts with the proposed reserves, and to understand their own needs and desire concerning their forests.

The total area proposed for reservation in the survey report equals 6.8 per cent of the unlogged indigenous production-zoned forests resource in Fiji. The main proposed national parks and reserves are:

Viti Levu

1. Proposed extension of Mount Tomanivi Nature Reserve into the Wabu Creek Catchment, and proposed National Park:

To protect the last remaining large stand of dense dakua makadre forest in Fiji found in a pristine catchment area. The national park would represent three forest communities growing on volcanic rock - cloud forest, steepland montane forest, and dense dakua forest, and the ecocline between these three. The forests have high cultural values because the area is one of the earliest settled by the Fijian people, and is consequently rich in history and mythology.

2. Nadrau Plateau (Western Sector): Proposed National Park:

To protect outstanding plateau edge features comprised of sedimentary rock and associated dakua makadre/dakua salusalu forest.

3. Sovi Basin National Park:

To protect Fiji's premier landform feature, the bowl-shaped Sovi basin formed by intrusive Colo plutonic rock and eroded volcanic rock, and the undisturbed rainforest within, which represents ten different forest types of western (wet zones) Viti Levu.

4. Waikatakata Archaeological and Forest Park:

To protect an important remnant of coastal hill forest of southern Viti Levu, and to protect outstanding archaeological sites within the forests.

5. Proposed Mount Evens Forest Park:

To protect the only remaining significant stand of the western Viti Levu dry/intermediate zone forest communities and the associated spectacular recent volcanic landforms.

Taveuni

6. Proposed Teveuni National Park

To protect outstanding volcanic landform featuring undisturbed dense rainforest, with associated high wildlife values (attributable to the large extent of the forest and the absence of the introduced predator, the mongoose), diversity of habitats (including lake and wetlands), and intact ecoclines.

Vanua Levu

7. Vuniviva National Park Proposal:

To protect a once common but now unique ecocline from dry to wet zone forest, and from mangrove coastal fringe to high inland ridge forest. The proposed park is sited on volcanic rock.

8. Proposed Waisali Forest Park:

To protect an example of wet zone Vanua Levu dakua makadre/dakua salusalu forest.

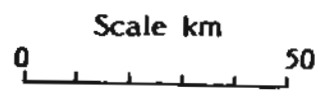
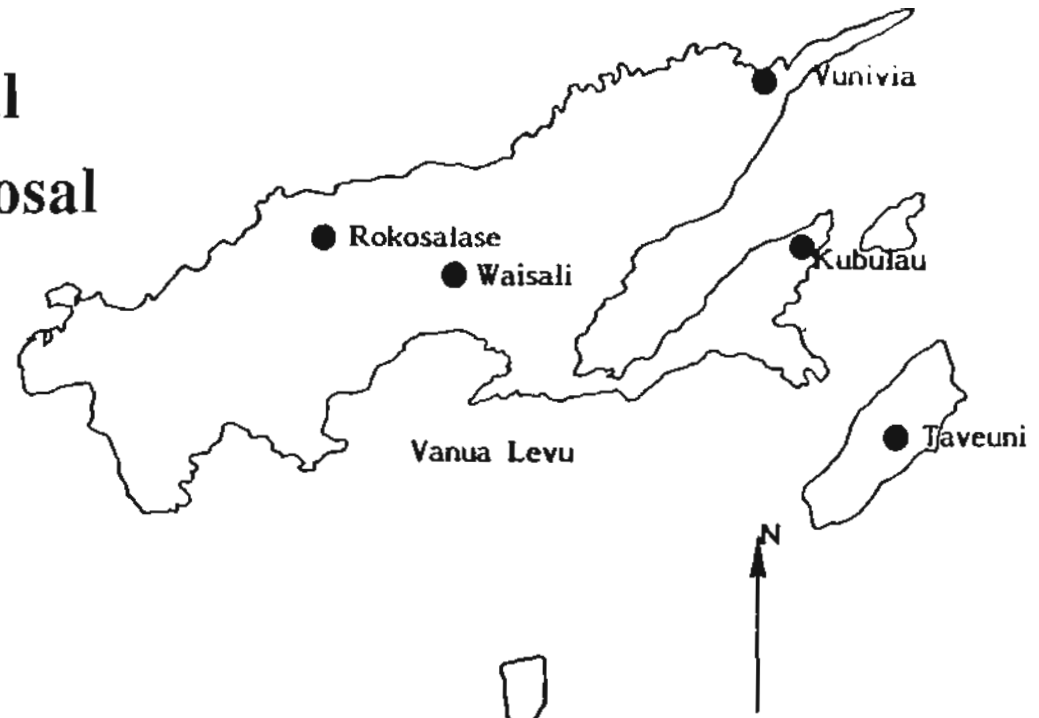
9. Proposed silktail reserve, Tunloa Peninsula:

To protect the habitat of the endangered silktail.

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A Representative National Parks and Reserves Proposal For Fiji



CASE STUDY: THE NATURE CONSERVANCY'S HERITAGE PROGRAMME -
THE HAWAII EXPERIENCE

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INTRODUCTION

The Nature Conservancy is an international conservation organisation based in the U.S., and dedicated to the preservation of biological diversity. Its goal is to find, protect and maintain natural areas that support the best examples of native ecosystems and endangered species. As of August 1989, the Conservancy owned and managed approximately 1000 reserves, the largest private reserve system in the world. In addition, it has worked with public and private conservation groups to protect many more areas. Overall, the Conservancy has helped to protect more than 3.8 million acres through its active programmes in the U.S., Canada, Latin America and the Caribbean. For a more complete description of the Conservancy's programmes, refer to the paper by Kelvin Taketa.

This case study describes the biological databases developed by the Conservancy to identify the species and ecosystems in need of protection and to select lands best suited for preservation. Using Hawaii as an example, it will also describe how these databases have been useful in planning for protected areas and natural resources development in an island setting.

HERITAGE PROGRAMMES AND CONSERVATION DATA CENTRES

The Conservancy began building biological databases in the eastern U.S. in 1973, because objective and up-to-date biological information was needed to identify the most important areas for protection. This allowed us to apply limited conservation dollars wisely. In addition, this information proved useful to a variety of agencies and individuals involved with land-use planning and development. As a result, partnerships developed to establish a network of state databases (typically called Heritage Programmes) in all 50 states. In most cases the databases are built and maintained with support from state governments, and many are now totally administered by the state natural resource agency. In addition, a national database was established to help determine national and regional protection priorities. More recently, the network has expanded to Canada and 8 Latin American countries (called Conservation Data Centres).

Each database is a simple biological book-keeping system. It compiles all available information on the rare plants, animals and natural communities (collectively called elements) in the state, region or country, and summarises this information on maps and computer records. It consists of four major components:

1. **Maps:** All locality information is recorded on USGS topographic quadrangles (1:24,000 scale) to provide a picture of biological hotspots (concentrations of rare species and communities) and information gaps.
2. **Computer Records:** Summaries of the available information are maintained in a database (dBASE III Plus on IBM-compatible computers). This database includes site-specific records on the location,

habitat, size, trends, threats, management and information sources for each rare population or community example. It also provides analyses on the overall (state, national, or global) distribution and rarity of each rare plant, animal and natural community.

3. **Staff:** The database is staffed by knowledgeable biologists. Staff sizes vary from one to more than 20, with the ideal minimum staff to include a zoologist, botanist, ecologist and data manager. Through their work these people develop special expertise in the rare or significant biota of the region, and represent an important information resource for protection and land-use planning.
4. **Methodology:** The database is intentionally restricted to rare species and communities. Its aim is to focus attention on the most unique and hence vulnerable resources in a cost-effective manner. Like any book-keeping system, the Heritage databases employ a consistent methodology, which allows for powerful, objective comparisons of the rarity or diversity of different areas. It also makes this information quickly and easily available for all kinds of land use decisions.

A unique value of these databases is that they are designed to build on existing information, and to be continually updated. The database does not require a comprehensive and expensive biological survey to begin being useful to decision-makers. Rather it continually gathers information from a variety of sources, including publications, unpublished documents, aerial photos, museum collections, and individuals familiar with the resources of interest. This data-gathering identifies specific information gaps that can be filled (with new surveys or additional research and interviews) as needed. Unlike a report or survey, the database is never "complete", but it also does not go out of date. Rather, it grows more comprehensive and useful as the total understanding of the significant biological resources in an area improves.

EVALUATING HAWAII'S BIOLOGICAL RESOURCES

As is the case in islands throughout the Pacific, in Hawaii isolation and a diverse array of physical environments have resulted in one of the highest rates of endemism in the world. More than 90% of Hawaii's native plants and animals are endemic (i.e. unique) to the Hawaiian islands. Unfortunately, many of these unique species are also rare and seriously threatened by habitat loss to a staggering array of invasive introduced plants and animals. In some areas, particularly coastal and lowland areas, development is also displacing significant biological resources. Current natural communities are rare and at risk of being lost in the next 15 years if they are not protected soon. Overall, more than 25% of the candidate endangered plants and birds in the U.S. are Hawaiian, and Hawaii also has the largest share of U.S. extinctions.

With such large numbers of rare species, it was not practical to plan a statewide network of biological preserves by protecting one species at a time. Instead, the Heritage Programme developed a simple natural community (ecosystem) classification to use as a checklist for protecting the full range of habitats in the islands. Like most Pacific islands, Hawaii did not have a comprehensive biological survey or detailed vegetation map. So the classification was initially developed through meetings with biologists familiar with the islands. The classification includes terrestrial, aquatic and subterranean systems (marine systems have not yet been addressed). The majority of Hawaii's native natural communities are forests, shrublands and grasslands, which were described by their general elevation, moisture regime, physiognomy (vegetation structure), and dominant canopy species. As each distinct com-

munity type was identified, the biologists also created a list of sites where they thought it occurred; and estimated its rarity using the Heritage global ranking system. These initial lists are constantly revised by new field observations and discussions with active field people. At this time, approximately 140 community types have been recognised, and more than half (80) are considered rare.

PLANNING FOR PROTECTED AREAS IN HAWAII

Armed with this information, the Conservancy launched a major campaign to raise \$10 million from private contributions to create and manage at least 8 new preserves for Hawaii's rarest communities. Over three years, the Conservancy raised the funds, created 7 preserves and are working on 4 more.

Using this natural community classification, the Heritage staff also discovered that a large number of rare and common native natural communities could be protected on government land. In fact 45 per cent of the native natural communities in Hawaii could be protected immediately, if the State managed their existing Natural Area Reserves System so as to control introduced herbivores and aggressive weeds. The Heritage data convinced the Governor and Legislature to appropriate more than \$5 million for these reserves and related conservation programmes over four years; an 80-fold increase over the preceding 17 years combined.

Now the conservancy is using the Heritage database to find the remaining biological gaps in Hawaii's system of parks and protected natural areas. In the next five years the Conservancy hopes to protect at least one example of every native natural community in the islands through public and private efforts. At the same time the Heritage Programme will continue to steadily compile information on rare species that will be needed in the future to fine-tune this system of protected areas to include the full diversity of the islands.

PLANNING FOR NATURAL RESOURCE USE IN HAWAII

In addition to identifying outstanding natural areas, the Heritage Programme's information is used in planning or reviewing a wide variety of land-use projects. These include environmental assessments, coastal zone management, roads, trails, telecommunication sites, and fire pre-planning. In general, the database provides information on potentially significant areas, which is used by planners, landowners and government agencies to adjust the project and avoid conflicts before they make expensive commitments.

For example, the Hawaii Coastal Zone Management Programme (CZM) contracted with the Heritage Programme to prepare maps and a computer database on the location and status of rare coastal plants and animals. Most of these species were well-known and frequently surveyed by different individuals, but the information was scattered in museum collections, state offices, national government offices, and the files and field notes of various scientists. Furthermore, there was no map showing the distribution of all these unique species at one scale. As a result, it was impossible for the CZM staff to determine whether a rare species was known from a site when reviewing an environmental assessment or permit request. With the database, this determination is quick, and CZM also provides this information to people considering projects to help them avoid costly conflicts as early as possible. To keep CZM up to date, the Heritage programme incorporates new information on these coastal species into the database, and will provide periodic new printouts to CZM.

Similarly, a private landowner provided funds to gather database information for the southeastern Waianae Mountains on the island of Oahu. This was to assist with their regional land-use planning. In this case the summit area was well-known to local botanists, because of its unusual pockets of very rare plants; the birds were not systematically surveyed; and the natural communities were undescribed. The landowner was generally unaware of the biological value of this land, since it was watershed and they had no development plans for it.

The database confirmed that this small 1000-acre summit area was incredibly rich. The reported populations included more than 10% of all the rare plants in Hawaii, some of which occurred only in this area. The lack of information on communities spurred a reconnaissance survey, which revealed that some of the habitats present were also unique and rare. On the survey, an active nest of the endangered Hawaiian owl was also sighted.

After receiving a summary of the database findings, the landowner opened discussions with the Conservancy about creating a nature preserve in the summit. Shortly thereafter, they used the database to select access routes and antennae sites for their planned expansion of telecommunication facilities in the area. In both cases, it was possible for them to design a project that met their economic needs and avoided all biologically sensitive areas. Finally, they intend to use the database to be sure their consulting botanist addresses all the rare species likely to occur in the area as part of the environmental assessment for the telecommunications project, which is required in our state.

Since 1985 the Hawaii Heritage Programme has worked with more than 16 different agencies and organisations on a variety of land-related projects. Each of these projects has built a new link between land decisions and conservation concerns. To date, the Heritage Programme has systematically gathered and processed the available information for approximately half of the rare species and communities in Hawaii, and will complete the initial data compilation in two years. As the database grows, it can assist with broader land use analyses, but in Hawaii it has provided valuable information for planning from its earliest projects.

CASE STUDY: PROTECTED AREA PLANNING FOR ATOLL ECOSYSTEMS
 IN THE NORTHERN MARSHALL ISLANDS

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1. INTRODUCTION

This paper summarizes the results of a recent biodiversity survey and protected-area-suitability assessment of atolls in the Northern Marshall Islands (Thomas et al., 1988). During September 1988 a multidisciplinary team of scientists and planners surveyed six atolls and one island in the Northern Marshall Islands including: Taongi, Bikar, Taka, Jemo (Island) and Erikub Atoll in the Radak (western) Chain, and Rongerik Atoll in the Ralik (eastern) Chain.

The above-listed atolls may be categorized functionally, with respect to the traditional human use of atoll resources, into three distinct types: i) uninhabited and remote atolls (Taongi and Bikar); ii) uninhabited but accessible 'pantry' atolls (Taka, Erikub, Rongerik and Jemo Island); and iii) inhabited atolls (Wotho). For this paper we have chosen Taongi, Taka and Wotho Atolls as examples in order to discuss biodiversity/natural ecosystem integrity and strategies of protected area management compatible with existing patterns of traditional Marshallese resource use.

The paper also recommends a range of protected area categories to accommodate the diverse conservation objectives confronting the Northern Marshall Islands, and offers suggestions on national legislation and the administrative organization/structure necessary for implementing a comprehensive protected area system for the survey area.

2. SURVEY AREA AND METHODOLOGY

The newly-founded Republic of the Marshall Islands consists of 29 atolls and 5 small islands or "table reefs", lying in the Pacific Ocean, north of the Equator and west of the 180 degrees meridian (Map 1). To the south-west lies the Caroline Archipelago, and to the south-east, Kiribati (the Gilbert Islands).

The Marshall Archipelago is about 800 miles (1,300 km) E-W, 700 miles (1,500 km) N-S, scattered irregularly in two chains, the Ralik, or western, and Radak (Ratak), or eastern, trending north-west to south-east. The total land area in the Republic is approximately 70 square miles (181 sq.km), while the total area including enclosed lagoon is about 4,507 square miles (11,664 sq.km).

The atolls are usually characterized by an irregular ring-shaped reef with one, to many, "islets" (land areas above high-tide level) lying on it. This reef-ring encloses a "lagoon", connected, in most cases, with the sea by one or more deep channels or "passes" and/or by small shallow channels. Water also exchanges between the ocean and the lagoon over the perimeter reefs (with no islands) during high tidal phases. All the islets are low lying, and formed entirely of calcium carbonate in the form of coral sand and gravel, cobbles and boulders, and consolidated limestone.

The field survey was undertaken using a Marshall Islands fisheries surveillance vessel. Six atolls, for which approval to visit had been obtained from the landowners, and one island were visited. These included Taongi, Bikar, Taka, Jemo (Island), Erikub, Rongerik and Wocho Atoll (see Map 1). With the exception of Wocho, all were uninhabited. The atolls visited were chosen in consultation with the Marshall Islands government, and represented those on which the ecosystems were likely to be least disturbed (by human activity), and which offered realistic opportunities for establishing protected areas.

The survey team visited 42 atoll islets, and surveyed 96 underwater stations during the 17 days of the survey. Activities of the terrestrial team were coordinated so the maximum number of islands, islets and sand cays were visited. The usual survey procedure for the terrestrial team was to walk the perimeter of the islands making several forays into the interior of the larger islands, taking field notes on the fauna, vegetation, soils, geomorphology and cultural sites encountered. Comparisons were made with previous vegetation and avifauna records of the atolls and islands visited, and significant changes noted. Principal references used for this purpose were those of Fosberg (1988) and Amerson (1969).

An excellent checklist of fishes of the Marshall Islands has recently been compiled by Randall and Randall (1987). The authors recorded a total of 817 species in 338 genera and 92 families, including all reef, shore and epipelagic fishes known from the Marshall Islands. With such a large number of species it was impossible to develop complete species lists for each atoll visited during our brief survey. Instead information was recorded on relative abundance of the dominant species (particularly in those genera which include important resource species for Marshallese fishermen) found in the major biotypes for each atoll.

The marine team selected survey stations both within the lagoon and on the ocean-side reef. These were chosen to cover as wide a variety of habitat and reef formations as possible. Field notes on corals, reef characteristics, marine mammals and reptiles, fish, molluscs and other invertebrates were taken at each site by snorkeling and free diving. Where possible, sandy beach and shoreline areas were traversed to record sea-turtle tracks and nesting pits.

On the basis of these field surveys and assessment of current levels of traditional Marshallese resource exploitation coupled with newly evolving "community development" goals, a range of protected area strategies has been suggested.

3. A PROTECTED AREA SYSTEM FOR THE MARSHALL ISLANDS.

Given the wide range of human-environment relationships in the atolls of the Northern Marshall Islands, a comprehensive protected area plan will require an appropriate range of protected area categories to meet conservation objectives.

The categories recommended generally meet the current international definitions defined by the International Union for the Conservation of Nature (IUCN), but include some adaptations to local needs:

A. National Preservation Areas (Strict Reserves)

This category is designed to protect entire natural systems and the diversity represented in the habitats, species and physical features of an area of national and/or international conservation significance. The objective is to ensure that the area is protected, in perpetuity, at a level which allows its dynamic and evolutionary ecological processes to continue undisturbed. A National Preservation Area would be available for scientific study, monitoring and low-impact educational use, but all exploitative resource uses would be prohibited. Access to the Area would be closely controlled and regular surveillance required.

B. National Parks

The principal objectives of this category are active management of an area with outstanding, largely unmodified and highly scenic features, primarily for protection of those features and for recreation, tourism, educational and scientific purposes. However, the category allows traditional use of the park for subsistence-resource gathering and continued traditional use of non-critical resources. Controls on such harvesting would be exercised on the basis of resource monitoring and estimates of sustainable yield. Within the park, specially designated areas would be set aside for development, specific habitat and species protection, controlled traditional-resource harvesting and for recreation and tourist activities.

C. Nature Reserves, Marine Reserves, and Wildlife Sanctuaries

Reserves in this category are designed to protect ecosystems, natural habitats, specific species, groups of species, biotic communities and physical features of local or national importance. Provision is made for controlled use for scientific, educational and recreational purposes. Access may or may not be controlled. Generally, these reserves and sanctuaries would be smaller, more discrete areas than those selected for national preserves or national parks. Where a protected area comprises predominantly marine habitats, it can be designated as a Marine Reserve. Where an area is being set aside predominantly for the protection of a specific species such as the green turtle, it would be designated a Wildlife Sanctuary.

D. Resource Conservation Area

This category of protected area would be established at the request of land-owners or local communities concerned about the plight of one or more of the living resources of an atoll or its waters. Its aim is to provide a category of protected area which is established voluntarily for the conservation of specific living resources (plants, animals, fish, etc.), and managed locally with assistance from the proposed Conservation Service, according to a jointly agreed management plan.

E. Historic/Archaeological Reserves

These areas would provide for the protection of surface (including buildings, etc..) and subsurface remains and locations of major cultural significance. Investigation of such sites, removal of artefacts for safekeeping, and development of a site for educational purposes would only be allowed by permit.

F. Management Plans

Management of the above protected-area categories would be subject to provision of a management plan prepared by the managing authority in conjunction with the landowner(s) and the local atoll communities. Such plans would clearly state the objectives of the protected area and the action required to achieve those objectives. Provision would be made to adapt the plan to changing circumstances. Once approved by the managing authority and the local community, the plan would become the guide for all operational activities.

4. LAND TENURE AND PROTECTED AREAS

The recommendations for specific parks and reserves in the following section are based primarily on ecological and cultural considerations, and take no account of the tenure and legal status of the lands and waters involved. However, as one of this report's aims is to provide guidance on the establishment of a protected-area system, it is important that these issues be considered. Accordingly, the following paragraphs outline the role of traditional land tenure in the Marshall Islands, and identify some options for the government in establishing the recommended parks and reserves. Much of the following information on the traditional and modern tenure system is derived from Mason (1987).

The Constitution of the Marshall Islands emphasizes the desire of the Marshallese people to preserve the traditional land and title system (Article X) including the rights and obligations of the *Irooj laplap* (paramount chiefs), *Irooj-edik* (lesser chief Radak chain only), *Alap* (clan chief) and the *Rijerbol* (those with workers' rights to the land). No land can be alienated or disposed of without approval of the above parties. The *Nitijela* (Marshall Islands legislature) is a democratically elected body, and can supplement traditional land law as necessary, by appropriate legislation.

Article III recognizes the traditional role of the *Irooj laplap* by the creation of a Council of *Irooj*. The council reviews any action of the *Nitijela* (after the third reading) which deals with customary law, traditional practice or land tenure, and can make recommendations. The *Nitijela*, however, makes the final decision on land law. So far, however, no legislation has come into force without the support of the Council of Chiefs.

The Constitution also provides for a Traditional Rights Court representing all four of the titled groups mentioned above. The court reviews titles, land rights and other legal interests depending on customary law and traditional practice, and advises the High Court (on request and by resolution) of its members' views. The High Court is bound only to give these due consideration.

The Bill of Rights declares that there shall be no taking of land except by government, and then only for public use. Such action must first be reviewed by the High Court with advice from the Traditional Rights Court. Just compensation is assured.

It is also worth noting that the rights of an atoll population shall extend to the sea and sea-bed of the internal waters and surrounding sea and sea-bed to a distance of five miles.

Mason (1987) concludes that the traditional system of land tenure in the Marshall Islands is still 'alive but not well.' He suggests that generally the older generation still respects the traditional system of title and land tenure, but the younger people are often less enthusiastic and well-informed about the way the customary system works. He notes that while the constitution recognizes the traditional system, in practice the legislative and executive branches of a highly centralized form of government have the power to override any aspect of the customary law or traditional rights that does not suit the government's current needs.

It thus appears that there are two basic courses of action available to the government for establishing the recommended parks and reserves.

First, the government can take land for public purposes following review by the High Court, provided that just compensation is paid. Such action would be justified only where the national value of an area is perceived to be such as to override traditional ownership rights, and where all other avenues of negotiation had failed.

Second, in normal circumstances the approval of the Irooj Iaplap must be obtained before land or waters within five miles of an atoll are alienated (sold, leased, licensed, etc.). Under this course of action the government must negotiate a mutually satisfactory arrangement with the Irooj Iaplap. This approach is preferable, as it facilitates the all-important elements of public and traditional landowner support for the protected area, and community acceptance of its management provisions.

Under the second approach, there are a wide range of options including:

- (i) outright purchase by the government on a willing-seller-willing-buyer basis and at an agreed price:
- (ii) dedication of a proposed protected area to the nation for its conservation values by the traditional owners. This allows the proposed protected area to remain under traditional ownership and to be managed in consultation with the traditional owners. Normally, the dedication would be legally binding on successors-in-title of the traditional owners. Variations to this aspect of the agreement would be negotiable. Dedication of land could involve some form of annual compensation to the traditional owners, perhaps in the manner of a traditional tribute to the Irooj Iaplap.
- (iii) partnership management of an area for protection of its conservation values and compatible development of low-impact revenue-generating activities such as recreation and tourism. Under such an arrangement the protected-area management agency and the traditional owners would enter into a joint-management agreement for a specified period of time in which the rights and obligations of each party would be clearly spelt out. The agreement could be legally binding, and overall management would be subject to a jointly approved management plan. The principal advantages of this approach are that the area stays in traditional ownership and the owners avail themselves of the abilities and expertise of the protected-area management agency in order to protect the conservation values of the area and to help develop its revenue-generation potential.

(iv) a leasehold agreement whereby ownership of the area remains in the hands of the traditional owners, but the government acquires management control. Many variations are possible, relating to the term of the lease, the rental, renewal provisions lessee/lessor rights, etc.. However, there are several drawbacks to the lease approach. The long-term security of tenure implied by the term "protected area" is lacking unless perpetual rights of renewal are negotiated. The cost of rental or leasehold, although much less than that required for outright purchase, could prove to be very high in the long term. The government could be faced with sudden and substantial increases at the time of renewal, as a result of the increased value of the area following the development of, for example, recreation and tourism facilities.

As stated above, each approach gives rise to many variations which should be canvassed during negotiations. The approaches outlined in (i), (ii), (iii) and (iv) are preferable to compulsory (forced) acquisition of an area, for ultimately, the success of protected areas depends on support from landowners, the public and the neighboring community. It is therefore important that negotiations are carried out with fairness and integrity.

One way to ensure local-community involvement in the management and development of protected areas on remote atolls, is to appoint a local management committee. It would oversee management, and act as a forum for liaison between the national protected-areas management agency and the local community.

5. SURVEY RESULTS AND CONSERVATION RECOMMENDATIONS FOR REPRESENTATIVE ATOLL TYPES

A. Taongi Atoll

General Description

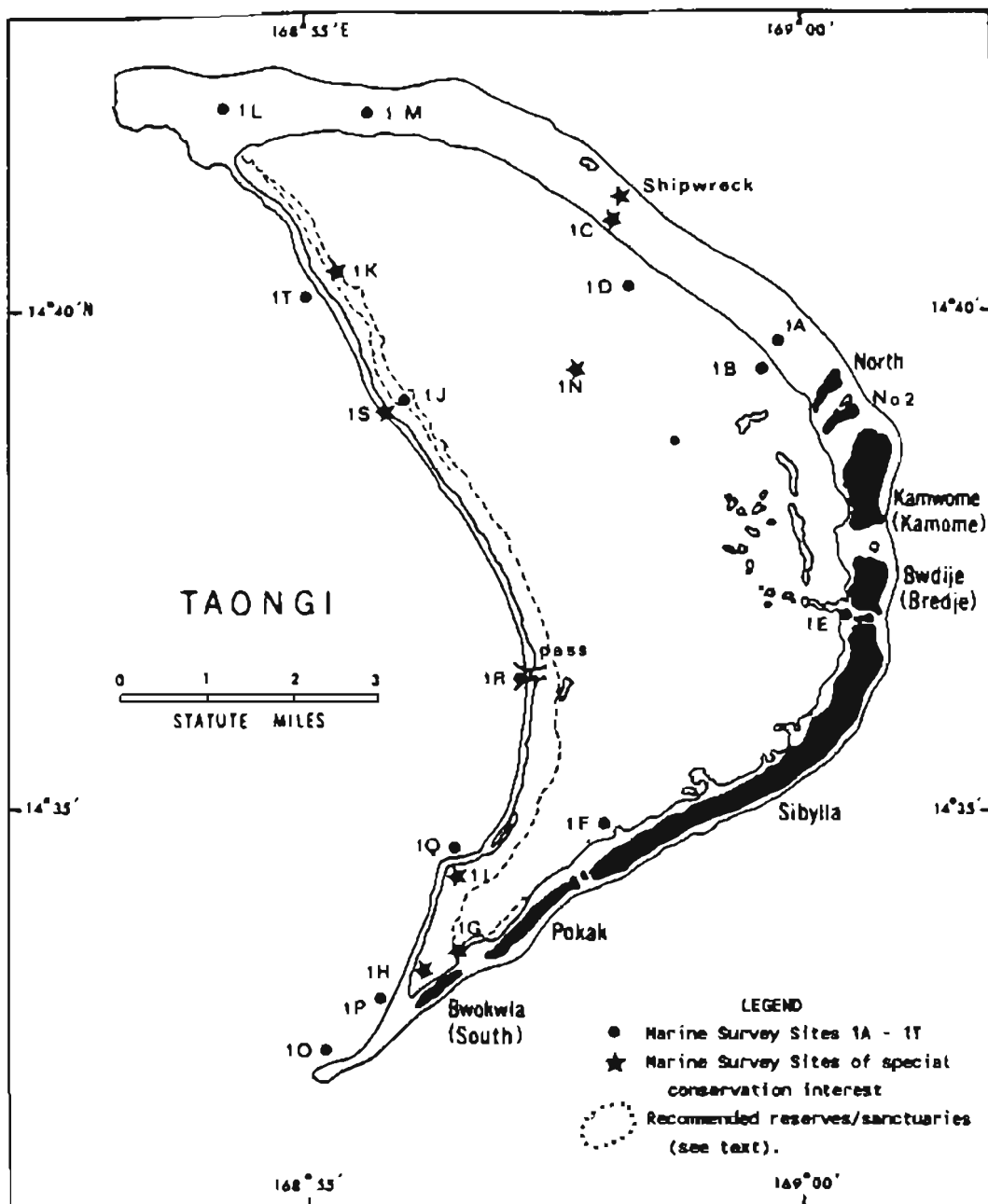
At 14⁰43'N, 168⁰57'E, Taongi is the northern-most of the Marshall Islands, lying about 150 miles (255 km) NNW of its nearest neighbor in the Radak Chain, Bikar Atoll. The atoll is roughly crescent-shaped, about 11 miles by 5 (19 by 9 km), orientated north-south with the convex side to the east (see Map 2). Although never inhabited, the atoll was occasionally visited by Marshallese who regarded it as a bird refuge, and the harvesting of young birds and eggs was carefully regulated. (Fosberg, 1957b). In the early 1960s the atoll was declared a protected area under the Trust Territory of the Pacific Islands administration, a status which has lapsed under the Republic. Isolated by its distance from population centers, Taongi is the least disturbed of the atolls visited and probably of any of the atolls in the Marshall Islands. Access is difficult as the single, narrow and hazardous boat pass which empties the lagoon through the west-side reef is suitable only for small outboard-powered boats.

Climatically, Taongi is the driest of the Marshall Island atolls, having a striking arid, semi-desert character. Ten islets lie on the southern part of the eastern reef. The largest islet, named Sibylla, is approximately 4.5 miles (7.2 km) long and up to 1,000 ft (305 m) wide.

High boulder and sand ridges indicate a history of severe storms, and are a feature of these islets. The northern two-thirds of the seaward shore of Sibylla is backed by a large boulder ridge up to 6 m high. The soils of Taongi are mostly very immature, characterized by little humus accumulation.

The Taongi lagoon is shallow, probably not exceeding 100 ft (30 m) in depth, and has many coral heads and patch reefs, some reaching the surface. A massive algal ridge lines the outer edge of the windward reef, while the south and west reefs are coral-covered narrow flats. An interesting feature, perhaps unique to Taongi Atoll, is the presence of a tiny algal rim on lagoon shores of the western-most islets, on east-facing lagoon reef-fronts, and on the windward edges of coral patches in the lagoon. This rim is a miniature living algal ridge 4-6 in (10-15 cm) high and is maintained by constant water flow over the reef flat during virtually all stages of the tide. Water level in the lagoon averages about 1.5 ft (0.5 m) higher than the surrounding ocean, and even at low tide the algal rim is constantly bathed with water flow across the reef from the lagoon to the ocean side.

M A P 2



Source: Adapted from Amerson, A.B. 1969

Flora and Vegetation

Botanically, along with Bikar Atoll, Taongi is the most impoverished of the Marshall atolls, having only nine species of flowering plants. However, the atoll is unique in that all nine species are native to the Marshall Islands, and the atoll is thus devoid of alien species.

The following list comprises the entire vascular flora of Taongi:

Lepturus gasparricensis
Lepturus repens
Boerhavia repens
Pisonia grandis
Portulaca lutea

Sida fallax
Ipomoea macrantha
Tournefortia argentea
Scaevola sericea

There are basically six vegetation types on Taongi, each dominated by a single species. Various combinations of these occur, as well as different aspects with regard to height, density, luxuriance etc.. Distinctive vegetation associations dominated by *Tournefortia argentea* scrub forest and *Scaevola sericea* or *Sida fallax* shrub land are considered to be among the best remaining examples of their type adapted to dry atoll conditions in the Marshall Islands and most likely the entire Pacific region.

Avian and Terrestrial Fauna

The bird fauna of Taongi is perhaps the most important feature of the atoll from the standpoint of preservation of natural diversity. The incredible abundance of sea and shorebirds present may be some indication of the prehistoric conditions on the other atolls. Indeed, the survey results of the seven atolls visited generally supports the view of Fosberg (1988) that a negative correlation exists between the abundance of birds and the presence and proximity of humans on or near atolls and atoll islets.

Amerson (1969) reports some 26 species of birds as being recorded from Taongi atoll. These include 19 seabirds, 5 shorebirds, 1 duck and 1 heron. Of these, 20 species were observed during our survey: the number of species observed and their general abundance was greater on Taongi than any other atoll visited, and it thus topped the comparative index of bird diversity and abundance prepared on each atoll.

Other terrestrial fauna encountered included the Polynesian rat (*Rattus exulans*) which was observed only on Sibylla. The atoll still appears to be free from other more aggressive species of rats, which is of great significance to its future as a bird-breeding ground. However, the possibility of future shipwrecks or human visitation leading to the establishment of a population of *Rattus rattus* poses a great threat to the future of the atoll, and every possible precaution must be taken to guard against decimation of these spectacular bird populations. A small lizard (*Cryptoblepharus boutonii poecilopleurus*) and large hermit crabs (mostly *Coenobita perlata*) were common, along with other unidentified insects and small terrestrial arthropods.

Cultural/Archaeological Resources

This survey was the first investigation ever undertaken into the cultural and archaeological resources of the atoll. Though it is understood that the atoll has traditional significance as a resource-gathering area (particularly for sea birds), controlled by the Irooj laplap for the northern Radak Chain, no traditional Marshallese remains were identified. This was not surprising as the atoll has a harsh, desiccating climate, lacks potable water, and, the islets, except for Pokak islet, lack soil development.

The only significant historic site on Taongi is the scattered remains of a small Japanese communication outpost on Pokak islet, where substantial amounts of unexploded WWII ordnance were encountered.

Reefs and Corals

Before this survey little was known of the coral and other marine fauna of the atoll, although the unusual reef structure had been noted by C. G. Johnson and F.R. Fosberg in their 1952 visit (Fosberg, 1955; 1957a; 1965). The reef systems of Taongi and Bikar atoll to the south are unique in the Marshall Islands in that they almost completely encircle the atoll, have only one very narrow pass, and have an unusual 'stepped' windward reef structure with an elevated lagoon and elevated sloping leeward reefs. Lagoon waters are shallow, and the higher lagoon water level, sometimes up to 3 ft (1 m) above ocean water levels, is maintained at a constantly high level by the influx of wind-driven waters over the windward ocean reef. Unable to escape easily due to the lack of reef channel, the water rushes out of the lagoon through the narrow winding channel, creating pressure waves of up to 3 ft (1 m), and making passage by small boats hazardous except for the short slack tide period. Water also flows like a waterfall over the coral-covered rim and flats of the sloping leeward reef. The lagoon itself has a fine sediment bottom with many coral heads and patch reefs, some reaching to the surface.

After surveying the corals at 20 different stations (see Map 2), it was considered that the coral fauna, although healthy, was generally impoverished with low species diversity. Several general fauna common elsewhere in the Marshalls were missing, suggesting some geographic isolation of the corals with the rest of the Marshall Islands.

One unusual feature was the presence of shallow-water beds of the hard, pink, fan coral *Stylaster* sp. Seven of the surveyed sites were considered to have exceptional reef or faunal features (Map 2).

Marine Fauna

Throughout the survey particular emphasis was given to assessing marine-turtle-breeding activity and *Tridacnid* clam population status. Despite a great abundance of smaller clam species (*Tridacna maxima*, *Tridacna squamosa*, *Hippopus hippopus*) there was a total lack of giant clams (*Tridacna gigas*) at Taongi. No dead giant clam shells were observed. The abundance of smaller clam species at Taongi was greater than that at any of the other atolls and reefs visited for the survey.

Along with the absence of giant clams was a total absence of any marine-turtle-nesting activity (nests or tracks) on the atoll islets, nor were turtles seen in the surrounding waters. The absence of marine turtles is also consistent with Fosberg's observations during his 1950 visit.

The reef fish population is dominated by Lethrinids, Scarids and *Lutjanus fulvus*, and is relatively low in diversity. However, the species present were extremely abundant and of large size. An interesting feature of the reef fish population at Taongi (as with the corals) is evidence of a definite faunal break with the rest of the Marshall Islands. Noticeable was the absence of *Lutjanus bohar*, *Lutjanus gibbus*, and leopard groupers (genus *Plectropomus*), which are all dominant apex carnivores throughout the rest of the Marshall Islands. A similar break in coral fauna is apparent from several missing coral genera noted above.

Discussion

Although it exhibits less diversity in terms of the numbers of species present (except for birds) than other atolls in the Marshall Islands, Taongi clearly has unique and important features which give it great value for resource conservation and protection. Foremost amongst these is its virtually undisturbed, pristine state. It is rare in the world today to find a completely natural, unaltered atoll ecosystem and Taongi, with its isolation and treacherous access, may be the best remaining example of an undisturbed semi-arid atoll in the world.

This discussion would not be complete without comment on a proposal to use Taongi as a site for dumping unspecified wastes from the U.S. mainland and to build a town, resort and golf course on the resulting landfill. A proposal to fill Taongi Lagoon with imported municipal waste from North America, creating "new land" for settlement for Marshallese and tourist use (complete with golf courses) is incomprehensible, given the dynamics of the lagoon, the expected deterioration and settling of dumped refuse and the isolated exposed nature of the atoll which is clearly ravaged frequently by tropical storms. If this project were to proceed, it would result in the loss of a unique national asset and the destruction of a natural habitat of regional and global biogeographical significance. For these reasons, the survey team strongly urges that the proposal be opposed both by the Marshall Islands Government and concerned international conservation agencies.

Recommendations

1. That Taongi Atoll and its surrounding ocean waters be designated as a National Preservation Area for the purposes of protecting, in perpetuity and in an undisturbed state, the entire atoll environment, including its land and marine habitats, species diversity, ecological associations and ecological processes.

In the long term and following establishment of the Preservation Area, consideration shall be given to its nomination, together with Bikar Atoll, as a World Heritage Site under the UNESCO World Heritage Convention.

2. That all visits to the atoll be prohibited except for purposes of authorized surveillance, scientific study, ecological monitoring and education. Fishing boats, yachts and other unauthorized vessels should be expressly excluded from approaching within 10 miles (16 km) of the atoll.
3. That in view of its national, regional and international importance as a unique undisturbed natural environment, the Government of the Marshall Islands oppose the proposal to convert Taongi Atoll to a waste-disposal site on location for resort development, and oppose dredging and enlargement of the existing channel for boat harbor development.

B. Taka Atoll

General Description

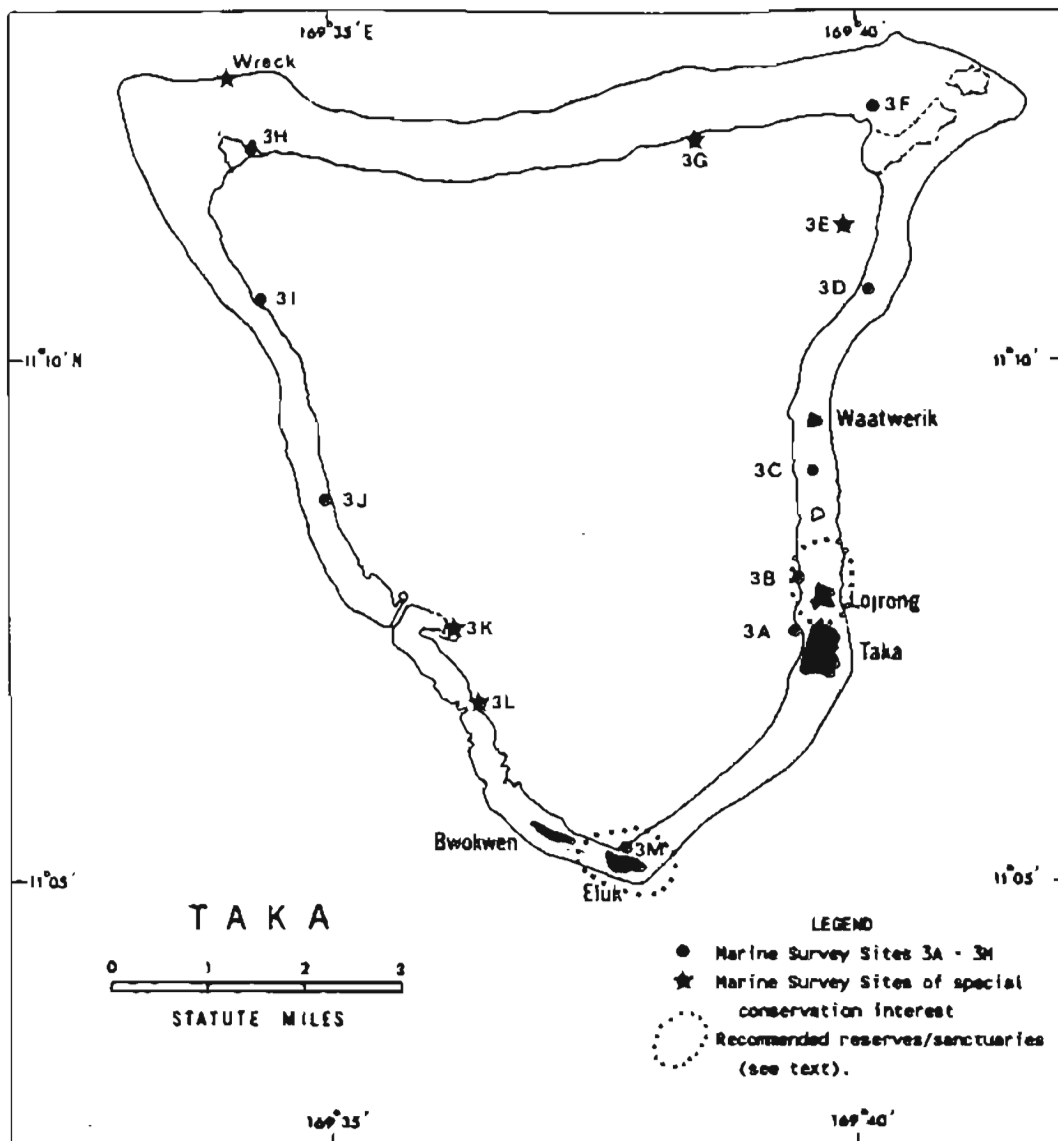
Uninhabited Taka Atoll (11⁰07' N - 169⁰46' E) is small, roughly triangular in shape, 9 miles (14 km) long (north-south) and 9 miles (14 km) wide (see Map 3). Its lagoon area is approximately 36 square miles (94 sq.km). There are six distinct islets, the largest being Taka, approximately 0.5 mile (0.8 km) long and 0.25 mile (0.4 km) wide. Although uninhabited, Taka is located only

6 miles (10 km) south-west of the inhabited atoll, Utirik. People from Utirik visit several times a year to fish, harvest copra (Taka islet), and to gather birds and eggs.

Taka Atoll is scenically very attractive. The islets have beautiful reefs, white sand beaches and luxuriant vegetation including coconut palms (on Taka islet). The clear aquamarine waters of the lagoon are encircled by the extensive reef system which is broken by a wide pass suitable for the passage of larger vessels. The lagoon affords safe anchorage, and has an open tidal flushing and circulatory pattern typical of most atolls in the Marshall Islands.

Climate is moderately dry with 60-70 inches (1520-1780 mm) of rainfall annually. Mean temperature is approximately 82°F, and the prevailing wind is from the north-east.

MAP 3



Source: Adapted from Amerson, A.B. 1969

Flora and Vegetation

All but two of the 23 plant species reported from the atoll by Fosberg (1988) were located during this survey. The most luxuriant vegetation on the atoll is found on Taka Island. Here an abandoned coconut grove planted in 1951 dominates about one-third of the islet with mixed native species covering the rest. Within the coconut grove, in places where the canopy is closed, a dense, pure stand of *Phymatosorus* with fronds 12-18 in (30-45 cm) tall forms the ground cover. In more open areas patches of *Boerhavia* spp. intermixed with *Lepturus*, *Laportea*, *Eragrostis* or *Digitaria* are found. The rest of the island interior is covered with a dense stand of mixed forest comprised mainly of *Guettarda*, *Pisonia*, *Pandanus*, *Tournefortia* and *Morinda*. The coastal fringes are dominated by dense cover of *Scaevola*, *Tournefortia*, *Pisonia* and *Guettarda*, (*Pemphis* and *Suriana* are also locally common).

Avian and Terrestrial Fauna

The atoll was ranked third of the atolls visited for bird species diversity and abundance. Nineteen species of birds had been previously recorded for Taka Atoll, and fourteen species were observed. The sighting of a White-tailed tropic bird was a new record for the atoll.

After visits to Taongi and Bikar Atolls, a noticeable feature of the avifauna of Taka Atoll was the generally lower numbers of larger resident breeding birds, e.g. Red-footed boobies, brown boobies and great frigate birds. Nevertheless, the abundance of these species encountered on this survey represented a significant increase over the very low numbers observed by expeditions in 1964 and 1967. Together with the abundance of several other species, this suggests that the bird population might be recovering. A vast Sooty tern colony with an estimated 10,000+ birds was located on Lojrong islet.

Taka islet itself was devoid of significant numbers of birds with the exception of White terns and Brown noddies, a reflection perhaps on the frequency of human visits as evidenced by a semi-permanent shelter and cooking pits on the northern beach. Other species of fauna sighted included Polynesian rats, large green tree geckos (*Lamprolepis* sp.), and blue-tailed skinks (*Emoia* sp.).

Cultural/archaeological Resources

Although most of the islets were visited by the archaeological team, effort was concentrated on Taka Island on the assumption that the largest islet would yield the most significant cultural information. Indeed, the remains of a semi-permanent or permanent pre-modern (pre 1900) settlement were identified on Taka, located along the lagoon side of the islet. Sub-surface testing at one site suggested that a relatively thin (to 40 cm below the surface) cultural deposit may be located in this area. Radio-carbon dating samples were taken, but the results are still unknown. No other cultural remains were identified, and the social and cultural significance of the site remains unknown.

Reefs and Corals

The reef and lagoon characteristics of Taka Atoll are more typical of the rest of the Marshall Islands than those of Taongi or Bikar. A deep, wide pass on the western (leeward) side of the reef provides safe vessel access to the sheltered anchorages of the lagoon, and several smaller passes also occur in the western reef. These facilitate a normal flushing and circulatory pattern for lagoon waters. General reef development is good and a high diversity of habitats and species are found in the lagoon.

Marine Fauna

Although there was evidence of green turtle nesting on Taka (24 sets of tracks) and a hawksbill turtle was sighted underwater at marine station 3-F, the atoll is ranked only as of intermediate importance for turtle breeding. Of the 24 sets of turtle tracks, Taka had 16, Lojrong had 4 and Eluk had 4. The presence of large numbers of dead giant clams, apparently decimated by an overseas fishing boat about five years earlier, and some live ones, was noteworthy. The remaining giant clams obviously need protection.

The diversity of reef fish species was considered normal. Fish were abundant but signs of fishing pressure were obvious. As with most of the uninhabited atolls surveyed, of particular abundance were large schools of Scarids (parrot fish). Gastropod molluscs were much more abundant here compared with the northern atolls of Taongi and Bikar.

Discussion

Taka Atoll does not have the unique and outstanding features of its northern neighbors, Taongi and Bikar, the exception being the presence of giant clams. However, Taka possesses a diverse range of habitats representative of those found on many of the Marshall Islands. The reefs, coral gardens, clear lagoon waters, white sand beaches and vegetation-covered islands combine in a physical environment of considerable natural interest and great aesthetic beauty. A diverse range of species - corals, breeding seabirds, green turtles, reef fishes, giant and small clams and coconut crabs all contribute to the natural diversity of the atoll.

Traditionally, Taka has been a 'pantry' atoll for the people of nearby Utirik who harvest the birds, fish, turtles and clams several times a year. Unfortunately, the survey team was unable to discuss the significance of Taka as a source of subsistence resources with the Utirik people. However, relatively recent campsites indicated continuing human visits and some populations (e.g. reef fish and clams) showed signs of harvesting pressure. The future value of Taka as a 'pantry' will depend on effective sustained-yield management of the most preferred resource species and particularly those now exhibiting signs of depletion. Clearly, some resources can be harvested on a sustainable basis without detriment to the natural diversity of the atoll, while others (e.g. giant clams, turtles and sea-birds) must be carefully conserved, and any harvesting strictly controlled within a framework of monitoring and management control. Declaration of this atoll as a National Park would provide appropriate habitat and species protection while allowing controlled resource harvesting under a management plan based on a comprehensive scientific assessment of sustainable exploitation levels.

The diversity of Taka's natural resources and the overall high quality of its environment offers considerable potential for environmental education purposes, as well as the possibility of small-scale tourism.

Although the people of Utirik and the Irooj-laplap have not been asked about their interest in promoting the tourist and educational potential of Taka, both activities would be compatible with the 'National Park' designation. In fact Taka is well suited to such uses, and with careful planning, sensitive development and good park management, it is likely that small-scale, low-impact tourism, based on locally-owned accommodation at Utirik Atoll, would be viable. International tourists or Marshallese visitors could be taken to Taka on day or overnight trips from Utirik, necessitating little need for substantial accommodation development in the park itself. Good planning and management of the park is essential if this concept is to be developed, as the success of such a venture would depend on protection of the environmental

resources on which it is based. Utirik also has an airstrip allowing potential park visitors to reach Taka via boat from nearby Utirik, thus precluding the need for airstrip development on Taka.

In addition to its tourist potential, the Taka Atoll National Park could provide educational opportunities for young Marshallese, particularly those from urban centers who have little chance to experience the rich natural diversity and beauty of an undisturbed atoll environment. Regular field trips by school children to the park could be a feature of the environmental education curriculum, and would be subsidized directly by the government and/or from revenue earned from park visitor fees, which could also go towards offsetting park-management costs and providing revenue for landowners.

Designation of the Taka Atoll National Park would provide employment and training opportunities for one or more young persons, preferably from Utirik, as local conservation officers. Similar indirect local employment opportunities based on the National Park would arise from the influx of visitors, should tourism and educational use of the park be successfully developed.

Recommendations

Insofar as adoption of the following recommendations may have an impact on the traditional rights of Atoll landowners and resource users, their involvement and agreement would be essential if a protected-area programme is to be implemented successfully.

1. That Taka Atoll and its surrounding waters be declared a National Park for the purposes of protecting and conserving in perpetuity, for the benefit, enjoyment and use of the Marshallese people, the natural environment, scenic beauty, ecological associations and ecological processes of the atoll.
2. That a Taka Atoll Conservation Committee with majority representation from the Utirik community and Taka landowners and including representation from appropriate government agencies, be established to guide park establishment, management, planning and policy.
3. That where compatible with overall park objectives, provision be made for the controlled, sustained harvesting of subsistence resources using traditional means, by the Utirik people.
4. That to the extent compatible within overall park objectives, provision be made for the promotion of education, tourism and recreation activities.
5. That all activities likely to disturb the archaeological sites of Taka islet be prohibited until such time as full subsurface archaeological investigation has been carried out, and the extent and significance of the site determined.
6. That Eluk and Lojrung islets be accorded special protection either within the park, or until the park is established, as a Wildlife Sanctuary, with all harvesting and disturbance of the bird population prohibited.
7. That nesting green and hawksbill turtles and giant clams be fully protected.

C. WOTHO ATOLL

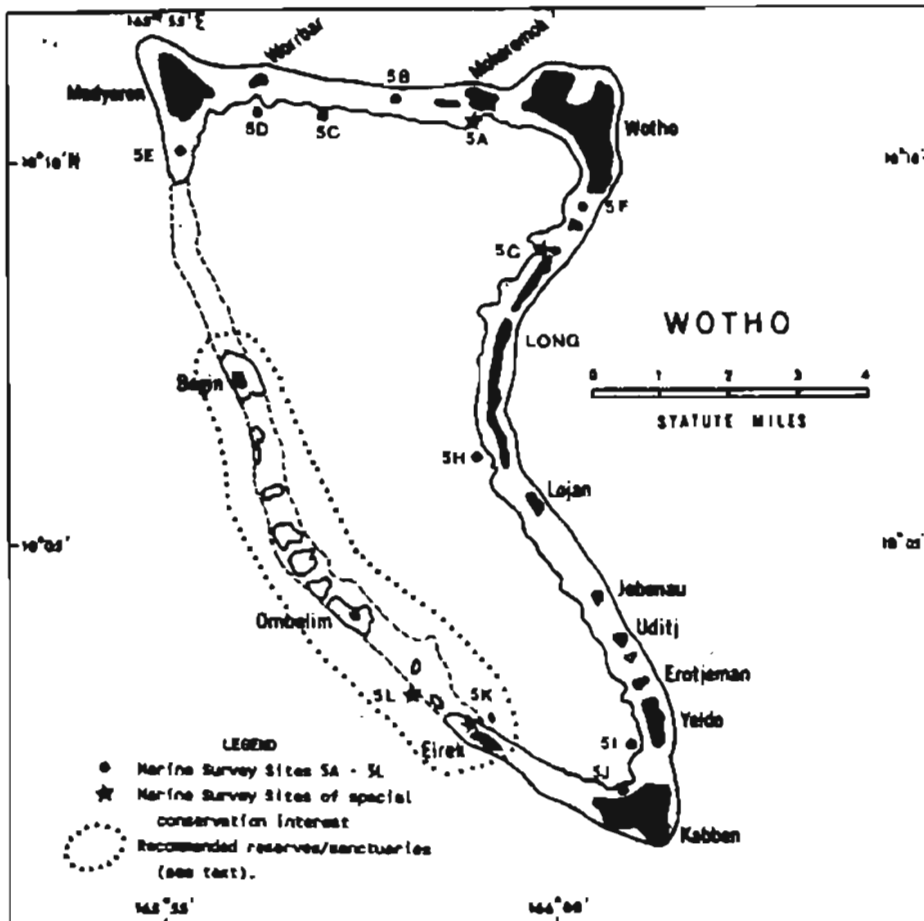
General Description

Wotho Atoll (10°06' N, 165°59' E) lies in the Ralik Chain of the Marshall Islands. With a population of about 100, it was the only inhabited atoll to be surveyed. The atoll itself is an irregular triangular shape, 11 by 9 miles (19 by 14 km) and has some 18 islets, mostly on the east reef (Map 4). There is a wide but shallow pass on the west reef. Unlike most of the atolls surveyed, Wotho has a considerable land area of 1.60 square miles (4.1 sq.km), and although only one of the eighteen islets is populated, it retains substantial natural biodiversity.

Its climate is moderately wet with about 70-100 inches (1780-2540 mm) of rainfall per annum. Mean temperature is around 82°F and the prevailing wind is from east to west.

The lagoon shores of the islands are dominated by beautiful white sand beaches which at times take on a pinkish hue. The beaches often grade to a low, broad sand ridge and are frequently lined by beach rock dipping lagoonward. The seaward shorelines are more diverse, and can consist of boulder beaches and broader boulder flats. The interior soils of the islets commonly comprise a fine grey silty material (organic) with occasional admixtures of coral gravel or rubble of various sizes. Well-developed peat/humus soils are often encountered under *Pisonia* forests.

MAP 4



Source: Adapted from Amerson, A.B. 1969

Flora and Vegetation

The wet climate of the atoll has resulted in the presence of many more species and more diverse ecosystems than on the dryer, less disturbed atolls at the northern end of the group. The atoll has the most diverse flora of those surveyed: 60 species of which 40 are native and 20 alien. Fifteen new atoll records were established of which 4 were native species. Not all the islets were able to be visited in the time available.

As would be expected, vegetation on the larger islets has been subjected to substantial human modification with coconut plantations (some abandoned) representing the dominant land use. Lush areas of remnant native forest remain on many of the small islets of the atoll, including mixed stands of *Pisonia*, *Tournefortia*, *Terminalia*, *Neisoperma*, *Suriana* and *Pandanus*.

Reefs and Corals

The reef configuration of Wotho, with at least two wide passes and broad corner reefs, is typical of most Marshall atolls. The reefs are picturesque and easily accessible. They contain a large variety of habitats, and the corals show moderate to high diversity. Three of the 13 stations surveyed were notable for coral communities of high diversity, the presence of giant clams, and high fish diversity. Generally, the corals and reefs were in very good condition and as discussed later, would prove to be safe and important attractions for visitors to the atoll seeking recreational snorkeling or diving experiences.

Marine Fauna

The reef fish populations showed signs of regular fishing pressure with abundance being generally low, particularly in the northern part of the atoll, relative to numbers observed on the uninhabited atolls. Still there is high diversity of species, and fish are plentiful with many large specimens present.

The numbers of giant clams observed at Wotho exceeded those seen on any other atoll - 15 live and 16 dead, compared with 5 live and 27 dead on Taka, the second-ranked atoll in terms of giant clam abundance. This was a little surprising as local sources had informed the survey team that large numbers of giant clams had been harvested by a Taiwanese fishing vessel eight years previously. However, it was also revealed that the Wotho islanders (and Marshallese generally) do not normally harvest this species, preferring the smaller *Tridacna* species for food. Also, apart from the one isolated but devastating incident mentioned above, the presence of inhabitants obviously discourages poaching. Despite recording the highest abundance of living clams the almost 1:1 ratio of live to dead giant clams on Wotho indicates the vulnerability of such a population to exploitation, even on a 'one-time' basis occurring several years previously. It was noticeable that there were fewer of the smaller clam species, tending to confirm that these are locally preferred to giant clams.

Green turtles nest on Wotho but in low numbers. A total of eight pairs of tracks were observed, and one female green turtle was taken from Long islet on 18 September by the crew and villagers after it had laid its eggs. Pairs of tracks were found on Begin islet (4), Kabben islet (2), and Long islet (2). Turtles are harvested infrequently with 'several' being taken from the outer islets each summer (N. Nashon pers. comm.). Indications are that the local people are very conscious of the vulnerability of the nesting turtle population, and limit their harvesting activities accordingly, consuming turtles only on ceremonial occasions.

Avian and Terrestrial Fauna

Prior to our survey, 15 bird species were known from Wotho Atoll. The survey documented one previously unrecorded species, the red-footed booby, and observed 13 other species. Birds in general were not abundant, especially on populated Wotho islet. White terns and brown noddies were the most common of the smaller birds and brown boobies (70+) were the most abundant of the large seabirds. Few red-footed boobies and only two great frigate birds were observed, in contrast to Fosberg's observation of over 100 frigate birds roosting on Ambelin islet in 1952.

Clearly, the close proximity of the settlement of Wotho is a factor inhibiting the value of the atoll as a bird habitat. Of the islets surveyed, Begin had the greatest number of bird species (9), with numbers in comparative abundance. The islet was relatively undisturbed, and also contained a fine stand of natural *Pisonia* forest which enhanced its value as a habitat. It would be desirable to see this islet protected as a local bird sanctuary.

Cultural/Archaeological Resources

Wotho Atoll is a place of high traditional and social status in the Marshall Islands; the name means "old place" and indicates the traditional Marshallese assessment of the atoll. In keeping with this background, it was not surprising that the survey discovered extensive pre-modern (pre 1900) and probably prehistoric (pre 1800) remains on Wotho and Kabben islets. The atoll is ranked highest for historic preservation of the atolls visited.

These locations are considered to be of very high archaeological research potential. This is especially so when one considers the close proximity of Bikini Atoll where the earliest (to 1900 B.C.) yet identified cultural deposits in Micronesia have been found. It is not unreasonable to assume that similar deposits may be present on Wotho.

Probable prehistoric cultural remains (both surface and sub-surface) are present on Wotho islet inland of the village through the center of the island and along the lagoon shoreline. The center of Kabben islet is another promising location. On Kabben the probable remains of a chief's house, paved and lined walkway and a cemetery as well as an extensive village settlement (including 37 house sites) were located. Several Marshallese artifacts were recovered from the surface in this area.

A rare traditional Marshallese ocean-going sailing canoe was beached near the village on Wotho islet. This represents a significant cultural resource in itself as the canoe is over 40 years old, and the ability to build such vessels is fast becoming a lost skill in Marshallese society. Virtually all remaining traditional canoes are of smaller size for restricted (lagoon) use. The Wotho ocean canoe should be restored and placed under shelter where it could become a point of great interest to visitors to Wotho and the younger generation of Marshallese.

Discussion

Although inhabited, Wotho Atoll has a remarkable range of intact natural habitats representative of many of the central atolls of the Marshall Islands. Natural diversity is relatively high (compared to the dryer northern atolls) and the presence of coconut crabs, green turtles, giant clams and many species of seabirds on this one atoll is notable. The beautiful reefs are easily accessible and comprise many rich and diverse coral communities and habitat for a wide variety of reef fish. Islets with white sand beaches and verdant

vegetation contrast with the changing colors of the clear lagoon waters, giving the atoll great scenic beauty very similar and equal to that of Taka Atoll.

The presence of the traditional village and largely subsistence-based community of Wotho adds a special cultural dimension to the environment, obviously missing from the uninhabited atolls. Indeed, under the stewardship of the Wotho islands, the environment in which they live has been well cared for, and has natural and cultural qualities of special interest, particularly to tourists and Marshallese visitors from more urban settings.

As it happens, the Mayor of Wotho said that the local people were interested in developing tourism on their atoll. Clearly, the atoll is well suited, providing the scale of the operation is kept small and locally controlled, and the tourist activities are of low impact, both culturally and environmentally.

The atoll is now well served by air and sea, and this will greatly facilitate tourism development. An appropriate scale of development might be 3-6 thatched cabins constructed primarily of local materials with sewage, running water, electricity and ceiling fans. A central cook house/dining room would also be necessary. Preferably, such a complex would be located on a beach-front site (lagoon side), but far enough away from the village to buffer the local people from the constant attention of the visitors and vice versa.

Initial demand for this accommodation would clearly come from the heavily populated Kwajalein Atoll (both U.S. Base personnel and local Marshallese from Ebeye) and from Majuro. Assistance for the venture could come from a variety of sources - the government, through Air Marshall Islands (AMI), which would be the principal carrier and could promote the scheme either on behalf of the Wotho owners, or as a minority joint-venture partner. The Office of Outer Island Affairs, Ministry of Resources and Development could also assist and at the regional level, the Tourism Council of the South Pacific, based with the South Pacific Bureau of Economic Co-operation in Suva, Fiji, could help with planning and financing this venture and a similar one for Taka.

Principal tourist activities would be relaxation, snorkeling, diving, picnicking and day-long nature trips to the outer islets to view bird and turtle nesting and the cultural remains on Kabben Island. Other experiences would include the local culture and traditional ocean lore using the large canoe as a focal point. Visits would probably be only of 3-4 days duration.

In addition to its obvious tourist potential, the atoll has the natural environment and cultural resources making it suitable for education activities, particularly if a decision to proceed with the building of small-scale accommodation is taken. Wotho would be of particular value for senior school studies of atoll ecology and village lifestyles, and would be an important cultural experience for many Marshallese children who have grown up on Ebeye or Majuro. Indeed, the possibility of an annual field trip for outstanding students drawn from the main Marshall Islands schools, as suggested for Taka Atoll, should also be investigated here. Such a trip could be subsidized by AMI from some of the profits or tax revenues of operating the tourist transport to Wotho in conjunction with the Department of Education and the proposed Conservation Service as part of their environmental education programme.

The increased activity described above would inevitably place additional pressure on the natural resources and environment of the atoll. This would occur primarily in the form of additional harvesting of fragile resources such as the coconut crab, turtles and clams to provide 'local' specialties on tourist menus and from disturbance of habitats and species (especially birds), through increased human visits to otherwise largely undisturbed outer islets. The

presence of the tourist accommodation complex, although small-scale and of low-impact design, would generate additional demand for water, and necessitate a sewage disposal system and disposal of additional domestic garbage. The social impact of such a venture on a largely traditional community may be high, and should be thoroughly assessed before development proceeds. In particular, the potential introduction of alcohol to a 'dry' atoll and the allocation of jobs and revenues within the local community will require close scrutiny.

One mechanism for maintaining both the natural diversity of the atoll and controlling the impact of visitors is to establish a national park over the atoll excluding Wothe islet. Management of the park would take place within the framework of a management plan developed in conjunction with the local community.

Establishment and planned management of the atoll as a national park would ensure the protection of habitats and species, control over visitor activities and the managed harvesting of vulnerable resources such as clams, coconut crabs, etc. on a sustainable basis. The preservation of cultural/archaeological resources would also be provided for.

An important function of the national park is to educate and inform visitors about the park's natural environment and cultural resources. A park at Wothe would provide many opportunities for the explanation of the ecology of an atoll environment and the habitats and species to be found there. Wothe Atoll also represents an excellent opportunity for developing cultural resources for both tourist and educational purposes. The archaeological and cultural sites on Kabben could be interpreted for visitors and students, and aspects of the modern village lifestyle and Marshallese culture could be the subject of special visits and lectures. For example, in addition to being very scenic, the interior portions of Wothe islet could be re-cultivated for taro in the traditional manner for tourist and educational purposes, and integrated into a programme emphasizing traditional Marshallese technology such as *Tridacna* adze tool manufacture and canoe building. At least, a small museum display, based on the traditional canoe and artifacts discovered from the archaeological investigations, could be established.

The management plan for the National Park would, in effect, become a resource management plan for the atoll generally. As such, it would require intensive local involvement in its preparation. This would be assured by the establishment of a Wothe Atoll Conservation Committee comprising local personnel and appropriate government representatives. The committee would oversee all policy and planning activities related to the park and its operation.

Day-to-day management of the park would require the appointment and training of at least one local conservation officer/park manager and possibly assistants. As park development gets underway and visitor numbers increase, further staff may be needed for park management and related employment.

Even if the park concept does not proceed, it is advisable that consideration be given to the selective protection of key islets or habitats on the atoll. In particular, Kabben islet should be considered for its cultural/archaeological resources and Begin and Ambelim for their vegetation and seabird-breeding habitat. Protection or controlled harvesting of turtles, giant clams and coconut crabs, based on monitoring of the populations and estimated sustainable harvest, should also be considered.

Recommendations

Insofar as adoption of the following recommendations may have an impact on the traditional rights of Atoll landowners and resource users, their involvement and agreement would be essential if a protected area programme is to be implemented successfully.

1. That with the exception of Wotho islet, Wotho Atoll be declared a National Park for the purposes of protecting and conserving in perpetuity, for the benefit, enjoyment and use of the Marshallese people, the natural environment, scenic beauty, and ecological associations of the atoll.
2. That a Wotho Atoll Conservation Committee, with majority representation from the Wotho community and landowners and including representation from appropriate government agencies, be established to guide park establishment, policy, planning and management and policy.
3. That provision be made for the controlled and sustainable harvesting of subsistence resources by the Wotho people.
4. That to the extent compatible with the overall Park objectives, provision be made for the promotion of education, tourism and recreational activities in the Park.
5. That special consideration be given to the conservation of the cultural and archaeological resources of the atoll through:
 - (a) the intensive archaeological survey and subsurface testing of all major atoll islets concentrating on Wotho and Kabben islet;
 - (b) the clearing of the Kabben islet village area, protection of the site and its interpretation as a traditional village living area;
 - (c) the restoration of the old traditional Marshallese ocean-sailing canoe to its original condition, for display and use as an existing example of this ancient but nearly lost art of Marshallese society.
6. That specific protection be given to the islets of Eirek, Ombelin and Begin and the intervening reef areas, as representative examples of the terrestrial and marine habitats of the atoll having particular importance as bird sanctuaries for turtle nesting and as giant clam habitat, either within the national park framework or as a nature reserve should the park not proceed.
7. That a research programme into the status and dynamics of green-turtle and coconut-crab populations of the atoll be undertaken by the Marshall Islands Marine Resources Authority with the objective of determining the sustainable harvest of both species and appropriate species management needs.
8. That until the programme recommended in 7 above, is established, the Wotho Atoll Local Council control the harvest of these vulnerable species for local consumption only.
9. That a voluntary moratorium on the taking of giant clams be introduced by the Wotho Atoll Local Council.

10. That the assistance of the Tourism Council of the South Pacific be sought by the Marshall Islands Government for a feasibility and planning study for a small scale tourism development on Wotho Atoll.

6. INSTITUTIONAL ARRANGEMENTS FOR PROTECTED AREA MANAGEMENT

Implementation of the above conservation and protected-area recommendations in the Republic of the Marshall Islands will require the development of new policy, legislation and administrative structures. It is proposed that nature conservation and protected areas be elements of an overall National Conservation Policy to be developed to guide future national-resource conservation and development in the Marshall Islands. Such a policy would serve as a formal expression of the nation's commitment to the sustainable development of its resources, and would provide the government with a mandate and priority for national conservation action. The development of a National Conservation Strategy is also proposed as a way of assessing the nation's conservation goals and objectives, and defining a strategy for their achievement.

In the absence of an existing legal framework for the development of a protected-area system and species conservation action, comprehensive legislation would be required, and should ideally include:

- * the establishment of an organizational structure for effective implementation of the proposed legislation,
- * the identification and legal establishment of several categories of protected areas which will form the basis of the protected-area system in the Marshall Islands,
- * management planning for protected areas and public participation in the planning and policy formulation process,
- * the conservation of flora and fauna, both terrestrial and marine,
- * recognition of the relevance of international conservation treaties and conventions to the conservation programme in the Marshall Islands,
- * enforcement and regulatory powers.

The proposed legislation should recognize the desirability of adopting existing administrative structure where appropriate, and developing institutional mechanisms which ensure close landowner and community involvement in all aspects of the protected-area and species conservation programme. They include:

- * the establishment of an ad hoc National Conservation Authority to guide the Minister responsible for the Act, developing and reviewing the protected area and species conservation programme and ensuring coordination and consultation between government agencies, the public and landowners on conservation issues,
- * the establishment of Atoll Conservation Committees to act as a mechanism for encouraging local commitment and involvement in the conservation of living resources and establishment and management of protected areas,
- * the establishment of a Conservation Service, located within the Ministry of Resources and Development or the Environmental Protection Authority, to provide technical and administrative support to

the proposed National Conservation Authority, and provide for decentralized (regional/local) implementation and field management of the protected areas and species conservation programme.

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**CASE STUDY: A BIOLOGICAL DIVERSITY INFORMATION NETWORK
FOR THE SOUTH PACIFIC**

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Introduction

In 1988 the United States Agency for International Development (AID) and The Nature Conservancy (TNC) began a cooperative project on collecting and managing biological diversity data in the South Pacific Region. This paper provides some background information on AID and TNC, summarises our experience together in the South Pacific, offers some projections for the future, and briefly discusses the potential value of the biological diversity information we seek to collect.

Background on AID

In 1983 amendments to the U. S. Foreign Assistance Act authorised AID to assist countries with the protection of their wildlife and plant species and habitats, with the establishment of parks and nature reserves, with the enhancement of anti-poaching activities, and with the identification, study, and inventory of rare plants and animals. Since 1986 Congress has dedicated AID funds for the conservation of biological diversity. AID also includes the conservation of biological diversity in Country and Regional Development Strategy Statements (CDSS, RDSS), and cooperates with regional, national, and international organisations to conserve biological diversity. Congressional support and funding for AID participation in the conservation of biological diversity is, and promises to, remain quite strong.

Background on TNC

TNC is an international non-profit organisation based in Washington, D.C. TNC's goal is to protect ecologically significant areas and the biological diversity they support. TNC operates by identifying significant areas and then working to assist with their protection. Working in the Americas, TNC has secured the protection of 1.2 million ha through nearly 5,000 individual projects. TNC owns and manages about a quarter of a million ha in over 1,000 nature reserves in the US. Please note that roughly four-fifths of TNC's effort, measured in either hectares or projects, has resulted in the establishment of nature reserves under someone else's ownership. These "other owners" include all levels of government as well as private, for-profit and non-profit organisations, customary owners and private individuals. TNC has pioneered the development and application of less-than-full-acquisition approaches to land conservation.

TNC emphasises identification of the most ecologically significant areas for conservation. All 50 states in the US now have active inventories of such areas (Natural Heritage Programmes), some of which are actively managed by TNC

and some of which have been transferred to state government control. TNC has also started Natural Heritage Programmes with the Tennessee Valley Authority and the Navajo (American Indian) Nation. Conservation Data Centres (CDCs), similar to Natural Heritage Programmes, have been started in Bolivia, Columbia, Costa Rica, the Netherlands Antilles, Panama, Paraguay, Peru, and Puerto Rico. TNC's approach in these last cases has been to emphasise the strengthening of local government and conservation organisations and the transfer of CDC technology to them. All of these programmes have been administratively tailored to the local situation while emphasising data collection and management standards to develop global compatibility of data.

AID-TNC Joint Activity in 1988

For several years, TNC has been considering the possibility of extending its international efforts into the Asia and Pacific region. In January 1988 TNC entered into an agreement with AID to evaluate the possibility of establishing a biological conservation programme in the AID South Pacific Region consisting of the countries of Cook Islands, Kiribati, Fiji, Niue, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, and Western Samoa. The evaluation was to consist of four parts. These were:

1. identification of additional data (that is, in addition to data collected in the standard CDC methodology) that would be necessary for a multinational project in a region with many countries, most of which occupy many islands;
2. collection and organisation of this data plus basic information on endemic and threatened taxa and significant ecosystems for the countries of the AID South Pacific Region;
3. preparation of a regional overview of biological conservation issues and opportunities; and
4. a desirability and feasibility analysis and suggested plan for a TNC and/or AID programme in the region.

The project eventually produced three major products. The first two were reports from TNC to AID, and they appear to have had some beneficial effect.

On 30 April 1988 TNC submitted to AID a document entitled Materials in Support of a Biological Diversity Annex to the Regional Development Strategy Statement (RDSS) for the South Pacific Region Served by USAID. That document contained a regional overview including discussions of the distribution of biological diversity, threats to biological diversity, and the relationship between development and biological diversity. Regional programmatic opportunities were identified. As a result, AID ultimately listed the following biological diversity priorities in the South Pacific for US federal fiscal years 1990 - 1994:

1. as part of its overall goal, ensuring that agricultural and marine development activities are designed to minimise any threat to biological diversity and maximise resource conservation;
2. strengthening its relationship with SPREP and seeking to have conservation of biological diversity given a greater priority in the programmatic activities of SPREP;
3. supporting the systematic collection and management of information relating to biological diversity (emphasis added);

4. supporting activities which increase the awareness in island communities of long-term importance of this issue and its relationship to economic development; and
5. supporting activities which increase the capacity and commitment of island governments in the conservation of biological diversity.

On 2 December 1988 TNC submitted to AID a document entitled An Evaluation of Biological Diversity in the South Pacific: Issues, Data, Institutions, Programmes. This document recommends, among other things, that a regional network of CDCs is both desirable and feasible in the South Pacific island region including but not limited to the AID South Pacific Region. The report also recommends that such a network should have an administrative and policy centre at SPREP, an information collation and distribution centre at USP, and linkages to other regional universities and institutions, the East-West Center, the Bishop Museum, and other international NGOs (e.g. ICBP, IUCN, WWF). Finally, the report recommends that the best short-term approach to developing such a network would consist of developing a pilot project in Western Samoa, while establishing some of the institutional relations, linkages, and plans required for the ultimate development of the network.

The third product of the 1988 contract is an incomplete data base of basic information for the countries and islands in the AID region. This data base includes fairly comprehensive bibliographies. Data from many dozens of documents and data bases remain to be entered. This data base is probably best thought of as a process which is ongoing and which has already demonstrated its value as a summary or overview instrument for decision and policy makers in AID and TNC. A partial copy of the data base for the Cook Islands is attached as an example.

The IIED/TNC/WWF-US Memorandum of Understanding and the AID/WWF-US Conservation of Biological Diversity Project

On 31 May 1988 the chief executive officers of the International Institute for Environment and Development (IIED, now merged with the World Resources Institute), TNC, and World Wildlife Fund-US (WWF-US) signed a memorandum of understanding establishing a joint venture to inform and focus AID biological diversity programmes and to provide a sound scientific basis for AID biological diversity investments. WWF-US is named as the lead agency in a ten year contract with AID. On 9 June 1988 AID signed a project agreement with WWF-US for the Conservation of Biological Diversity Project. The project specifically includes support for pilot projects for adapting and applying the TNC Conservation Data Center Model for application in other countries.

On 19 December 1988 TNC submitted an application to AID and WWF-US for support over 20 months to develop the data being collected in Western Samoa into a prototype CDC for Western Samoa. TNC, AID, and WWF-US consider this to be a pilot project for the region. A second component of the project will be to plan for and begin to develop the necessary institutional arrangements for a regional network of CDCs.

Our priorities are:

1. to work with the Government of Western Samoa and other interested parties to develop the prototype Western Samoa CDC from data now being collected;
2. to demonstrate the utility of the Western Samoa CDC in Western Samoa and in other countries and states in the SPREP region;
3. to work as closely as possible with SPREP, USP, and other regional universities and NGOs, perhaps best coordinated through the Association of South Pacific Environmental Institutions (ASPEI), to develop plans for a regional network of CDCs; and
4. to insure that the regional network of CDCs, if it comes to exist, will cooperate with and support all other regional and global biological diversity data bases.

Basic Organisation of a Regional Network of CDCs in the SPREP Region

Audrey Newman has discussed the basic organisation of a CDC (infra). A CDC is basically a dynamic, continuously updated, computerised atlas of the locations of those species and ecosystems considered to be the critical elements of biological diversity in a region.

A CDC includes information on the exact or approximate locations of populations of rare and/or threatened plants and animals, of representative ecosystems and of critical components of wildlife habitat such as sea turtle nesting sites and seabird rookeries. It could also include regions of critical ecosystem interactions such as areas where barrier or fringing reefs, seagrass beds, and mangrove swamps interact. The data in a CDC is structured to include elements (species, ecosystems, habitat components, etc.), sites where elements are found, and nature reserves and other managed areas where sites are protected. These data are organised in a non-hierarchical format where they are fully interactive.

A CDC is generally staffed by one or more full-time biologists and data managers, but in the SPREP region this may not always be possible. For this reason we propose to work to develop an administrative and data management support staff at SPREP headquarters and a data distribution network through the Pacific Information Centre at USP.

Expected Utility of a Regional Network of CDCs in the SPREP Region

Well-established CDCs generally contribute to the selection and design of nature reserves, to the development of land-use plans and environmental assessments and to the development of environmental policy. How might these options be exercised in the SPREP region?

A comprehensive survey of ecosystems will eventually lead to a plan for a representative system of nature preserves in Western Samoa (infra). Suppose similar inventories and plans also existed for the rest of the countries in the region. Representativeness of the regional network of reserves could then be evaluated vis--vis the Action Strategy for Protected Areas in the South Pacific Region.

In the SPREP region it is not unusual for an island state to be facing and attempting to evaluate international assistance projects from a variety of donor countries and agencies. These various donors may or may not offer any environmental impact assessments of the projects under consideration. The recipient state is generally hard-pressed to evaluate the proposals. With a local CDC, national officials can at least assess the potential impacts of the proposed projects on local biological diversity to the extent of current knowledge, and make some intelligent guesses beyond that (risk assessment). They can also evaluate the utility and accuracy of environmental impact assessments that are prepared by others, at least insofar as local biological diversity is concerned.

A regional network of CDCs would permit scientists to evaluate the impacts of global environmental trends on regional biological diversity. For example, the global warming trend attributed to the greenhouse effect will surely have considerable effects on the biological diversity of Oceania, especially on coral reefs and atolls and in coastal regions of high islands. Regional summaries of representative ecosystems and endemic species and their locations will be invaluable to the assessment of these impacts.

Although most countries in the SPREP region have some form of legislation designed to protect wildlife, very few of these acts accurately designate all threatened and endangered species in the country. The information that is needed to do so just has not been available. Any country with a functional CDC could reasonably designate threatened and endangered species at a given time, and then modify these designations over time based on accumulating information in the CDC data base. Other forms of national policy vis vis biological diversity could be similarly informed and kept current.

Summary

TNC, AID, WWF-US and SPREP have developed a working relationship with the aim of eventually building a South Pacific regional network of Conservation Data Centres. An important goal is to involve and serve all other institutions in the region with an interest in biological conservation. The first objective is to develop a pilot CDC in Western Samoa, with individual CDC and network development to expand into the near future. The local and regional advantages of such a network of CDCs seem very large.

ATTACHMENT

COUNTRY BASIC FILES

COUNTRY: Cook Islands
SYNONYMS: Iles Cook (French)
Islas Cook (Spanish)
CMC CODE: KK
ISO CODE: CK
UN CODE: 998 South Pacific islands

BASIC GEOGRAPHY

LATITUDE OF CENTRE: 16½ S (USDS Office of the Geographer c1985)
LONGITUDE OF CENTRE: 161½ W (USDS Office of the Geographer c1985)
NORTH TO SOUTH LATITUDE EXTENT: 6½ - 26½ S (USDS Office of the Geographer c1985)
WEST TO EAST LONGITUDE EXTENT: 168½ - 155½ W (USDS Office of the Geographer c1985)
CONTIGUOUS COUNTRIES: Kiribati, French Polynesia, Niue, American Samoa, Tokelau (USDS Office of the Geographer c1985)
TERRESTRIAL AREA: 240 sq.kms (Bureau of Intelligence and Research 1983, SPC 1987)
241 sq.kms (Dahl 1986)
EEZ AREA: 1,830,000 sq.kms (Dahl 1986, SPC 1987)
COMPONENT ISLANDS: 15 islands and atolls
MEAN ANNUAL PRECIPITATION: 1928 mm - Mangaia (Giambelluca et al. 1988)
2103 mm - Rarotonga (Paine 1988)
MEAN MONTHLY MAX PRECIPITATION: 233mm - January - Mangaia (Taylor 1973)
277 mm - March - Rarotonga (Taylor 1973)
MEAN MONTHLY MIN PRECIPITATION: 99 mm - June - Mangaia (Taylor 1973)
106 mm - July - Rarotonga (Taylor 1973)
MEAN ANNUAL TEMPERATURE: 23.9½ C - Rarotonga (Carter 1984)
MEAN MAX TEMPERATURE:
MEAN MIN TEMPERATURE:

1985 POPULATION: 17,600 (SPC 1987)

ANNUAL GROWTH RATE (1980-85): -0.3 (SPC 1987)

MAPS, IMAGES, AND SURVEYS

For general maps of good quality, use:
Cook Islands Survey Department 1983

AERIAL PHOTOS:

SATELLITE IMAGERY:

Landsat data and images are available from EOSAT Corporation in Lanham, Maryland and Sioux Falls, South Dakota. Reference NOAA 1982 sheet 20.

SPOT data and images are available from ORSTOM in Noumea, New Caledonia and SPOT Data Corporation in Washington, D.C.

TOPOGRAPHIC MAPS:

Department of Lands and Survey c1970, 1983

VEGETATION MAPS:

GEOLOGY MAPS:

Marshall 1927

Wood *et al.* 1970

SOIL SURVEYS:

Campbell 1982

Leslie 1980

Webb 1981

Wilde 1981

Wilson 1982

POLITICAL INFORMATION

POLITICAL STATUS: New Zealand Free Associate (1965)

CAPITAL ISLAND: Rarotonga

CAPITAL CITY: Avarua

SENIOR LEADER: Dr. Pupukey Robati, Prime Minister (1987)

MEMBERSHIP IN INTERNATIONAL CONVENTIONS AND ORGANISATIONS;

(convention information and memberships from Pulea and Va'ai (1983) among others, organisation information from Carter (1984) and Franco *et al.* (1982) among others):

Asian Development Bank

Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (SPREP Convention; requires 10 instruments of ratification. So far Belau, Cook Islands, France, Marshall Islands, New Zealand, USA and Western Samoa have deposited such instruments) (Sloth 1988).

Economic and Social Commission for Asia and the Pacific

Food and Agriculture Organisation

South Pacific Commission (1980)

South Pacific Forum (1971)

South Pacific Forum Fisheries Agency Convention

South Pacific Nuclear Free Zone Treaty (signed)

Tourism Council of the South Pacific

UN Convention on the Law of the Sea

University of the South Pacific

SPREP FOCAL POINT:

Dr. Gerald McCormack, Director
Cook Islands Conservation Service
P. O. Box 371
Tupapa, Rarotonga
COOK ISLANDS

Phone 21-256.

THREATS TO BIOLOGICAL DIVERSITY

POPULATION AND LAND-USE THREATS TO BIOLOGICAL DIVERSITY.

The Cook Islands' population is declining slightly (-0.3% per annum, SPC 1987) due to emigration to New Zealand. Population pressure can be locally high on atolls, where landlessness is a social problem. Development pressure in the lowlands of high islands is also moderate to severe. Twenty-six per cent of the land is considered arable (Vergara and Nair 1985). Urban growth and multiple ownership (see land tenure discussion) have resulted in many Rarotongans being unable to gain access to any land for gardens or other uses. Illegal tenancy is becoming a problem (SPC 1987, Thaman 1986). On Rarotonga widespread coastal and valley clearing and burning has resulted in Gleichenia grasslands in the coastal foothills (Paine 1988). Phosphate mining is under consideration for the islands of Rakahanga and Manihiki (Paine 1988). Thaman (1986) lists soil destruction, deforestation and overgrazing as severe problems.

ALIEN SPECIES THREATS TO BIOLOGICAL DIVERSITY:

Standardisation of garden and agricultural crops is probably resulting in the loss of endemic cultivars of Breadfruit (Artocarpus altilis), Kong Taro (Xanthosoma sagittifolium), True Taro (Colocasia esculanta), Giant Taro (Alocasia macrorrhiza), Banana (Musa spp), Kava (Piper methysticum), and Sweet Potato (Ipomea batatas) (Barrau 1961).

Twelve per cent of the current flora of the Cook Islands was introduced by Polynesians, and 60 per cent was introduced following European discovery (McCormack 1988a). Widespread invasive species include guava (Psidium spp) and Lantana spp. especially on Rarotonga (Paine 1988).

Between 1870 and 1965, the African Ant (Pheidole megacephala) caused the extinction of 11 out of 13 endemic snails on Rarotonga (Fitter 1986).

Rats (Rattus rattus, R. exulans, R. norvegicus); feral dogs (Canis familiaris) and cats (Felis domesticus), feral goats (Capra hircus), pigs (Sus scrofa), and other ungulates; and mongooses (Herpestes auropunctatus) are ubiquitous in the region (Thaman 1986). Dahl (1986) mentions those islands where the impacts from some or all these alien species have been avoided.

OTHER THREATS TO BIOLOGICAL DIVERSITY:

Isolated populations of rare species are subject to "accidental" extirpation through the agencies of natural disasters. Thaman (1986) reviews these for the Cook Islands, and cites tropical cyclones (19 from 1946-76) and moderate seasonality of precipitation with droughts and floods moderately common. Crown-of-thorns starfish (Acanthaster planci) have done significant damage to reefs throughout the Cook Islands (Paine 1988).

Indiscriminate use of pesticides in agriculture, landscaping, and household and urban pest control; illegal poisoning and bombing of fish; and indiscriminate disposal of various pollutants, including sewage, solid wastes, and

soluble toxics is resulting in localised environmental damage throughout the region (Dahl 1984, Dahl and Baumgart 1983, Paine 1988, Thaman 1986). Five hundred and eighty-five pesticides are recommended or approved for use in the member states of the South Pacific Commission; 76 of these are banned or restricted in the United States and/or the European Community (Mowbray 1984 reported in Thaman 1986). Thaman 1986) lists pollution as a severe problem.

Pearl oyster stocks are threatened by commercial harvesting.

LAWS RELATING TO BIODIVERSITY CONSERVATION

Cook Islands Act of 1915

"Every title to and interest in customary land shall be determined according to ancient custom and usage of the Natives of the Cook Islands" (Pulea 1985). Provides for the establishment of reserves for historic, scenic and water supply conservation and for recreational parks (Paine 1988).

Local Government Act of 1966

This act establishes Island Councils and (among other things) empowers them to pass by-laws controlling land-use and to establish local reserves to protect flora and fauna (Pulea 1984, Sloth 1988, Venkatesh et al. 1983).

Land Use Act of 1969

This act provides for land-use zoning (Venkatesh et al. 1983).

Land (Facilitation of Dealings) Act of 1970

See the discussion of land tenure.

Harbour Control Act of 1971

This act prohibits the deposition of rubbish, dead animals or filth below the high-water mark in any harbour or on any Crown Land adjacent to any harbour (Pulea 1984, Sloth 1988, Venkatesh et al. 1983).

Conservation Act of 1975

The Conservation Act sets as its purposes the conservation of the natural resources of the Cook Islands and their territorial seas and the establishment of reserves. This act establishes a Director of Conservation and confers on him or her broad powers to prevent, correct and control air, water, and soil pollution; to protect wildlife; and to regulate agriculture, development and mining insofar as their environmental impacts require it. It also provides that the Director may establish, plan for, and manage National Parks, Reserves, Historic Sites and World Parks to protect areas of natural, cultural or historical importance, especially in areas threatened by agriculture and other developments. The act provides for the protection of any area of land, sea, reef, or seabed declared to be in one of the protected classes. The act also reinforces the Harbour Control Act of 1971. The Director has the responsibility to train people to carry out these functions, to conduct investigations of environmental problems, to conduct research as it is needed, to prepare management plans, and to propose regulations (Pulea 1984, 1988; Sloth 1988, Venkatesh et al. 1983).

Trochus Act of 1975

This act establishes trochus fishing reserves at Aitutaki, Manuae, and Palmerston, and prohibits fishing or diving for the shells within the reserves without a licence (Eaton 1985, Pulea 1984, Sloth 1988, Venkatesh et al. 1983)

Territorial Sea and Exclusive Economic Zone Act of 1979

This act establishes an EEZ and provides for the conservation and management of fishery and mineral resources. Foreign vessels may not exploit resources within this zone without a licence. Regulations are authorised to protect the environment within this zone (Pulea 1984, Sloth 1988, Venkatesh et al. 1983).

Conservation Act of 1987

Considerably enhances the powers of the Director of Conservation (personal communication with G. Baines reported in Paine 1988).

LAND TENURE

LAND TENURE NARRATIVE:

Most of the land is owned by Cook Island Maoris. No Maori may alienate his land except by mortgage to an approved body to secure a housing loan or by lease to approved person for up to 60 years. Leases and mortgages must be approved by the High Court (Land Division). Land can be alienated to the church. Multiple ownership is very common, with many owners resident overseas, especially in New Zealand. The Land (Facilitation of Dealings) Act of 1970 was passed to permit the owners resident in the Cook Islands to represent absentee land owners in land dealings. Local owners may bind absentee owners with the approval of the High Court (Carter 1984).

TENURE CLASSES:

AGENCY FILES

AGENCY RESPONSIBLE FOR: Conservation of Rare, Threatened, or
Endangered Species of Plants and
Animals
National Parks, Nature Preserves, and
other Protected Areas
Forest Conservation
Marine Resources Conservation

AGENCY NAME: Cook Islands Conservation Service

COUNTRY WHERE BASED: Cook Islands

SENIOR LEADER: Dr. Gerald McCormack, Director

ADDRESS: Conservation Service
P. O. Box 371
Tupapa, Rarotonga
COOK ISLANDS

TELEPHONE: 21-256

AGENCY POSITION IN GOVERNMENT:

Dr. Terepai Moate, Minister of Conservation
Dr. Gerald McCormack, Director, Conservation Service

COMMENTS:

The Minister of Conservation appoints the Director of the Conservation Service and four other members of a Conservation Council. The Director appoints the Conservation Service employees. The Service works through the Ministry of Agriculture and the Department of Marine Resources on matters relating to forest and marine resources conservation. The Director is also the SPREP Focal Point.

ECOSYSTEMS FILES

COUNTRY: Cook Islands

ECOSYSTEMS:

Dahl (1980a) lists 23 terrestrial and marine "biomes/habitats" for the Phoenix - Line - Northern Cook Islands province. Of these, only 7 (4 in the Northern Cooks) are terrestrial. Dahl (1980a) lists 24 terrestrial and marine "biomes/habitats" for the (Lower) Cook - Austral Islands province. Of these, 7 are terrestrial and found in the Cook Islands. On Rarotonga, widespread coastal and valley clearing and burning has resulted in Gleichenia grasslands in the coastal foothills (Paine 1988).

THREATENED ECOSYSTEMS: Homalium montane rain forests on Rarotonga and Aitutake (Dahl 1986, Paine 1988)
Cloud forests on Rarotonga (McCormack 1988a)
Coastal and foothill forests (especially on Rarotonga) (Paine 1988)
Atoll forests (Dahl 1986)
Semi-deciduous forest on Pukapuka (?) (Dahl 1986)
Freshwater marshes on Atiu, Mangaia, Mauke, Mitiaro, Rarotonga (Dahl 1980, Paine 1988)
Saltwater marshes on Rarotonga (Dahl, 1980, Paine 1988)

TAXA FILES

(lists restricted to birds to save paper)

COUNTRY: Cook Islands

TAXA:

Of 538 angiosperm species, G. McCormack (1988a) states that 21 (4%) are probably endemic to the Cook Islands. There are no endemic genera (Van Balgooy 1970). McCormack (1988a) also notes that another 130 species are native, Whistler (1988) states that 18 are endemic and 173 are native. 66 species were probably introduced by Polynesian settlers, and 322 (60%) have probably been introduced since European discovery (McCormack 1988a). The World Conservation Monitoring Centre Plant Data Unit (formerly IUCN CMC Threatened Plants Data Unit) has 5 computerised taxon records for the Cook Islands, of which 1 may be an endemic taxon and none is considered threatened (IUCN CMC Threatened Plants Data Unit 1988).

At this time, the most critical need for nature reserve establishment is in the cloud forests of the interior of Rarotonga where there are numerous endemic plants and invertebrates (snails) and "several of our rarest native plants, such as Omalanthus nutans, Vaccinium cereum, and Charpentiera australis" (McCormack 1988a).

The Cook Islands originally had 11 endemic species of endodontid and 13 species of charopid snails, but most of these are now extinct. On Rarotonga, 10 endemic species of the endodontid genus Sinployea were collected in the late 1800s, and by the 1960s only one of these could be found. Only higher elevation species of endodontids persist. Rarotonga is unusual in that it has experienced extinction of most of its charopid and punctid snails as well (Solem 1976, 1982).

ENDEMIC TAXA:

Birds

- (Acrocephalus kerearako) (Lower Cook Islands)
(Dahl 1986)
(Atiu Swiftlet (Aerodramus sawtelli) (Atiu) (Collar
and Abdrew 1988, ICBP 1988, Pratt et al. 1987)
Rarotonga Starling (Aplonis cinerascens) Rarotonga
(Collar and Andrew 1988)
Mangaia Kingfisher (Halcyon ruficollaris) (Mangaia,
Atiu, Mauke) (Collar and Andrew 1988, Dahl 1986)
Rarotonga Monarch (Kakerori) (Pomarea dimidiata)
(Rarotonga) (Collar and Andrew 1988, Dahl 1986)
Rarotonga Fruit Dove (Ptilinopus rarotongensis) (Atiu
and Rarotonga) (Dahl 1986, ICBP 1988, Pratt
et al. 1987)

THREATENED TAXA:

Birds

- Atiu Swiftlet (Aerodramus sawtelli) (found only in a
few caves) (Collar and Andrew 1988, IUCN CMC and
ICBP 1988, ICBP 1988, Pratt et al. 1987)
Rarotonga Starling (Aplonis cinerascens) (Collar and
Andrew 1988, IUCN CMC and ICBP 1988) possibly
as few as 100 birds remain) (Hay 1985)
Mangaia Kingfisher (Halcyon ruficollaris) (Mangaia,
Atiu, Mauke) (threatened by Indian Myna) Collar
and Andrew 1988, Dahl 1986, IUCN CMC and ICBP
1988)
Rarotonga Flycatcher (Kakerori) (Pomarea dimidiata)
(Totokoitu and Taipara Valleys considered
critical habitat. Primary threat is rat
predation, approximately 35 birds remain)
(Collar and Andrew 1988; King 1981; IUCN CMC
and ICBP 1988; personal communication, H.
Robertson, DSIR Ecology Division 1988)
Herald Petrel (Pterodroma arminjoniana)
(Paine 1988)
Blue Lorikeet (Vini peruviana) (also French Poly-
nesia) (threatened by Swamp Harrier and avian
malaria) (Collar and Andrew 1988, King 1981)

MAJOR COLLECTIONS:

The B. P. Bishop Museum in Honolulu, Hawaii, has approximately 500,000 plant specimens, of which approximately 60 per cent are vascular plants from the SPC region; approximately 5,000,000 land snail specimens, of which approximately 30 per cent are from the SPC region; 13,500,000 insect specimens, of which approximately 70 per cent are from the SPC region; and approximately 10,000 bird specimens, of which approximately 50 per cent are from the SPC region. In each case, the majority of the non-Hawaiian specimens are from Papua New Guinea and Solomon Islands, but all island groups are represented (personal communications with Bishop Museum personnel 1988). The Bishop Herbarium Pacificum was considered by Oliver (1957) to be one of the two major collections from the Cook Islands.

The American Museum of Natural History in New York City has most of the animal (especially bird) collections of the Whitney South Seas Expeditions which visited all of the island groups of the SPC region except the Pitcairn Group, Niue, Tonga, and the Marianas. See American Museum Novitates from 1920 through the 1940s.

The U.S. National Herbarium at the Smithsonian Institution has over 4,100,000 plant specimens with an unknown but significant percentage from the SPC region (Holmgren and Stafleu 1981). The Cook Islands are represented (personal communications with Smithsonian Institution personnel 1988).

The Herbarium at the Royal Botanical Gardens, Kew, with over 5,000,000 specimens (Holmgren and Stafleu 1981), includes useful collections from the Cook Islands (Oliver 1957).

The National Museum of New Zealand in Wellington has over 300,000 plant specimens, of which a significant portion are from the Cook Islands (Holmgren and Stafleu 1981). Zoological and botanical collections from the 1965 Cook Islands Eclipse Expedition (McNight 1972) and the 1969 Royal Society of New Zealand Cook Bicentenary Expedition in the South-West Pacific (Gibbs *et al.* 1971) may also be housed here.

MANAGED AREAS FILES

COUNTRY: Cook Islands

MANAGED AREA SYSTEMS: National Parks and Reserves
(Conservation Act of 1975)
Suvarrow (Atoll) National Park (1978:
134.7 sq.kms of which .4 sq.kms is
terrestrial (Dahl 1988, IUCN CMC
1985, Sloth 1988)
Kakerori Reserve (Rarotonga) (proposed:
10 sq.kms) (Paine 1988)

ISLAND FILES

ISLAND NAME: Mangaia

GROUP MEMBERSHIP: Lower Cook Islands, Cook Islands

ISLAND CODE: C-I-1

SYNONYMS:

BASIC GEOGRAPHY

LATITUDE OF CENTRE: 21 $\frac{1}{2}$ 55' S (U. S. Board of Geographic
Names 1957)

LONGITUDE OF CENTRE: 157 $\frac{1}{2}$ 55' W (U. S. Board of Geographic
Names 1957)

TERRESTRIAL AREA: 51 sq.kms (Dahl 1986)

ASSOCIATED ISLETS:

ISLAND TYPE: Volcanic Island with Raised Reef (extensive
makatea)

DAHL'S (1980) BIOGEOGRAPHIC PROVINCE: XVI. (Lower) Cook -
Austral Islands

UDVARDY'S (1984) BIOGEOGRAPHIC PROVINCE: 5.5.13 Southeastern
Polynesia

MAXIMUM ELEVATION: 169 m (Dahl 1986)

ENDEMIC SPECIES: (lists restricted to birds to save paper)

Birds

Pitcairn Reed Warbler subspecies
(Acrocephalus vaughni ssp.) (Dahl 1986)
Mangaia Kingfisher (Halcyon ruficollaris)
(Mangaia, Atiu, Mauke) (Collar and
Andrew 1988) (Dahl 1986)

SIGNIFICANT ECOSYSTEMS: freshwater Lake Tiriara (Dahl 1980,
1986)
marsh between volcanic centre and
makatea (Dahl 1986)
extensive makatea forests relatively
intact (Davis et al. 1986)

ISLAND NAME: Rarotonga
GROUP MEMBERSHIP: Lower Cook Islands, Cook Islands
ISLAND CODE: C-1-2
SYNONYMS:

BASIC GEOGRAPHY

LATITUDE OF CENTRE: 21½ 14' S (U. S. Board of Geographic Names 1957)
LONGITUDE OF CENTRE: 159½ 46' W (U. S. Board of Geographic Names 1957)

TERRESTRIAL AREA: 64 sq.kms (Dahl 1986)
67.2 sq.kms (Paine 1988)

ASSOCIATED ISLETS: Ngatangia Islands:
Motutapu (n)
Koromiri (n)
Oneroa (n)
Taakoka (n)
Black Rock (n)

ISLAND TYPE: Volcanic Island with Raised Reef

DAHL'S (1980) BIOGEOGRAPHIC PROVINCE: XVI. (Lower) Cook -
Austral Islands

UDVARDY'S (1984) BIOGEOGRAPHIC PROVINCE 5.5.13 SoutheasternPolynesia

MAXIMUM ELEVATION: 652 sq.kms (Paine 1988)

ENDEMIC SPECIES: (lists restricted to birds to save paper)

Birds

Rarotonga Starling (Aplonis cinerascens)
(endemic to the island of Rarotonga)
(Collar and Andrew 1988)
Rarotonga Monarch (Pomarea dimidiata)
(endemic to island of Rarotonga (Collar
and Andrew 1988) (King 1981)
Rarotonga Fruit Dove (Ptilinopus rarotongensis)
(Atiu and Rarotonga) (Dahl 1986) (ICBP 1988)
(Pratt et al. 1987)

SIGNIFICANT ECOSYSTEMS: central montane rain forest and cloud forest
(Dahl 1980, 1986)
tidal salt marsh, Ngatangia Harbour
(Dahl 1980)
fresh-water swamps and limited makatea
(Dahl 1986)

COMMENTS: 560 vascular plant species including 20 endemics (Dahl 1986)
13 endodontid snails, 11 of which may be extinct (Dahl 1986)

(The remaining island files and the Cook Islands bibliography have been left
out to save paper.)

CASE STUDY: THE WILDLIFE MANAGEMENT AREA SYSTEM
IN PAPUA NEW GUINEA

William Asigau
Marine Ecologist
Department of Environment
and Conservation
PAPUA NEW GUINEA

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THE WILDLIFE MANAGEMENT AREA SYSTEM
IN PAPUA NEW GUINEA

1. Summary

The Wildlife Management Area system was developed in Papua New Guinea in the 70s as a means of conserving natural habitats and specific wildlife species, involving the traditional landowners as resource managers.

Unlike many other countries, where most of the land is owned by the state, in Papua New Guinea the state owns a mere three percent (3%) while most of the land (97%) is held by the local people under customary ownership.

As most land is owned by the local people, the Wildlife Management Areas system stands to be one of the most successful means of conserving both natural habitats and wildlife species in Papua New Guinea.

I. INTRODUCTION.

In rural Papua New Guinea (PNG) societies there have been for generations traditional methods of conserving and managing natural resources. A mixture of customary rules and taboos have helped to protect certain species (e.g. the bowerbird, *Amblyornis macgregoriae* in the Southern Highlands Province) and places (habitats) (e.g. Mirikiri in the Western Province), Kwapena (1984).

These forms of traditional conservation continue to exist in many parts of PNG. However, disruption over the last 50-60 years to traditional conservation methods in many areas has resulted in a noticeable decline in the numbers of many wildlife species (Hudson, 1979).

In addition, the clearing of land for development projects (mining, logging and urban developments) has led to the loss of natural habitats. There is also increased pressure on wildlife from population increase, disregarding of tribal boundaries, opening up of remote places through road and air transport, extensive clearing of forest by logging, mining or urban development, commercial exploitation by outsiders (crocodile shooters and plume traders) and domestic sales on local markets for cash. This has made it necessary to introduce new conservation means compatible with traditional rights and customs.

There now exists a whole body of legislation designed to protect wildlife and natural habitats. The three most important statutes for wildlife conservation and the establishment of protected areas are:

- (1) National Parks Act of 1982.
- (2) Conservation Areas Act of 1978.
- (3) The Fauna (Protection and Control) Act of 1978.

The Wildlife Management Areas are established protected areas under the Fauna (Control and Protection) Act, a special legislation passed in April 1974 by the House of Assembly, which allowed the creation of such areas (Hudson, 1979).

A Wildlife Management Area (WMA) is an area of land reserved at the request of landowners for the conservation and controlled utilisation of wildlife and preservation of natural habitats. It can cover a piece of land owned by one man, a clan, a village, a census division or a council area.

The concept is accepted and works because it:

- (a) recognises customary ownership of land, and therefore avoids the loss of land by village people to the state, which is a major concern of landowners in Papua New Guinea, and
- (b) recognises that the landowners are directly in control of resources within their customary land.

II. THE WILDLIFE MANAGEMENT AREA CONCEPT.

The wildlife management area system was developed in Papua New Guinea in the seventies as a means of conserving natural habitats and wildlife of importance in the country.

Unlike many countries where most land is owned by the state, in Papua New Guinea most of the land is held under customary ownership, and a mere 3% is alienated land owned by the state.

The state therefore has very little control over most of the natural resources on customary land. The concept of the Wildlife Management Area was developed to overcome this problem. Without the Wildlife Management Area system, the state could either lease or buy (purchase outright) parcels of land for conservation purposes. The sale of land in PNG is complicated, and the reluctance of landowners to part with their land means that land will be very difficult to obtain for conservation purposes, especially when it is in demand for such things as mining, logging and urban development.

The legislation for the creation of wildlife management areas (passed in 1974) allows for the conserving of natural habitats and particular wildlife species without loss of land to the state.

The establishment of a management area under the Fauna (Control and Protection) Act allows for the demarcation of an area of land for the protection of wildlife species or habitat, managed by a representative committee of landowners that enforces a set of management rules made by themselves and approved by the Division of Nature Conservation in the Department of Environment and Conservation.

The National Parks and Reserves concept of conservation is widely exercised and readily accepted in many countries of the world, whereas the Wildlife Management Area system represents a uniquely Papua New Guinea form of conservation developed to suit the country's unique situation of land ownership.

The objectives are:

- (1) conservation of wildlife and habitat at the village level for now and future generations,
- (2) conservation of unique and valuable species, for example: megapodes, birds of paradise, dugongs and turtles,
- (3) self-help projects through controlled utilisation of wildlife. Small wildlife business ventures (Crocodile and butterfly farming),
- (4) control of hunting with guns.

III. THE ESTABLISHING OF A WILDLIFE MANAGEMENT AREA.

The establishment of a wildlife management area may arise in either of two ways:

- (1) The most important and common method is a request from landowners (village people) through field officers or by writing directly to the department and minister, after a wildlife problem is identified on their land.
- (2) The second method involves recommendations by wildlife or government officers working with particular species (e.g. birds of paradise) who may find important areas for the conservation of these animals. Discussions are then held with landowners for the declaration of the area as a Wildlife Management Area.

On receiving a request from the landowner, discussions are conducted between landowners and government officers to identify the cause of the problem (e.g. logging, mining, hunting with shotguns etc.), and to look at traditional conservation methods in the area.

On identifying the problem, specific solutions are discussed in light of traditional conservation methods that could be used in the area.

The decision to have a Wildlife Management Area is made by the landowners. When the landowners have decided on a Wildlife Management Area, discussions are held to decide on the boundaries and the name of the area, and a representative committee is elected to manage it. On finalising the above, a report is furnished to the Minister for Environment and Conservation for approval. The Lands Department is engaged to prepare the legal boundary descriptions, and the Legislative Counsel is engaged to prepare documents for the declaration of boundaries, committee members and the name of the area for publication in the National Gazette, once the proposal has been approved by the Minister for Environment and Conservation for declaration.

The declaration is completed when the minister has signed the documents and the area is published as a Wildlife Management Area and a set of rules for its management are drawn up. Legislative Counsel are advised of the rules, and a statutory instrument is prepared for signature by the minister. Once the statutory instrument is signed, it is sent to the National Executive Council for information and to the Governor General for approval, before the rules are published in the National Gazette and become law.

Field staff ensure that there is plenty of publicity about the area and its rules. All interested parties and bodies (e.g. councils) are advised of the gazettal notices. Patrols are taken to explain the rules, and interviews conducted to clarify them, and news releases made for maximum publicity. The rules and boundaries may be changed at any time as required by the landowners, but the changes have to be gazetted before they are enforced.

Meetings with landowner committees may be held whenever the people require them. Rules may be reviewed at each meeting and the need to amend rules may be discussed.

The length of time from the proposal stages to the final declaration of rules varies for each area. Kwapena (1984) estimates up to five (5) years as the maximum and an average of three (3) years as normal.

IV. ENFORCEMENT OF WILDLIFE MANAGEMENT AREA RULES.

The rules are made by the landowners assisted by the wildlife conservation officers to render them consistent with conservation and protection principles and ethics.

On finalising the rules, they are gazetted and enforced by the landowners. Enforcement of the Wildlife Management Area rules is the responsibility of landowners who may be assisted by government officers when necessary.

V. WILDLIFE MANAGEMENT AREAS SYSTEMS IN REVIEW: FROM 1975 TO 1989.

A) Strengths

The Wildlife Management Area system remains the most practical way of conserving natural habitats and wildlife species of importance in Papua New Guinea. The conventional system of National Parks adaptable in many countries is not easily accepted in Papua New Guinea. The securing of land for National Parks and other protected areas by buying or leasing is not easy in Papua New Guinea. The difficulty is not only in the land tenure system but in the lack of ownership by state. The state needs to buy or lease land for the establishment of National Parks or Reserves under the National Parks Act. The high compensation demands for land plus complicated land tenure and ownership systems make negotiations for sale of land cumbersome and difficult. (Genolagani, 1984; Kwapena, 1984). The Wildlife Management Area system allows for the management of resources without loss of land by the people, and enables enhancement of practical traditional conservation methods, as most have been eroded by the opening up of remote areas and the breakdown of traditional practices. Using the Wildlife Management Area system the landowners are able to block off areas of traditional significance, stop the hunting of birds for plumes, etc. therefore conserving their natural heritage.

The Wildlife Management Area system is also easily accepted because the system allows for the formalising of land rights, meaning that people are able to sort out their differences and create boundaries which are formalised as belonging to the particular group. In this sense the clan or group can re-establish their control over the use of resources on that particular piece of land.

B) Weaknesses

One of the greatest weaknesses of the system is the area that can be obtained for the conservation of a particular resource. The size of land that can be declared under the Wildlife Management Area system is controlled by clan or group ownership of land which may not necessarily be large enough to cover the total range needed for conservation of the resource.

Another weakness is lack of resource management knowledge by landowners. While most landowners are aware of common resource-management knowledge, and therefore understand the simple management concepts used in making the rules, often the importance of the Wildlife Management Area has to be explained, especially when the area has been identified by government officers. This is true especially when the resource, e.g. turtles, is plentiful, and the people do not see an immediate need for its protection.

The Wildlife Management Area system is an interesting system and readily accepted by landowners, so numerous requests are received by the department. The department needs to service these requests to maintain the landowners' interest. Landowners tend to lose interest when the department fails to follow up, which can lead to people becoming uncooperative when the department is ready to assist. The establishment of the Wildlife Management Area therefore is at the convenience of the landowners and not so much the reverse. The inability of the department to service the many requests can make the people less willing to make their land available for Wildlife Management Area.

Delays in the establishment of Wildlife Management Area can also create discontent. After the committees are formed, rules are made and the boundaries fixed, the documents are sent to the Lands Department for legal description of boundaries. As the department has no direct control over the work of the Lands Department, long delays are encountered, which can consequently lead to the loss of interest by landowners in the creation of the Wildlife Management Area.

An obvious weakness is the enforcement of rules. As the responsibility for enforcement remains with the committee, and the department has no direct control, the success of enforcement depends on the landowners' interest in enforcing the rules. Lack of interest can lead to lack of conservation or protection of the area or wildlife species in that area.

This can be greatly remedied by constant visits by government officers to indicate to the people the government's interest in maintaining the Wildlife Management Area.

VI. CONCLUSION.

The Wildlife Management Area system despite its weaknesses remains the most successful way of managing and protecting natural habitats and wildlife species in Papua New Guinea. Since the introduction of the Wildlife Management Area system, in the declaration of Tonda Wildlife Management Area and Pokili Wildlife Management Area (both in 1975), the system has secured up to 10,529.6 square kilometres for conservation while the conventional National Parks system has only secured 127.0 square kilometres (APPENDIX 2). The potential of the Wildlife Management Area system for securing more land and sea area for conservation is increasing as people become more aware of the benefits of the system, as evidenced by the numerous requests before the department.

The Wildlife Management Area system could be introduced with confidence in other Pacific island countries facing similar problems to those of Papua New Guinea.

VII.**REFERENCES**

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VIII. APPENDICES.

APPENDIX 1.

Procedure for the Creation of a Wildlife Management Area

Customary land-owners inform government
of wildlife problems

Discussions between land owners and
government field officers

Final meeting to decide boundaries,
committee members and regulations

Report by field officer to Wildlife
Division

Report to Minister for Environment and
Conservation for approval

Department of Lands prepare legal
boundaries description

Legislative counsel prepares declaration
which includes boundaries, committee
members and the name of the area

Declaration signed by the Minister for
Environment and Conservation

Declaration to Government Printer for
printing in National Gazette

Legislative counsel advised of rules.
Prepares draft rules for approval

Statutory Instrument signed by the Minister
for Environment and Conservation

Instrument submitted to National Executive
Council for information

APPENDIX 2 - LIST OF PROTECTED AREAS DECLARED IN PAPUA NEW GUINEA.

NAME OF AREA	CATEGORY	YEAR DECLARED	PROVINCE	AREA Sq. Km	SIGNIFICANT FEATURES PROTECTED
WILDLIFE MANAGEMENT AREAS					
Garu	WMA I	1975	West New Britain	89.0	Megapodes
Tonda	WMA I	1975	Western	6 041.4	Waterbirds & Rusa deer
Baniara	WMA II	1975	Milne Bay	14.8	Agile wallaby
Pokili	WMA I	1975	West New Britain	112.6	Megapodes
Bagiai	WMA I	1977	Madang	140.8	General Wildlife
Ranba	WMA I	1977	Madang	429.2	Marine Turtles
Balek	WMA III	1977	Madang	4.8	Scenic
Crown Island	WMA III	1977	Madang	603.8	Marine Turtles
Sawataetae	WMA I	1977	Milne Bay	7.1	General Wildlife
Siwi Utame	WMA I	1977	Southern Highland	128.4	Birds of Paradise
Long Island	WMA III	1977	Madang	161.0	Marine Turtles
Maza	WMA I	1978	Western	1 886.4	Marinelife (Dugongs)
Nojirau	WMA I	1978	East Sepik	51.9	General Wildlife
Oia-Mada Wa	WMA I	1981	Milne Bay	233.8	General Wildlife
Lake Lavu	WMA I	1981	Milne Bay	27.0	Crocodiles, water-birds
Zo-oimaga	WMA I	1981	Central	15.2	Birds of Paradise
Ndrolowa	WMA I	1985	Manus	59.9	Marine Turtle, Shell
Nuserang	WMA I	1986	Morobe	0.2	General Wildlife
Neiru	WMA I	1987	Gulf	40.7	General Wildlife
Iomare	WMA I	1987	Central	39.2	General Wildlife
Pirung	WMA I	1989	North Solomons	442.4	Marine Life

TOTAL WILDLIFE MANAGEMENT AREAS: 10,529.6 sq. km

NATIONAL PARKS

Baiyer River	San.	1968	Western Highlands	1.2	Birds
Variarata	NP	1969	Central	10.9	Birds
McAdam	NP	1970	Morobe	21.1	Araucaria forest
Talele	NR	1973	West New Britain	0.4	Sea birds, reefs etc
Cape Worm	MP	1973	East Sepik	1.5	World War II relics
Nanuk	NR	1973	East New Britain	0.1	Recreation
Mt Wilhelm	NP	1976	Simbu	49.7	High altitude habitat
Namanatabu	HR	1979	Central	0.3	World War II
Paga Hill	Scenic	1986	Central	0.1	Scenic
Jimmy Valley	NP	1986	Western Highlands	40.8	Lowland Forest
Mt. Gaha- visuka	PP	1987	Eastern Highlands	0.8	Montane species, orchids

TOTAL NATIONAL PARKS AREAS: 127 sq. km

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APPENDIX 3. Three examples of Wildlife Management Areas.

Example 1.

NAME: MAZA Wildlife Management Area - Western Province

The area is off the coast of Western Province in the Torres Strait, to the west of the mouth of the Fly River. The boundaries extend south to the Wapa Reef and north to the coastline. Both Daru and Bristow Islands are in the Maza Wildlife Management Area. The area was established in 1979 as a result of negotiations between the local people and the government concerning the hunting of dugongs. The dugong (declared a national animal in 1976) was considered endangered and therefore protected, however local people were exempted (by request) as the animal is a major source of protein. Maza Wildlife Management Area was created as a means of managing the resource in the area.

Area: 184,230 ha. (1886.4 square kilometres)

Fauna: Deer, Dugongs, Turtles, Reef fishes, Crayfish, Prawns and Barramundi.

Vegetation: Marine reserve (large seagrass flats within the management area together with mangrove forest on Daru and Bristow Island and the coastline).

Committee:	Members' Names:	Village:
	Baia Gimini	Mabudaware
	Bandu Sabake	Mabudaware
	Buluzi Kausa	Mabudaware
	Kanai Tura	Mawata
	Rapest Alia	Mawata
	Duba Sedu	Tureture
	Tarepa Buni	Tureture
	Noel Bea Mapa	Tureture
	James Daniel	Kadawa
	Saya Marama	Kadawa
	Sibuteu Tawai	Parama
	Kevia Wiba	Parama
	Bagani Baruka	Katatai
	Manai Maruse	Katatai

Rules: 1. RESTRICTION OF TAKING, ETC., OF DUGONG.

- (1) Subject to Subsection (2), a person that at any time takes, catches, or kills a dugong within the Area by the traditional hand-harpoon method from a canoe, whether powered by out-board engine or otherwise.
- (2) A person shall not take, catch or kill -
 - (a) a mother dugong or a baby dugong within the Area; or
 - (b) a dugong, other than a mother or a baby dugong, except in accordance with Subsection (1).

2. RESTRICTION OF USE OF NETS IN THE AREA

- (1) A person may use a net to take or catch Baramundi within the Area and for that purpose shall only use a net the mesh size of which is 15.2 centimetres.
- (2) Notwithstanding Subsection (1), a person shall not use, in the reef areas around Bobo and Daru Islands, a net the mesh size of which is over 5.1 centimetres.

3. SELLING OF DUGONG AND TURTLE

- (1) A dugong or turtle taken or caught within the area may only be sold in the market at Daru and in case of a dugong -
 - (a) only one dugong may be brought in for sale at any one time; and
 - (b) the dugong shall be of 2.4 metres or above in length.
- (2) Where a person intends to sell a dugong or a turtle in the market at Daru he shall, before offering it for sale -
 - (a) in the case of a dugong, bring it, in whole, to the Daru Wildlife Division Dugong Project Office for inspection by -
 - (i) a Wildlife Officer; or
 - (ii) a member of the Committee, or
 - (iii) a person authorised by a wildlife officer or member of the Committee; and
 - (b) pay to a member of the Committee or a person authorised by him the total amount of royalty payable on a turtle or a dugong, as the case may be; and
 - (c) on payment of the royalty under Paragraph (b), be issued a receipt which shall be endorsed with
 - (i) the name and village of the owner of the turtle or dugong; and
 - (ii) the amount of the royalty; and
 - (iii) the signature of the member of the Committee or the person authorised by him.

4. ROYALTY

A person who intends to sell a dugong or turtle in the market at Daru shall pay a royalty of K5.00 for each dugong and K1.00 for each turtle.

5. PENALTY

A person who, without reasonable cause (the burden of proof of which is on him), contravenes or fails to comply with a provision of these Rules is liable to the appropriate penalties set out in the Act.

