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THE SCOPE OF "BIOLOGICAL DIVERSITY" IN BURMA,

WITH SPECIAL COMMENTARY ON THE ROLE OF WOMEN

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## EXECUTIVE SUMMARY

Biological diversity refers to the variety and variability among living organisms and the ecological complexes in which they occur. The term as used in this study covers ecosystem diversity as well as species diversity. Inclusion of a third dimension, namely genetic diversity, cannot be satisfactorily done for Burma at this stage because of lack of requisite information.

The existing ecosystem diversity in Burma can be viewed as a complex system, resting on three broad inter-related sub-systems, namely,

- Types of forests and their distribution by biogeographic zones;
- Topography, wetlands as well as coastal and marine habitats together with the types of fisheries associated therewith;
- Soils, temperature, rainfall and physical conditions that support different patterns of agriculture in different parts of the country.

Linkages between these three sub-systems are established partly by natural phenomena and partly by the human sub-system as it has developed in a social, cultural and technological sense.

Burma's situation in the tropical region and in the biogeographic/faunistic area called Indo-Malaysia, assures the country not only of a large diversity of faunal species, but also of a sizeable total number of animals. In spite of the wide interest taken by biologists and conservationists in the species diversity of Burma, there exists no single authoritative survey to update the information which lies scattered in different sources. According to the best estimates, there exist in Burma:

- 289 species of mammals
- 1000 species of birds
- 366 species of reptiles and amphibians
- 600 species of fishes
- 7000 species of plants

The most important indicators of reduction in ecosystem diversity in Burma have been identified in this study as:

- a) Deforestation in hills due to shifting cultivation which is a recognized socio-economic-cultural tradition of the local population;

- b) Deforestation in the dry zone due to population pressure, demand for firewood, and over-exploitation of the forestry resources of the area, and all this aggravated by pressure of poverty-pockets;
- c) Degrading of the mangroves forest in the Irrawaddy delta to expand rice cultivation. This actually meant substituting rice for fish, because mangroves are important breeding areas for fish. This is the best example of linkage between the three ecological sub-systems in Burma listed above;
- d) Replanting of forests as part of an official program which often results in diversification of forests and substitution of bamboo or teak forests for other forest types;
- e) Soil erosion and sedimentation because of a diversity of factors like absence of watershed management, forest fires and silting of rivers.

Although information on the total numbers of species is obviously hard to update, the International Union for Conservation of Nature and Natural Resources (IUCN) does try to keep track of "threatened species" which is a good indicator of a likely reduction in species diversity. Numbers of species of wildlife listed as "Endangered" or "Vulnerable" in the IUCN Red Data Books are shown below, together with names of economically important species among the threatened ones:

	Number of endangered species	Number of vulnerable species	Economically important among threatened species
Mammals	7	12	Elephant
Birds	0	4	-
Reptiles	9	3	Turtle & Crocodile
Fishes	NA	NA	Giant freshwater prawn
Plants	NA	NA	Orchid

The causal factors endangering the various species naturally vary, but the most important general causes are:

- Habitat destruction
- Indiscriminate, uncontrolled hunting
- Misuse of pesticides and agricultural chemicals
- Over-exploitation of economically important species
- Poaching and illegal trade
- Lack of public awareness of the importance of conservation
- Lack of reliable information about the current status of the various species.

The Socialist Republic of the Union of Burma has protective laws, enacted in the days of the British administration and slightly amended after independence, of which the most relevant are:

- Forest Act 1902
- Fisheries Act 1905
- Wildlife Protection Act 1936

Under these laws, nearly 15% of the total forest area has been declared reserved forest, and 14 wildlife sanctuaries covering 0.7% of the country's total area have been established (which is the smallest level of protection in the neighboring Asian countries). A study of the legal provisions made and the extent to which they are actually enforced has shown that:

- a) There is little control on disturbances within a wildlife sanctuary, for example, hunting, trespass, settlement or damage to vegetation;
- b) There is no protection for carnivores; tigers are actively hunted as they are believed to be harmful to farmers;
- c) Categories of completely protected or seasonally protected animals still exclude animals which, according to IUCN, are vulnerable or may become threatened;
- d) There is no provision for establishing natural parks or any other category of protected area other than a wildlife sanctuary;
- e) Even existing laws are not adequately enforced due to lack of manpower, insufficient equipment, lack of inter-agency coordination, administrative inefficiency, local corruption, difficulties of travel and communication, and public apathy and insensitivity.

The entire subject of "Nature Conservation and National Parks" has been studied by a UNDP/FAO project which has made many far-reaching recommendations. The project has proposed 9 new Wildlife Sanctuaries, and 9 Natural Parks/Nature Reserves. It also identified urgent conservation priorities. Problems related to institutional development, new legislation, and staff training have also been highlighted. Further, a pilot project in Watershed Management is currently under implementation in the Kinda Dam area with the technical assistance of FAO/UNDP.

Despite the new awareness generated by the various reports and the world-wide conservation movement, SRUB limitations must be appreciated. Issues involved are highly complex and progress in implementation of recommendations (even after they are accepted by the government) is bound to be slow. However, the focus of this study is to identify what type of interventions USAID/Burma could usefully make in the light of the 1983 amendment to the Foreign Assistance Act which calls for support to biological diversity projects. As this is the beginning of AID's concern in biological diversity issues in Burma, the recommendations presented in Section VI of this report give the option of selecting and designing in-depth proposals for relatively small-scale interventions at this time.

**I. INTRODUCTION**

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### 1.1. Definition

Biological diversity refers to the variety and variability among living organisms and the ecological complexes in which they occur. Diversity can be defined as the number of different items and their relative frequency. For biological diversity, these items are organized at many levels, ranging from complete ecosystems to the chemical structures that are the molecular basis of heredity. Thus, the term encompasses different ecosystems, species, genes and their relative abundance.

How does diversity vary within ecosystems, species and genetic levels? For example,

- Ecosystem diversity: A landscape interspersed with croplands, grasslands, and woodlands has more diversity than a landscape with most of the woodlands converted to grasslands and croplands.
- Species diversity: A rangeland with 100 species of annual and perennial grasses and shrubs has more diversity than the same rangeland after heavy grazing has eliminated or greatly reduced the frequency of the perennial grass species.
- Genetic diversity: Economically useful crops are developed from wild plants by selecting valuable inheritable characteristics. Thus, many wild ancestor plants contain genes not found in today's crop plants. An environment that includes both the domestic varieties of a crop (such as corn) ~~and the crop's wild ancestors has more diversity than an environment with wild ancestors eliminated to make way for domestic crops.~~

Concerns over the loss of biological diversity to date have been defined almost exclusively in terms of species extinction. Although extinction is perhaps the most dramatic aspect of the problem, it is by no means the whole problem.

For the purpose of this report, those aspects of the maintenance of biological diversity in Burma receiving attention from national and international organizations only will be considered. The issues include: conservation of forests, plants and wildlife, diversification of selected species, development of particular species of flora and fauna for conservation and commercial purposes, relevant legislation and its appropriacy, institutions and staff involved with the issue, and finally, the objectives and commitment of various organizations to the promulgation of biological diversity in Burma.

## 1.2. The Issue and Its Importance

The Earth's biological diversity is being reduced at a rate that is likely to increase over the next several decades. This loss of diversity is occurring in most regions of the world, although it is most pronounced in particular areas, most notably in the tropics. The principal cause is the increasing conversion of natural ecosystems to human modified landscapes. Such alterations can provide considerable benefits when the land's capability to sustain development is preserved, but compelling evidence indicates that rapid and unintended reductions in biological diversity are undermining society's capability to respond to future opportunities and needs. Most scientists and conservationists working in this area believe that the problem has reached crisis proportions, although a few people from other fields remain skeptical and maintain that this level of concern is based on exaggerated or insufficient data.

An accurate estimate of the rate of loss of biological diversity is not currently possible, though biologists deduce that the rate of loss is greater than the rate at which new species evolve. Further, biologists estimate that over the next 20 to 50 years, between 5 and 20 percent of species of microbes, plants and animals are vulnerable to extinction, due principally to the continued loss and alteration of wild habitats, especially tropical forests.

Reduced diversity is cause for serious concern due to its consequences for civilization. First, we depend on the biota of our planet for all our food and for much of the material for our clothing, shelter, medicines, and industrial raw materials. Both the productivity and security of currently utilized species can and has been enhanced by the utilization of genetic variation obtained from wild germplasm. For example, in the U.S. alone, per hectare yields for eight principal food crops showed increases of from 112 to 311 percent between 1930 and 1975. About 50 percent of this increased productivity can be attributed to the use of plant genetic resources in selective breeding programs.

In addition, we continue to identify new and practical uses for many species formerly thought "worthless". The most striking recent example is the development of two potent anti-cancer drugs, derived from a Caribbean wildflower, that have, in the last 20 years, increased the remission rate more than four-fold for childhood leukemia.

The projected loss in species diversity could cripple the genetic base for the continued improvement and maintenance of currently utilized species. It may eliminate options to use untapped resources for agricultural, industrial, and medicinal development.

A second principal concern over the projected loss of species relates to the unknown ecological consequences of such a drastic reduction in the diversity of life on earth. It should be noted that even those species with no currently recognized direct economic or humanitarian value are nonetheless components of natural systems and processes (nutrient and water cycling, soil formation and retention) that are essential to maintaining a productive and habitable world. The loss of 5 to 20 percent of the species on earth could produce secondary environmental consequences with direct, pragmatic impacts on society.

Most losses of diversity are unintended consequences of human activity. Air and water pollution, for example, can cause diversity loss far from the pollution's source. The decline of several fish species in Scandinavia and the near extinction of a salmon species in Canada have been attributed to acidification of lakes due to acid rain. Population growth in itself may not be intrinsically threatening to biological diversity. However, when population growth is compounded by poverty, a negative impact is characteristic. In many tropical developing countries, high population growth and the practice of shifting agriculture employed by peasant farmers are considered the greatest threats to diversity.

Maintaining biological diversity will depend on more than applying technologies. Technologies do not exist to re-create the vast majority of ecosystems, species, and genes that are being lost, and there is little hope that such technologies will be developed in the foreseeable future. Therefore, efforts to maintain diversity must also address the socioeconomic, political, and cultural factors involved.

### 1.3. Integrating Economic Development and Biological Diversity Maintenance

The interest and activities of development agencies and conservation organizations have merged in recent years, largely due to some costly lessons learned from a number of projects that failed to take environment into account. Consequently, planning for development

projects began to include environmental considerations in cost-benefit and similar analyses during the 1970s. The emphasis was on mitigating negative side effects, such as pollution and salinization. By the late 1970s, development agencies began to include components designed specifically to sustain the resource base that affected a project. Watershed protection above irrigation systems began to receive some funding, for instance. Development assistance began in the early 1980s to support projects designed to deal directly and primarily with the problems associated with natural resources degradation, such as fuelwood shortages in arid regions.

Although maintenance of biological diversity has not yet become a major objective of development assistance projects, each of these steps led toward development that generally caused less resource degradation and thus less reduction of biological diversity. In the 1983 amendment to the Foreign Assistance Act, Congress directed AID to take the process one step further by directly supporting projects that have maintenance of biological diversity as a major objective, such as establishing protected areas and controlling poaching.

One noteworthy change as conservation began merging with development has been a shift in attitudes among developing country officials, who until recently viewed environmental issues as an industrial country luxury, and sometimes as an attempt by industrial countries to stifle Third World economic development. Over the last decade developing countries have increasingly initiated efforts to include conservation activities, including the maintenance of biological diversity, in economic development programs.

#### 1.4. Purpose and Scope of the Report

The purpose of this report is fourfold. Firstly, it describes the scope and breadth of "biological diversity" in Burma. Secondly, it identifies the institutions, offices, and individuals who are involved in activities related to the preservation of biological diversity in Burma. Thirdly, it identifies aspects of the subject which are most pertinent for AID and most urgent in Burma. Lastly, it explores alternative strategies by which AID/Burma might fulfill the objectives of this portion of the Foreign Assistance legislation.

Underlying this purpose are two key objectives:

- A. To encourage ongoing activities or influence development of new activities (by AID or others) to further work on promulgating biological diversity in Burma.
- B. To identify the actual and potential role of women, both as participants and as beneficiaries, in the development of such activities.

This report concentrates primarily on the Forests and Fisheries sectors, paying some attention also to Wildlife conservation and Agriculture programs in Burma. There were no identifiable reports or studies that addressed the issue of biological diversity in Burma in any systematic way.

The main focus has consequently been on establishing the scope of "biological diversity" as it applies to the above-mentioned sectors in Burma; to understand the roles of persons and institutions involved in preserving biological diversity in Burma; and to explore possibilities for new project interventions, especially those which offer employment and income, those which will increase the quality of ongoing conservation effort, and those which hold potential benefits to and participation of women.

II. FORESTS

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## 2.1. Burma Standard Forest Types

The great variation in rainfall, temperature, soil and topography results in many different forest types in Burma. The Forest Department recognizes the following Burma Standard Forest Types:

1. Closed broadleaf forests
  - a. Tidal (Mangroves)
  - b. Beach and dune
  - c. Swamp
  - d. Evergreen
  - e. Mixed deciduous
  - f. Deciduous dipterocarp
  - g. Hill
2. Closed coniferous forests
  - a. Pine
3. Bamboo forests
4. Scrub formation
  - a. Scrub forest
  - b. Indaing scrub

A detailed forest inventory for parts of Burma is being carried out under a UNDP/FAO Technical Assistance Project. Figures are not yet available for the extent of these forest types. There are, however, estimates based on air photograph interpretation for the 1950's and satellite imagery for the period 1973-1979 for certain major categories of forests. Estimates for 1976 and 1980 are shown in Table 2.1 below. See also Map 1 in Appendix A.

Table 2.1. Area Estimates for Burma Forests Based on Landsat Imagery for 1976 (In thousand acres)

Major forest type	Status of area Closed forest area	Closed forest area affected by shifting cultivation	Degraded forest area	Degraded forest area affected by shifting cultivation	Non-forest area	Area under water	Total area
Broad-leaved	60,670	23,756	15,202	18,781	40,058	3,448	161,915
Coniferous	222	296	69	148	-	-	735
Bamboo	1,553	592	29	279	-	-	2,453
Scrub	56	-	1,948	-	-	-	2,004
<b>Total</b>	<b>62,501</b>	<b>24,644</b>	<b>17,248</b>	<b>19,208</b>	<b>40,058</b>	<b>3,448</b>	<b>167,107</b>

Source: FAO (1984) p. 73, FC:DP/BUR/80/006

Leaving aside the non-forest area, the area under water, as well as the area affected by shifting cultivation, the total area under forest cover was estimated by FAO (through satellite imagery) to be 79,749 thousand acres or 124,608 square miles in 1976. This represented 47.7% of the total area of the country. Aerial photographs taken during 1953-1968 had shown the forest cover to be 57% of the total area. A comparison of these two percentages shows the extent of decrease in forest cover during the period 1953-1976.

According to FAO (Report DP/BUR/80/006 of 1984, p.74), tidal, beach and dune forests will be included in coastal and marine parks proposed for Tenasserim and the irrawaddy delta. (See section on Fisheries). Swamp forests, which must once have covered large areas in the lower courses of the major rivers have now virtually disappeared.

Evergreen forests, which are among the world's richest and most threatened ecosystems, have been seriously depleted in Burma. One feature of this forest type is that it contains a very large number of species of plants and animals but each species exists at a very low density. To preserve viable populations of plants and animals,

it is therefore necessary to have very large protected areas of forests. Evergreen forest previously occurred throughout the south of Burma. It has now been largely eliminated from Rhakine State but still occurs in S. Tenassarim. The most valuable area of this type of forest is in the Pakchan Reserved Forest.

Mixed deciduous and deciduous dipterocarp forests are still very widespread. They are perhaps the least threatened Burmese forest types.

Hill evergreen forests are widespread in northern Burma. They are threatened by shifting cultivation at intermediate elevations. The higher elevation forests (above 7,500 feet) are probably fairly secure. They are biologically rich and because of the mountain landscapes in which they occur, they are attractive to visitors.

Coniferous forests are of quite limited extent in Burma. They are subject to industrial exploitation in the Shan States and artisanal exploitation everywhere.

All bamboo forests are considered to be secondary. They are spreading at the expense of other forest types. They are not rich in species and are of conservation value only as a habitat for elephants.

Dry scrub and Indaing scrub are secondary habitats of the dry zone. They have no special conservation value except possibly as habitat for Thamin and some endemic dry zone birds.

## 2.2. Reserved and Unreserved Forests

(See Appendix B for definitions and details of all protected areas. See Appendix A, Map 2.)

The forests in Burma are divided into two broad categories : Reserved Forests, which are state-owned and strictly managed in accordance with forest working plans, and Unreserved, or Unclassed Forests, wherein management protection is less strict.

Of the total forest cover, approximately 15% is currently covered by Reserved Forests, and the rest (about 42%) by Unclassed Forests. The official figure is 14.9% of total land area, that is 39,031 square miles, which is covered by Reserved Forests (see table 1 in Appendix A). The Forest Department aims to increase the total Reserved Forest land area to 25% (see FAO/UNDP Nature Conservation & National Parks Project Document).

In addition to this, 14 wildlife sanctuaries have been established in Burma so far, covering a total land area of 1,779 square . miles, which is 0.7% of the total land area. 11 more sanctuaries have been proposed in Burma, to cover an additional 0.3% of the land area, making the total sanctuary area equal to 1% of all land area. Compared to other Asian Countries, this percentage is very low (see table 2 in Appendix A). This program was initiated in 1981 under the FAO/UNDP NCNP Project. Additionally, preliminary surveys of over twenty potential sites have been completed (June 1983), and several have been identified as suitable for establishing national parks, nature reserves or sanctuaries. Other areas, particularly in northern Burma, still remain to be surveyed.

### 2.3. Deforestation Rates

The officially quoted figure for overall forest cover of 57% is now somewhat out of date. The report of the FAO/UNEP Tropical Forest Resources Assessment Project; Forest Resources of Tropical Asia (FAO 1981), based on an analysis of landsat satellite imagery, estimated about 47% forest cover in 1980; including all types of woody growth such as scrub woodland and bamboo in addition to high forest. Phase II of the FAO/UNEP project is currently preparing an up-to-date detailed forest inventory, but figures are not yet available. The second phase of the project will end in 1989.

There is no clear annual rate of deforestation. An estimate by FAO(1981) based on comparing point samples on the 1950's air photographs and 1970's satellite imagery gave a figure of 61,750 acres per year (0.073% of closed forest lost annually). A second estimate based upon the agricultural needs of upland shifting cultivators (who are the main agents of deforestation) gave an annual forest loss of 234,650 acres (0.27% per annum). Both estimates (see NCNP Interim Report, FAO/UNDP 1983, FO: BUR/80/006 P.61) are very approximate, the higher one is probably nearer the true figure. Such figures reflect the annual conversion of forest land to agricultural or other uses. Figures for the latter are not available. Both estimates of annual deforestation rates are officially not accepted, and according to the Forest Department, no data is available on deforestation.

### 2.4. Reasons for Deforestation

Though the figure is officially unaccepted, at present, at least 20% of the forest area is degraded forest and is fast becoming bushland, according to FAO Reports. This figure may be even higher.

It is mainly the unclassed forest, but increasingly the reserved forests as well, that are being encroached upon. The reason for this is the population pressure and the relative poverty of the farming population (85% of the whole). Lack of local availability of food is also responsible for the claiming of forest land.

Both shifting cultivation, and the claiming of land for permanent cultivation are equal problems in significance. The former is more pronounced in the hilly areas, while the latter is more prominent in the plains. The farmers are protected by their rights as citizens to claim the land for cultivation, and hence this problem is difficult to control in the absence of strategies to check the socio-economic situation.

Classified by degree of impact, the reasons for deforestation are as follows:

1. Shifting cultivation - 27% of the forest area is affected by shifting cultivation. (See FAO/UNDP, 1981).
2. Fire - Usually the fire is started at the edge of a forest to burn off a section to be used for cultivation. Often, this fire gets out of hand and spreads, burning tens of thousand acres of forest.
3. Cutting down trees for fuel, timber and agriculture - This is mainly due to the incidence of villages within or near forest areas, who hunt wildlife, carry out agriculture, and collect firewood for subsistence. In hilly areas, this is even more pronounced during the wet season, due to shortage of food and fuel.

The problems of deforestation are different near cities, and in the Irrawaddy delta. Here, the major cause is claiming land for rice cultivation, and the collection of firewood. This is particularly the case in the central and dry zones, and the southern portion of hills where the population pressure is heaviest. Firewood gatherers here not only cut the vegetation but also dig out the roots of certain species. This results in exposure of the soil and consequent erosion. The lack of income and employment is another reason why the problem of deforestation is enhanced.

Notification under Rule 28 of the Forest Act has been ineffective since the restrictions under this rule are inadequate, covering as they do, only reserved tree species rather than all vegetation. Nor is declaration of areas as Wildlife Sanctuaries likely to have any very positive effect since there is virtually no wildlife apart from

birds, wild pig, and deer in most of the sanctuaries and also because wildlife is legally protected within the sanctuaries, but not the habitat. Most of all, there are practically no Forest Department Staff to enforce either the restrictions under Rule 28, or protection of areas as wildlife sanctuaries.

The forest staff act as police to protect the forest. The ratio of person to land area, however is extremely low. For example, 2-3 forest guards protect about 200,000 acres of land. The main problem, therefore, with the protection of forests is the lack of staff at the Forest Department. This makes the enforcement of legislation a serious problem. Furthermore, there is a communication problem through lack of equipment, roads, etc. The staff have to walk on foot to monitor the protection of forest areas. The need for a simple walkie talkie or some such equivalent appliance is felt in order to monitor from a distance.

The example of Sagaing Hills further illustrates these problems. Protection of the area is the responsibility of the Forest Department through the DFO Sagaing. However, with only one man, a Beat Officer stationed in Mandalay, directly responsible for the area and an inadequate budget, law enforcement is totally ineffectual except in the immediate vicinity of the monasteries where conservation conscious monks have managed to maintain small areas of woodland to provide shade. Although trees and other natural vegetation have been conserved in the immediate vicinity of some of the monasteries, the surrounding hills have been allowed to deteriorate in parts into near desert condition, and are throughout being over-utilized for firewood collection and grazing.

The environmental problems can be summarized as follows:

1. Inadequate legislation to protect the reserved forests and wildlife sanctuaries.
2. Population pressure and the relative poverty of 85% of the total population of Burma, especially the farming population.
3. Shifting cultivation, claiming of land for permanent cultivation, as well as to grow feed for cattle.
4. Slash and burn techniques for claiming the land.
5. Continual and very intensive cutting of firewood, both for local use and for commercial sale.
6. Exposure of the soil and consequent erosion.

7. Grazing by livestock, including herds of goats which are especially destructive.
8. Lack of Forest Department staff to protect the area and enforce the law.
9. Lack of fuelwood or pole plantations to provide for the needs of the local population.
10. Lack of income and employment opportunities.
11. Periodic and continual shortage of basic commodities, especially food and fuel, especially in remote areas.
12. Inadequate communication infrastructure.

### 2.5. Legislation and Law Enforcement

It is the responsibility of the Forest Department to formulate a national conservation policy and forest rules. The Burma Forest Act became law in 1881. It was enacted again in 1902. Thereafter amendments have been made from time to time to suit changing conditions. It is now called the Forest manual. It includes provision for the constitution of reserved forests and powers, rights and duties therein, the general protection of forests and forest produce, the control of forest produce in transit, penalties and procedure, and the investiture of forest officers with special powers (Burma: Agriculture Sector Discussion Report, ADB, 1984).

According to Section 26 of the Burma Forest Act (reprinted in August 1984), it shall not be lawful for any persons to do any of the following acts in a reserved forest, namely:

- a. "to trespass, or pasture cattle, or permit cattle to trespass, or
- b. to fell, cut, girdle, mark, lop or tap any tree, or injure by fire or otherwise any tree or timber, or
- c. to cause any damage by negligence in felling any tree or cutting or dragging any timber, or
- d. to kindle, keep or carry any fire except at such seasons and in such manner as a Forest Officer specially empowered in this behalf may, from time to time, notify, or

- e. to quarry stone, burn lime or charcoal, or collect, subject to any manufacturing process, or remove any forest-produce, or
- f. to clear or break up any land for cultivation or any other purpose, or
- g. to poison or dynamite water."

Limited practice of shifting cultivation is recognized under the Forest Act, as specified under Section 10 Sub-section (2):

"The practice of shifting cultivation shall be deemed a privilege subject to control, restriction and abolition by the President of the Union, without payment of compensation and unless otherwise expressly permitted in the notification issued under Section 18 (which specifies the boundaries of reserved areas), such cultivation shall be practiced only by the person to whom such permission is granted."

Rule 28 of the Forest Act (1902) under Notification No. 365, has the effect of prohibiting the cutting of reserved tree species for certain purposes including fuelwood for steamers, trains, brick or lime kilns, charcoal, or for commercial sale, but not for domestic use.

These rules have however been ineffective since the restrictions under these rules are inadequate, covering as they do only reserved tree species rather than all vegetation. Also the manpower limitations mean that there are no Forest Department staff to enforce either the restrictions under the different rules, or protect the reserved areas.

The Forest Department recognizes the critical need for a new Forest Act, with the changing socio-economic pattern of the nation, and the escalated poaching problem. The wildlife section of the Forest Department is responsible for drafting the new act, under the supervision of the Deputy Director General U Saw Han. U Saw Han is currently in the United States on a short-term training/observational program, and is expected to pursue the matter of the new legislation on his return.

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## 2.6. Ongoing Activities

### 2.6.1. Natural Forests and the Nature Conservation and National Parks Project

The Nature Conservation and National Parks (NCNP) project is the only one under the Ministry of Agriculture and Forests which specifically deals with conservation issues in Burma. In 1980, the Government of Burma requested technical assistance under the United Nations Development Program in the planning and implementation of a program for the conservation of nature, including the establishment of National Parks, Nature Reserves and other protected areas (see Appendix B for definitions). The NCNP Project was designed to identify areas suitable for development as National Parks and Reserves and to provide the legislative and administrative infrastructure necessary for their subsequent establishment and management. Development was initially confined to certain recreational areas designated as government priorities. The Project Document was finally signed by the government on 11 April 1981 and the project became operational on 1 July 1981. Phase II of the project is currently under negotiation.

The long-term objectives as stated in the Project Document are the conservation of natural ecosystems, the protection of animals and plants that might otherwise be in danger of extinction, the protection of natural landscapes and geological formations of unusual aesthetic or scientific interest, and the development of a system of National Parks and Nature Reserves.

Immediate objectives include: formulation of a nature conservation policy as part of the overall land-use policies of the Ministry of Agriculture and Forests ; establishment of a Division of Nature conservation and National Parks within the Ministry ; provision of technical assistance in preparation of a new Nature Conservation and National Parks Act ; assistance in development of an environmental education center at Hlawga near Rangoon; development of Mount Popa National Park as a pilot project ; completion of feasibility studies for the establishment of National Parks and Nature Reserves, preparation of management plans for such areas as might be finally selected, and assistance in their implementation.

There has, as yet, been no progress in formulation of a national policy on nature conservation as called for under the immediate objectives, and it was made clear at an early stage by the counterpart agency that no FAO assistance was required either in this connection or in preparation of new legislation. A government

committee has, however, been working on the latter for some time, and it is understood that a draft Act is now nearing completion, although no copy has been made available as yet for comments.

Also, there is clearly some way to go before an administrative organization is created which will be capable of managing a network of National Parks, Reserves and Sanctuaries and of dealing with nature conservation matters throughout Burma.

Satisfactory progress has been made in development of the Hlawga Wildlife/Zoo Park and a start has been made with the Popa Mountain Park, both of which are intended primarily for recreational use and will have relatively little conservation value. Hlawga has proved extremely costly and there are problems both in the capture of animals for the Wildlife Park, which has resulted in unacceptably high mortality, and also in seeing the animals once they have been introduced into the Park, due to the density of the vegetation. Also the Park has yet not been officially opened, though it has been ready for nearly a year. It is anticipated that it may be opened in December 1987, soon to be followed by Popa Mountain Park.

Progress towards attainment of the project's long-term objectives has also been disappointing. But from the surveys already completed it is apparent that there are several outstanding natural areas which offer excellent opportunities for establishment of National Parks or Nature Reserves, and which, apart from their conservation value, could eventually play a significant role in development of both domestic and foreign tourism.

Prior to the NCNP Project, there were only 14 wildlife sanctuaries in existence in Burma, where wildlife was legally protected but not the habitat (see Appendix B for list of names and brief summaries). Since the NCNP project was initiated in 1981, 9 additional wildlife sanctuaries have been proposed, as well as 9 National Parks. Also one Nature Reserve has been proposed and one wildlife sanctuary has been proposed for upgrading to a National Park (see Appendix B). As yet, none of these have materialized.

Hlawga Wildlife Park and Mount Popa Wildlife Park are complete (as of early 1987) and expected to be opened to the public by December 1987. Though of low conservation value, they are nevertheless of high priority to the Government. The third in the priority line is Alaungdaw Kathapa National Park. It is expected to take another 3-4 years before completion.

Under the NCNP Project, 2,500 additional personnel were to be recruited to take care of conservation issues and priorities in Burma. This has proved extremely problematic, and only about 900-1000 additional staff have been recruited so far. Training of the new recruits is also a problem (see sub-sections 2.6.6 and 2.7 of this report).

### 2.6.2. Plantation Forests

With the appointment of the new Director General of the Forestry Department, a new program for plantation forests has taken on a very high priority. The plantation program aims at reclaiming already degraded forest areas, by planting trees of different types. The program was started in 1973/74 with an aim initially to plant 10 thousand hectares. The coverage aim was increased by 10 thousand hectares each year till the target reached 90 thousand hectares, which was considered too ambitious and proved unmanageable. The present coverage target has settled at 80 thousand hectares per year.

Trees that are planted under the plantation program fall into one of the four following categories :

(see Appendix A for tables 3, 4 and 5)

1. Commercial plantation - e.g. teak and other hardwoods;
2. Village supply plantation - e.g. trees for firewood, which are usually fast growing;
3. Industrial plantation - e.g. trees for use in industry, like paper;
4. Watershed plantation - e.g. for stopping erosion, to check siltation, etc.

The success rate for the nation as a whole is claimed to be about 70-75%, determined by counting freshly planted and previously planted trees annually after the monsoon rains, i.e., around December. Forest settlements are under the supervision of the Township People's Councils, which provide the manpower for the counting and planting of trees.

The Forest Department acknowledges that even this coverage is not enough to check the rapid decline of forest areas. With the present target, however, the capabilities of the Forest Department are stretched to a maximum. The program is officially claimed to be highly successful, though it is acknowledged that the drier areas

are more difficult, where the rate of success is substantially lower. One may well be skeptical or just new manageable or successful the program is, as the Forest Department is suffering from a severe lack of staff and training, and seems to have no systematic data gathering or documentation outfit.

Furthermore, it is estimated by the Forest Department that it takes at least 60 years for a teak tree to mature, before it is cut down for commercial use. As the plantation forests are only 10-15 years old, it yet remains to be seen what the quality of plantation teak will be, and what percentage of teak trees planted, for example, will survive for 60 years. It is commonly acknowledged that the evolution of forests takes a very long time, in the region of a century or two. Hence, though a teak tree may take 60 years to mature, the ecology of the forest area within which it matures, itself needs to stabilize first. Hence, newly planted teak forests cannot compare to the old established teak forests, unless they are left alone for an equally long period of time. In view of this, the plantation forests cannot be judged on the same basis as the natural forests, from the conservationists' point of view.

Nevertheless, the plantation program has gathered great momentum under the leadership of the present Director General of the Agriculture Corporation (U Sein Maung Wint, who is leaving), and concentrates heavily on the commercial plantation of teak and hardwoods. Timber currently accounts for at least 25% of Burma's export earnings, mostly from the sale of teak. The target for 1987 and subsequent years is substantially higher. Since 1985, the Timber Corporation has been taking the major responsibility for export earnings and aims to surpass the Agriculture Corporation, if they haven't already done so. This puts more and more pressure on the Forest Department to plant more teak and on the Timber corporation to extract the teak. With the rapid decline in recent years in the quantity and quality of teak, the Timber Corporation is attempting to introduce alternative species of hardwood into the local markets. The effort is to increase the supply of teak available for export, by taking it away from home consumption. However, this is proving to be a major problem due to the preference and demand of the local population. One major reason for this is the superior quality of teak in that it is termite proof, unlike other species of hardwood. The Forest Research Institute at Yezin is doing some research on other species of hardwood to meet the local demand.

### 2.6.3. Village Co-operative Plantation Program

It has been mentioned earlier in this report that the shortage of firewood is a particularly acute problem in areas where the population concentration is high. Inhabitants from these areas have to go further afield to collect firewood. Purchase of firewood proves too expensive for these people, as even government controlled prices are too high due to transportation costs. Moreover, there is a marketing problem as the wood from other regions burns differently and gives a different quality of heat. The local people's taste and economic constraints hence limit them to locally available firewood. As a consequence, charcoal from the Irrawaddy delta, for example, is more or less depleted.

As a result of this problem, especially around urban and semi-urban centers, priority is now being given by the Forest Department to a village cooperative plantation program, which was started 3-4 years ago.

This program relies completely on community participation, monitored through the Village Councils and the Village Peasants' Assiyone. 4-5 million seedlings are distributed to villages based on demand established by the Township Councils. The idea is to promote ownership of plantation areas by the villagers. The Peasants Assiyone is like an NGO. Mass participation is developed and the benefits belong to the farmers who own the plantation land.

The biggest problem with this program is the lack of available land, due to population pressure and competing claims for multiple use. The program is relatively new, and no evaluative study has yet been done to measure its success.

### 2.6.4. Land-Use Planning and the National Forest Management and Inventory Project

It is believed that there are altogether 7,000 species of flora in the forests of Burma. Of these approximately 1,200 are tree species. The Forest Department does not have data on the types and properties of these various species. Moreover, there is no accurate and up-to-date estimate on the area of Burma under forest cover. The FAO/UNEP Tropical Forest Resources Assessment Project (1981) was the last one where an assessment was made of Burma's forest land, using Landsat satellite imagery.

Perceiving the urgent need for another such assessment, the Forest Department has currently undertaken an extensive project funded by UNDP with FAO acting as the executing agency. This is called the National Forest Inventory and Management Project, and its second phase will end in 1991. The project is developing a national forest inventory through the use of landsat satellite imagery. UNDP has donated a computer to the Forest Department in order to facilitate the compilation and classification of data.

As a part of the project, Landsat satellite imagery will be used to draw maps showing current land-use patterns. The Forest Department urgently needs to develop its land-use planning area. One of the key issues they need to determine is how much land to use for plantation and for Nature Reserves, respectively. Also, the maps of land-use planning will classify the agriculture land from the forest land separately.

The Minister of Forests recently agreed to appoint a committee on land-use planning. This agreement went through in December 1986, but nothing has materialized from it as yet.

The consequences of poor land-use planning are obvious. Two good examples of current mal-practice in Burma are the encroachment on forest land by shifting cultivators, as well as on the mangrove forests important for the fisheries sector, by rice cultivators. As much as 27% of Burma's forest area is affected by shifting cultivation, according to the FAO/UNFP Tropical Forest Resources Assessment Report (1981). Another serious consequence of poor land-use practices is on the sea and water environment. The quality of water that runs over the soil, as well as the degree of siltation, affects the quality of water in delta areas and the sea. This has implications for the fisheries, especially fresh-water and in-shore fisheries, because the quality of water is no more adequate for them to thrive in.

#### 2.6.5. Pilot Kinda Dam Watershed Management Project

The ecological balance (soil-plant-water-system) of many watersheds in Burma has been seriously disturbed by unsuitable land-use practices and particularly by resource-depleting shifting cultivation, uncontrolled extraction of fuelwood, forest fires, over grazing and poor soil management which generates erosion. As a result of watershed degradation the sustained use of the forest, soil and water resources is endangered and ill effects downstream have arisen in terms of silting of reservoirs and waterways, increased flooding and prolonged droughts and damage to irrigated

cropland, human settlements and infrastructure. During recent years Burma has made important investments in the construction of multipurpose dams which need to be protected. One of the most important of these dams is the Kinda Dam, constructed on the Panlaung River and due to be completed in 1986/87 at an investment cost of kyats 2,647.1 million and a loan of US\$ 159.1 million.

The Pilot Watershed Management for Kinda Dam Project was signed in September 1986 by SRUB, UNDP and FAO. UNDP is funding the project with an input of over US\$ 1.7 million. The project is now in its first phase, the duration of which is estimated to be 4 years.

The immediate objectives of the project are:

1. To complete a general survey of the physical and socio-economic characteristics and conditions prevailing in the Kinda Dam watershed.
2. To establish a selected pilot area within the Kinda Dam watershed, suitable for demonstration of methodologies to:
  - a) Carry out physical and socio-economic surveys to identify problems and potentials of the area;
  - b) Conduct land capability classification surveys on the basis of which suitable land use plans can be prepared as a framework for appropriate management practices and cropping patterns;
  - c) Improve the timing, quantity and quality of the water resources through forest management and improved land use;
  - d) Stabilize shifting cultivators through incentives, demonstration and technical assistance;
  - e) Provide employment for landless laborers through the implementation of labor-intensive activities;
  - f) Improve the living conditions of the local community in the pilot demonstration area.
3. To provide theoretical and practical training for local staff so that a nucleus of staff for future implementation of integrated watershed management at national level is created.

4. To train extension workers, field supervisors and village leaders to motivate and guide the local communities in the implementation of integrated watershed management through people's participation.

5. To formulate a series of proposals for improvement of legal, administrative, financial and operational procedures as a framework for the effective implementation of watershed management actions.

The Government is aware, as specified in the project document, that the major constraints to restoring the lost equilibrium between natural and human factors in watersheds of Burma are:

- a lack of a well adapted methodology to collect and analyze the physical and socio-economic data for integrated land-use planning and for the introduction of watershed management practices
- a lack of a strategy to involve the local community in management systems which will ensure the sustained production of the natural resources
- a lack of suitable institutional and legal framework to implement such programs
- a lack of trained staff in the techniques for watershed management and in appropriate conservation extension methods

Over years of continued exploitation, the soil has changed from high production to low, and the whole ecosystem has changed from one of high diversity to low.

The erosion problem is threefold:

1. Removal of the top soil
2. Siltation of water sources
3. Transportation of these to the reservoir

In tropical mountains, natural erosion is very high in itself, and lot of sedimentation is naturally produced. Hence, the further damage done by humans produces a much worse effect.

The 6-month old pilot project aims to introduce land use planning for the balanced use of the land area for each of the following through plantation programs:

- fuelwood
- fibrewood
- commercial wood
- fodder
- coffee and other crops like citrus crops

At this early stage, however, the emphasis is on data collection. The baseline data available at present is the 1982 population data at township level. The planning phase will begin only next year.

After that, the project will be introducing new technologies, e.g.

- soil conversion methods
- multiple cropping/terraced farming
- agroforestry
- management of fuelwood plantation
- extension work/training

Over the life of the project, one of the targets is also to increase the number of personnel from 70 (at present) to 110. Phase I of the project is for 4 years. However, it is difficult to phase the activities within the project, and all the activities will be carried out more or less simultaneously.

#### 2.6.6. Central Forestry Development Training Center

For the past year, the Forest Department has been negotiating with the Japanese to set up a Central Forestry Development Training Center. This project has now been agreed and the new center will be set up about 37 miles outside Rangoon. The Japanese will begin to construct the Training Center early 1988 and hope to have it ready for use by March 1989. The total Japanese aid for this project amounts to 2.725 billion yen or roughly US\$ 19 million.

The main objective of the project is to utilize the Training Center for:

- in-service training;
- training for staff and community on the village plantation program;
- training for extension agents;
- basic conservation education for the masses.

About 1,000 trainees will be trained at the Training Center annually by government approved training personnel from the Forest Department. The trainers will probably be senior government officials who have themselves been trained abroad in different aspects of forest management and conservation. Some Forest Department staff have been sent on training courses recently to the United States and Japan. The Director of Planning's (U Ohn's) Deputy will be the project officer from the Forest Department.

In addition to the above training program, the aim is to introduce a 2-3 months' training program for all foresters within the Forest Department.

A promising feature of the training program is that the target group includes not only the Forest Department staff, but also the village people and Village Council. Their exposure to basic education on the forest resources issue is a prerequisite for environmental protection in Burma. The education program for villagers will be the first step toward involving the community in forest resource maintenance.

The Forest Department also plans to use the Training Center as a site for the much needed Forest Extension Branch. Unlike the Agriculture Sector, Forestry does not have such a service as part of its structure. The urgent need for the development of an extension branch to protect forest land and to enforce the laws laid down by the Forest Act is widely agreed upon.

### 2.7. Institutions, Staff and Training

The present organization of the Forest Department follows the general framework laid out in the late nineteenth century. Table 2.2 below shows the structure and sanctioned strength of this Department in 1978.

Table 2.2 Organization and Staffing of the Forest Department, 1978.

Employee Rank	No. of employees sanctioned
Director General	1
Director	8
Deputy Director	44
Assistant Director	90
Range Officer	202
Deputy Range Officer	403
Forester	1,606
TOTAL	2,354

Source: Ministry of Agriculture and Forests, SRUB, 1978.

The Forest Department carries out its functions through 36 territorial forest divisions. Each division develops its own long term forest working plan and administers itself through a number of "working circles" such as: (a) Teak selection working circles, (b) Hardwoods selection working circles, (c) Local supply working circles. It is the responsibility of each working circle to: survey resources, develop harvesting cycles, improve stocks, attend to regeneration when this is necessary, and satisfy local needs for forest products such as small timber and firewood.

On the whole, the Forest Department attempts to maintain the forest resource for future use. This takes a two-pronged action: Firstly, it reforests land already depleted and exploited, through its plantation program. Secondly, it tries to maintain the natural forests and protect them from further damage.

Actual exploitation of Burma's timber resources - harvesting and sale - is undertaken by a public enterprise, the State Timber Corporation. Previously known as the State Timber Board, this body was formed in 1950 to assume the work of disenfranchised large European firms. Since 1962 this state agency has operated the nation's entire lumber industry. The present corporation is organized into five functional divisions: the office of the Managing Director, and the Departments of Accounts, Extraction, Marketing, and Engineering.

The Timber Corporation is extraction-oriented. Its main aim is the harvesting of timber for commercial use - both for the export market and for consumption at home. Their emphasis is on teak, but they are increasingly exploiting lesser known species for the local market, particularly as the overall quantity of teak is going down.

Timber accounts for about 25% of Burma's export earnings, mostly from the sale of teak. For 1985-86 the foreign exchange acquired by the sale of teak was 105 Crore kyats, i.e. approximately US\$ 150 million (official figure from the Ministry of Trade). The target for 1987 is 108 Crore kyats.

About 50% of all timber is extracted from the forest by elephant which remain the most effective means of moving logs in hilly country as well as the least damaging environmentally. There are presently a total of about 6,000 elephants employed in the timber industry, of which the majority are owned by either the Timber Corporation or privately, relatively few belong to the Forest Department.

The Forest Research Institute recently established in Yezin by FAO and UNDP under contract with the State University of New York, conducts research on forest biology, biometrics, conservation, inventory, management, silviculture, and yield. FRI is also studying the potential for commercial forests and social forestry. Research is being carried out on ways of better utilization of lesser known species of hardwoods. The problem with lesser known species is the treatment they require before being suitable for use. This can be very expensive, especially the drying, which requires the use of energy. Research at FRI is exploring the possibility of using solar energy for the drying of wood for export purposes. This is proving remarkably viable so far, and efforts are being made to develop it on a large scale.

The training facility of the Forest Department is grossly inadequate. There are only two institutions that provide training for the Forest Department staff at the moment. Rangoon University offers a B.Sc. degree in Forests at the Rangoon University Forests Department at Yezin. 50 graduates qualify under this annually. Additionally Maymyo Forest school runs a two-year diploma called "Forest Rangers Course" for the sub-professional level staff of Forest Department. 100 candidates qualify for this diploma annually. The Central Forestry Development Training Center, which is currently under negotiation with the Japanese, will aim to train 1000 students per annum in forest specialized subjects for the junior officers and extension agents.

The Forest Department suffers from an acute lack of staff. The total capacity is only 2,354 staff at all levels (figure for 1978, Ministry of Agriculture and Forests). The staffing problem manifests itself in many ways, but mainly in poor enforcement of laws for the protection of Burma's natural resources. On average, approximately 70 square kilometers of forest land is currently managed by 1 forester in most of Burma. An additional 2,500 staff were to be recruited under the NCNP project, but only 900 have been obtained so far. The usual qualification for senior staff recruitment is an undergraduate degree in either Forests, Geology, Zoology, Botany, or Soil Science. For the sub-professional level, a diploma from Maymyo Forest School is required.

One of the most important divisions that needs to be developed in the Forest Department is that of extension training. The extension service of the agriculture sector is well established, but this is a new area for forestry. The Forest Department hopes to take preliminary actions towards this under its Central Forestry Development Training Center Project.

## 2.8. Role of Women

It has been the experience of the Forest Department that very few women enrolled in the graduate program at Rangoon University Forestries Department. This led to a question about the appropriateness of the course for women, and in recent years enrollment has been restricted to men.

Discussion with senior officials in the Forest Department indicates dissatisfaction at this regulation and a move towards changing the status of women in the Forest Department. The three most senior members of the Forest Department strongly favor an increase in the participation of women. The Director General has himself written a paper on the role of women in forests (this has not been made available, however).

At the Forest Research Institute at Yezin, there is a substantial representation of women, up to about 35%, mainly as officers and researchers. In the forest nurseries, the majority of the workers are women. During field visits to the Hlawga Wildlife Park, more women than men were observed, especially in the Environmental Education Center. Also, in the various wildlife parks the majority of the veterinarians are women.

The only area of constraint to women's participation is in the extension program. As the conditions of work in this area are considered inappropriate for single women, e.g. living in tents, walking alone through forest lands for many miles, etc., their recruitment to the extension program as range officers and forest rangers will undoubtedly be difficult.

The most promising areas for expansion of women's participation in the Forest Department seems to be at the managerial and officer level, as policy makers, researchers, trainers for extension agents, for the village plantation program and for the basic education program, as veterinarian scientists at the various Parks and Reserves and in forest nurseries. In addition to these areas female participation can be encouraged at all levels in the Forest Department infrastructure.

Women are the primary users of forest products, and because of their close relationship to forests, they are the resident forest experts, forest conservators and managers.

· Additionally, and in conjunction with males, rural women utilize major and minor forest products to provide primary or supplementary income to their families by selling these products in raw or processed form. In increasing numbers, they also generate family income through employment as unskilled laborers on government sponsored commercial and community forestry development projects.

It should hence be evident that the relationship of Burmese women to their forests is a critical component to the overall production systems of rural households, given their contributions to domestic consumption and income-generation and given their contributions of time and labor to produce the forest goods for consumption and/or sale.

Given the above, it should be obvious that forestry development programs that fail to consider the interests and concerns of rural women are less likely to generate the kinds of community support that is necessary to achieve the various project objectives.

III. FISHERIES

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### 3.1. Fisheries Resources of Burma

Burma is rich in natural fisheries resources linked to its topography and climate. These resources fall into two broad categories, freshwater fisheries and marine fisheries.

Freshwater fisheries owe their existence to rivers, lakes, streams, wetlands and monsoon-flooded ponds. About 1.9% of the country's area (which comes to nearly 5,000 square miles) are perennially under water. Another 8.8% of the country's area (which comes to nearly 23,000 square miles) are inundated for four to five months in a year. The total area of swamps along the coast is approximately 2,030 square miles (or 0.8% of the country's area).

Freshwater wetlands, covering areas along the courses of the major rivers, are important fisheries. Some of these areas, after drainage, are used for agriculture. Nonetheless, very extensive areas of relatively undisturbed wetlands do remain, although estimates of their total area in the country are not available.

Marine fishing grounds along Burma's 1760 mile coastline are rich in fisheries resources. In May 1977, Burma declared a 200 nautical mile economic zone, thus considerably extending the exclusive fishing zone from the previous 12 nautical mile economic zone. Marine fishing grounds along Burma's coastline are regarded among the best in South-east Asia because of abundant plankton and food nutrients.

Among the coastal and marine habitats, special mention should be made of mangroves, islands, and coral reefs.

Mangroves are of interest to conservationists because of the unusual life forms and adaptations of the mangroves themselves and the invertebrate animals that live among them. They are important breeding areas for commercial fish and crustaceans and are an important source of nutrients (from decomposing leaves etc) for the otherwise poor Burmese offshore waters. Most of the extensive mangroves in the Irrawaddy delta are very degraded. However, nearly 56,000 acres (or 88 square miles) of undisturbed mangrove forests are still estimated to exist, mostly on the Tenasserim and Arakan coasts and offshore islands.

Many of the small islands, near Burma's coasts contain a wide variety of marine and terrestrial habitats. They are often very beautiful with beaches and inshore waters containing coral gardens. The best localities for conserving corals, mangroves and marine

turtles are around the Tenassarim islands. The Mergui Archipelago offers the greatest potential for the conservation of marine ecosystems.

Coral reefs are highly specialized and very diverse ecosystems usually requiring clear water. The best developed reefs are around the remoter islands of the Mergui Archipelago. The coral reefs of the Andaman Sea are exceptionally rich in species of animals and plants. The coral gardens are also of great beauty with a wide variety of colorful fish.

The main characteristics of fresh-water as well as marine fisheries in Burma, together with their component sub-categories are listed below:

**Table 3.1: Classification of Fisheries in Burma**

Broad Classification	Sub-Category	Places of occurrence
I. Freshwater fisheries	(a) Leasable fisheries	Streams and tanks which are seasonal in nature, and flooded during monsoons
	(b) Flood fisheries	Pool puddles and ponds caused by monsoonic floods of rivers
	(c) Open fisheries	Lakes and rivers
II. Marine Fisheries	(a) Onshore Fisheries	Tidal mud flats and swamps caused by ebb and flow
	(b) Inshore fisheries	Shallow areas within 10 miles from shore or areas where shore-line is visible and the duration of fishing time is within a day.
	(c) Offshore fisheries	Beyond the visibility of shore-lines or 10 miles offshore. The main species are pelagic and demersal fisheries.

Source: Nyan Taw and Win Htin, 1985, Fisheries Corporation

In addition to natural fisheries resources mentioned above, special mention needs to be made of "fish culture" as another sub-category of fresh-water fisheries. Fish culture in Burma rests on a modern technique of producing fish seed with, induced spawning by hypophysation or use of hormones. Stocking of quality fish seed in natural lakes and reservoirs is being done for this purpose.

Research on the marine resources of Burma began in the last century but was limited mainly to taxonomic studies, and to occasional observations on the life histories of various important species of turtles, fishes and invertebrates.

The results of the first stock assessments conducted in Burmese waters were published in 1956. Detailed data on the physical oceanography, the benthos, the plankton, the commercial invertebrates, and the fish resources of the Burma shelf were made available in 1973, in the report of the second cruise of the R.V. Akademik Knipovich in the Indian Ocean.

It was only in 1979, however, that a systematic coverage of Burmese marine resources was initiated through a project agreed between the Government of Burma, the U.N. Food and Agriculture Organization and the Norwegian Agency for Development AID (NORAD). In accordance with this, the fishery research vessel "Dr. Fridtjof Nansen" was commissioned to survey Burmese waters at two seasons: in September-November 1979 and in March-April 1980. This project, which lasted to the end of 1983 and included pelagic and demersal surveys, has led to a vastly increased knowledge of the resources off Burma, although there is still no complete inventory of fish species. The Fisheries Corporation has some information on about 200 species of marine fish, though there are believed to be over 600 species.

Present best estimates of demersal (fish within 0.5-1 meter of the sea bottom) biomass off Burma and their 95% confidence intervals are:

755,000  $\pm$  184,000 tons for the "post-monsoon" season and  
815,000  $\pm$  250,000 tons for the "pre-monsoon" season.

The seasonal differences in total biomass are relatively smaller than those noticeable at the species or family level, suggesting that most species-specific seasonal changes compensate for each other, and result in a seasonably stable biomass of demersal fish.

On the other hand, the biomass of small pelagics is about twice as high during the pre-monsoon season (1,330,000 tons) as during the post-monsoon season (620,000 tons). These differences are caused by a seasonal fluctuation in biological production of these generally short-lived fishes.

Combining the pelagic and demersal biomasses and using formulae commonly applied to multispecies stocks in Southeast Asia, a total potential catch of about 700,000 tons of marine fish per year has been estimated in a paper jointly prepared by FAO, PPFC, and International Center for Living Aquatic Resources Management (ICLARM). Compared to this the actual fish production in Burma (including fresh waters fish as well as marine fish) during 1984-85 was 648,390 tons, and its distribution by nature of catch is shown below:

Fresh water fisheries	150,460 tons,	of which	
		Fish Culture	4,850 tons
		Leasable fisheries	67,370 tons
		Flood fisheries	39,740 tons
		Open fisheries	38,500 tons
Marine fisheries	497,930 tons	of which	
		On-shore fisheries	169,910 tons
		In-shore fisheries	271,510 tons
		Off-shore fisheries	56,510 tons

Data on actual fish production show that marine fisheries account for 77% of the total catch, and they are well below the potential catch. Within the class of freshwater fisheries, fish-culture amounts to only 3.2%.

The MSY (Maximum sustainable yield) estimate for Burma is 500 thousand tons annually. All indications show that the annual yield is not above the MSY for Burma and that the fisheries sector is not over-exploited. Of all the countries in South-east Asia, Burma's fisheries are probably the least damaged.

However, with respect to fresh water prawn, the MSY may well be passed, or at least reached. Hence the availability of prawn in the market is poor, with high prices, and of smaller size.

The storage system is adequate and the supply of fish is still short of demand i.e., the storage tanks are not used to their maximum capacity.

The following table shows that up to 90% of the total catch of fish is in private hands. This despite the regulation that private commercial fishing is illegal.

The Fisheries Corporation feels an urgency to expand its operations to waters further afield, which are relatively untouched by illegal fishermen. However, this cannot be done without adequate data or information on which waters might be the most profitable.

Table 3.2 Fisheries Production by State, Cooperative and Private Sectors 1983-84

Sector	Production (mt)			% to total
	Total	Freshwater	Marine	
State	28,600	4,010	24,590	5.4
Cooperative	24,110	17,550	6,560	4.5
Private	479,030	41,330	437,700	90.1
<b>TOTAL</b>	<b>531,740</b>	<b>62,890</b>	<b>468,850</b>	<b>100.0</b>

Source: Win Htin and Nyan Taw (1985) PPFC

The Regional People's Councils give licenses to the Fisheries Corporation for fishing in certain waters. However, most of the fishing is unlicensed and hence most of the harvest falls into the hands of private fishermen.

### 3.2. Legislation and Law Enforcement

The Fisheries Act is old, formulated in 1905. The Department of Fisheries realizes that the 1905 Act needs to be updated, but no steps have as yet been taken. In addition to the stipulations of the Fisheries Act, there is also a Fisheries Manual. This is titled "Fisheries in Burma", published in 1943. Neither copies of the 1905 Act nor the manual are available at this time.

Burma's first Fisheries Act was passed in 1875, nearly a quarter century earlier than the All-India Act. The 1905 Act repealed the earlier Act, and covered the following Fishery Laws:-

1. The law was designed to preserve and protect fish, by:
  - a) enforcing close times for a few hours daily, or on certain series of days, or for several days together, or for certain seasons;
  - b) defining a minimum size limit below which none of the kinds of fish specified can be taken. It aims to protect immature and under-sized fish until they breed;
  - c) regulating mesh of net with the same object, viz. liberation of small and immature fish;
  - d) prohibiting the taking of spawn, the catching, killing, or even possession of fry and of small-sized fish of any specified species;
  - e) reserving and setting apart special areas of water for encouraging the propagation of fish.
2. Control of fisheries, in the public interest, by means of:
  - a) licenses, leases and permits, involving more or less exacting conditions in the exercise of the privileges conveyed;
  - b) prohibition of nefarious and injurious methods, such as the use of dynamite and explosives generally or of such implements or appliances as are too destructive to be regarded as fair and legitimate means of capture.
  - c) prohibition against the use of poison.
3. Laws to facilitate the migration of fish to and from their feeding and breeding grounds by:
  - a) forbidding obstructions to the ascent of fish to the spawning resorts;
  - b) requiring that the main channels or rivers may not be obstructed, and no nets shall extend more than a certain portion of the breadth of such river course;
  - c) providing fishways and passes over dams and weirs.

4. Regulations of the nature of precautions.
5. Preventing injurious influences affecting fish life, such as river pollution.
6. Regulations aiming to secure the quality and purity in manufactured and prepared fish products.

The Fisheries Act applies only to inland and inshore areas. No offshore areas are covered by the Act and are hence open for exploitation.

Private commercial fishing is illegal. However, due to the shortage of staff, enforcement is very poor.

### 3.3. Ongoing Activities

#### 3.3.1. Development Programs

Fisheries development plans are mainly undertaken by the Corporation. At present, the major development in Fisheries are post-harvest facilities and aquaculture.

Development of post-harvest facilities consist of shore facilities such as jetties, collection centers, ice making, cold storage and processing complexes. See Map 3 in Appendix A for location of ice-making and refrigeration complexes.

The Aquaculture development program is being implemented under the Inland Fisheries Development Project with funds from an ADB loan (see section 3.3.3 below). The project components consist of the establishment of three 50 hectare freshwater farms and hatcheries, six 50 hectares freshwater prawn farms and one hatchery, and four 50 hectare brackishwater prawn farms and two hatcheries. See Map 4 in Appendix A for the tentatively identified site location of the project.

Table 3.3 below gives a summary of the fisheries development projects which are in progress.

Table 3.3. The Fisheries Development Projects (F.C)

Sr. No.	Name of Project	Source of Loan	Name of State Division	Name of Township	Location of Project Sites
1.	Marine Fisheries Development Project	Asian Development Bank	Mon and Tennasserim	Ye, Launglone, Mergui, Bokeyyin Kawthaung	Wakyun, Kyauknimaw, Patawpothet, Panlonaw, Kawthaung
2.	Fisheries Commodity Loan for Shore facilities	Danish Government	Rakhine	Kyaukpyu, Sittwe, Myebon, Ramee, Gwa	Kyaukphu, Sittwe, Myebon, Ramee, Gwa
3.	Fisheries Development Project	Norwegian Government	Rakhine	Kyaukpyu	Kyaukpyu
4.	Marine Prawn Fisheries Development Project	Australian Commercial	Rakhine	Ahlone	Ahlone
5.	Marine Prawn Development Project	UK Commercial	Rakhine	Sandoway	Mayo Bay
6.	Fisheries Development Project	Danish Government	Rakhine	Ann	Tataung

The Fisheries Development Projects (F.C)(cont.)

Sr. No.	Name of Project	Source of Loan	Name of State Division	Name of Township	Location of Project Sites
7.	Inland Fisheries Development Project	Asian Development Bank			
	(1) Refrigeration and Processing complex**		Rangoon		
	(2) Collecting Center		Irrawaddy	9 Township	25 centers
	(3) Fish Farms**		Mandalay, Pegu, Shane	3 farms and Hatcheries	
	(4) Freshwater** Prawn		Rangoon, Pegu, Irrawaddy	6 farms and one Hatchery	
	(5) Brackish Water Prawn**		Rangoon, Rakhine	4 farms and 2 Hatcheries	
8.	Freshwater Prawn Seed Production Center	Japanese Government (JICA)	Rangoon	Thaketa	Thaketa

\*\* Site Location not yet conformed.

Source: Win Htin & Nyan Taw, 1985. F.C.

The Fisheries Corporation and the Department of Fisheries have indicated their urgent need for an external review of Sector activities and assistance in designing a long-term technical assistance project. The DOF and FC are operating under constraints from the Minister not to propose any projects but they can entertain external, unsolicited offers in the form of a review and/or a grant. The review should cover the entire range of Fisheries Management extension and development activities:

- statistical gathering and reporting
- resource assessment
- extension in artisanal fisheries
- aquaculture extension
- fisheries information service for high seas trawlers
- fisheries legislation
- law enforcement
- fisheries and aquaculture research
- public education and information
- fisheries economics
- fisheries marketing assistance
- fish processing research
- publications
- international relations, especially the Bay of Bengal Program (see Section 3.4)

### 3.3.2 Aquaculture and the Inland Fisheries Development Project

The Asian Development Bank has approved a loan of US\$ 20 million to finance the foreign exchange cost of the Inland Fisheries Development Project in Burma. The Project was due to start in 1981 and the first phase to end in 1986. The project is now in its second phase. The Fisheries Corporation is the executing agency and technical assistance is provided by Aquatic Farms Ltd.

The objectives of the project are: to increase fish production and improve its distribution for domestic consumption; to optimize prawn production and improve its quality for export; to increase foreign exchange earnings; and to help artisanal fishermen improve their income and create more gainful employment opportunity for them.

Only two species of prawn, Macrobrachium rosenbergii (giant freshwater prawn) and Penaeus monodon (giant tiger prawn) are being used for culture purposes in Burma. (For details of prawn culture see Nyan Taw 1983).

So far, the project has run into considerable problems leading to severe delays in implementation. The project finally started in 1983-84 after the objectives were reformulated. The initial emphasis was an marketing, though the focus now has almost exclusively shifted to aquaculture. Some processing facilities are also provided.

ADB consultants joined the project in 1985, since when some progress has been made. The rehabilitation of the Twante fish farm will finish in another 2 to 3 years. In addition, sites have been selected for 300 hectares of farms for prawn culture and 200 hectares of farms for shrimp culture.

The ADB project currently sees the greatest potential for Burma, and for fisheries projects, in brackish water marine shrimp culture, using low cost technology, based on models currently in use in Bangladesh, Philippines and Indonesia. This is mainly because Burma's resource of wild prawn/shrimp is greatly declining, and the reliance on aquaculture for export purposes is hence increasing. However, for such a program to be successful, an Extension Division of the Fisheries network will have to be set-up.

AID/Burma has recently provided training in Hawaii and the Philippines for hatchery technicians from the Fisheries Corporation, in marine shrimp culture.

### 3.3.3 Existing and Proposed Protected Areas

Under the NCNP Project (see Section 2.6.1.) of the Forest Department, there are two existing Wildlife Sanctuaries of interest to the fisheries sector, namely Thamihla Kyun (Diamond Island) and Moscus Island - the former is particularly important as a marine turtle nesting site; the latter is of value for conservation of marine fauna and flora including coral formations, and for the protection of nesting sites of marine turtle.

In addition to these two, three other sites have been proposed for protection of marine fisheries. Meinmahla Kyun is proposed as a wildlife sanctuary, which will be of particular conservation value for saltwater crocodiles. Although the population of saltwater crocodiles has been depleted and nesting may no longer occur, the FC plan to transport juveniles from the Rangoon Crocodile Farm and eventually to harvest the population on a sustained yield basis. Lampi Marine National Park is proposed as an outstanding natural area which almost certainly has greater potential for development as a marine national park than any other in Burma. It has a high value

for conservation of important ecosystems, including moist evergreen forest, mangroves and coral formations. Kadonlay Kyun is proposed as a wildlife sanctuary for the conservation of marine turtles, particularly if the species composition is different from that of other major nesting areas. The island is also reportedly used by estuarine terrapins, a formerly abundant species that appears to be close to extinction in Burma.

(See Appendix B for brief details of these areas, and Appendix A for map (Map 5) of Lampi Marine National Park).

### 3.4 Bay of Bengal Program

The Bay of Bengal Program (BOBP) is a large-scale fisheries program covering five countries bordering the Bay of Bengal - Bangladesh, India, Malaysia, Sri Lanka and Thailand. It is funded by SIDA (the Swedish International Development Authority) and executed by FAO (Food and Agriculture Organization of the United Nations). The program was started in 1979. Burma has not yet been included in the program, though its entire coastline falls in the area of Bay of Bengal.

Not enough information is available on the components of the Program, or on the reasons for Burma's exclusion from the program. However, it appears that BOBP is a multi-disciplinary program active in both off-shore fishing, technology and data, as well as in development of small-scale fisheries with craft, gear, aquaculture, extension, information and development support. The program also has a major component on women in fisheries in the region, concentrating on three main types of activities: surveys of women in fishing communities; methods to make extension services directed at women more effective; and techno-economic improvements in small-scale fisheries.

BOBP's main goals are to develop, demonstrate and promote appropriate technologies and methodologies to improve the total fisheries yield (both marine and inland) to improve the conditions of small-scale fisherfolk, and boost supplies of fish from both the large and small sectors in the BOBP member countries.

The continental shelf area of Burma which lies within the BOBP area is by far the largest, as indicated by the following table. (See Appendix A for maps on BOBP areas - Maps 6 & 7).

Table 3.4: Approximate estimates of the coastline, continental shelf and exclusive economic zone areas of the countries within the project area

Country	Coastline Km	Continental Km <sup>2</sup>	EEZ area Km <sup>2</sup>
Maldives	-	-	843,247
Sri Lanka	1,760	30,000	256,410
India (east)	3,000	33,836	1,157,942
Bangladesh	480	69,900	-
Burma	-	2,800	280,000
Thailand(west)	740	44,000	111,000
Malaysia(west)	8,001	-	69,413
Indonesia (N.E Sumatra)	1,300	-	100,000

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Source BOBP/WP/36, 1986, p. 7

It appears that Burma would benefit greatly by joining the BOBP. It appears that the proposal for joining has to come from an external agency.

### 3.5. Institutions, Staff and Training

The Department of Fisheries and the Fisheries Corporation are the two main organizations responsible for the development of the fisheries sector in Burma.

The main responsibilities and function of the Department of Fisheries are conservation of fisheries resources, enforcement of fishery law and revision of the Burma Fisheries Act, rendering of legal advice to the Ministry on matters relating to the International law of Fisheries and law of the sea, compilation and maintenance of fishery statistics and rendering of technical advice

on various aspects of fisheries; drafting the fisheries plan, undertaking necessary research, training the extension service and modernization and mechanization of fishing gear and fishing craft.

Township offices are situated at 26 townships in 13 states and Divisions for fisheries administration, research and extension. For the enforcement of the Fisheries Act and Regulation of fisheries, Fishery Inspectors are posted in 17 townships where the major fisheries are in operation.

The Fisheries Corporation is responsible for the production and marketing of fish products in various forms, and distribution of fishing gear. Experimental research on aquatic products and training for further development of fishing methods is also undertaken by the FC. The Corporation, being a state economic organization, concentrates on the operation of marine and freshwater fisheries for domestic consumption and export. The management offices and operation stations for production and post-harvest facilities are situated in major fisheries areas.

The Fisheries Cooperatives (under the Ministry of Cooperatives) are responsible for the operation of cooperative fisheries, whose main target is to plan and produce regionally for the local markets and to supply fish and fish products at low prices. The cooperative gives financial and fishing material aid to fisherfolk. Almost all fishermen belong to the cooperative and are obliged to deliver all their catch to them. If the cooperative owns fishing boats used by fishermen, they must also return a percentage of their profit earnings to the cooperative.

There is clear distinction in function between the Fisheries Corporation and the Fisheries Department. The FC is the commercial wing charged with maximizing the catch primarily for export while the DOF is research and legislation oriented. The DOF controls the take of the FC, limiting it through the issue of licenses for fishing in certain waters, etc. The DOF attempts to strike the right balance with MSY (maximum sustainable yield), keeps a databank, and is responsible for legislation. The FC, on the other hand, wishes to catch as much fish as they can find.

The FC started to export on a test basis in 1971-72 and has been increasing its sales ever since. Currently, at least 5% of the national foreign exchange is received from the export of shrimp and prawn. The FC wants to increase this figure substantially, and hence is under pressure to increase its total catch.

However, not even 20% of the total take of fish from Burma waters is controlled by the FC. Most is in the hands of private fishermen/fisherwomen, who sell their catch in the local market at black market prices, or to export to brokers directly.

This is facilitated by the DOF who lease out the waters to fishermen. Even the FC can fish only in waters that are leased to them. However, it is very difficult to supervise the leasable aspects of fishing on a practical level, as private fishermen will illegally go out and fish. Moreover, the DOF's control is restricted due to lack of data, lack of appropriate legislation, and an acute shortage of staff to enforce the law.

For commercial purposes, the FC feels the urgency to expand its operations to waters further afield, that is, into offshore, deep sea fishing, as these areas are relatively untouched by illegal fishermen. However, this cannot be done without adequate data or information on which waters might be the most profitable. Neither the DOF nor the FC have access to any such data as yet. This is recognized as the most urgent need of the fisheries sector.

The Fisheries Research Institute is situated near the Crocodile farm in Thaketa. Their main activity is to develop the culture of prawns. The Institute comes under the Research and Planning Division of DOF. It is very well equipped with a library (largely donated by ODA in 1986, and supplemented by the ADB in 1987), a Science Lab, a quality control center, and a feed research unit.

The FC's departmental up-grading training courses are given by the Corporation's Institute of Fisheries Technology. The development of the Institute was undertaken by UN/FAO. Many short-term courses are given, mainly to up-grade the skill of deck officers and engineers. Short-term courses on the fisheries management are also given to Station managers. Three fishermen training centers are also being established, one each at Rakhine coast, Irrawaddy Delta and Tenasserim Coast. Fish and Prawn Culture short up-grading training courses are also given periodically. (See table 6 in Appendix A for the Universities and Institutes related to fisheries sciences in Burma). Both the FC and DOF are interested in increasing their staffing capacity, especially the FD, on whose shoulders lies the responsibilities of planning and statistics, licensing and law enforcement, etc. At present the total staff of DOF is 408 (raised from 192 within 2 years), and their aim is to employ 1000. 50 out of the 408 staff are women.

### 3.6. Role of Women.

In the Fisheries Corporation, the total number of women employed is substantial. Though exact figures are not available, it was learned that at the executive level, 2 General Managers are women out of a total of 10. At least 20% of the staff are women at the counterpart level and as much as 50% of the staff are women at the technical/professional level of deputy project managers.

In the DOF, 50 out of the 408 staff members are women, though their exact designations and status are not known.

As many as 30-40% of fishermen in the delta region of Burma are women. In the delta areas, but not on the coast, it is a common sight to see women fishing. This is quite unusual, even for Southeast Asia.

Another major activity of women within the fisheries sector is in processing. During the height of the season, from August to September, the FC hires women and girls to pick and process the shrimp and fish in their processing plant at Ahlone. Commercial processing methods are sun-drying, smoking, pickling, canning on a small scale, paste and sauce making, purifying and drying, dry-salting, wet salting, etc. "Gnapi" fish paste, is the staple source of protein for the majority of the population of Burma. All these processing activities are carried out exclusively by women.

Artisanal fishermen play a major role in the production of marine fish in Burma. But they are still using indigenous fishing craft, without insulated fish holds and their range of operation is also limited. These fish carriers are not only few in number but also small in size. As such, fish carrying capacity is inadequate for the industry and only a small portion of the marine fish caught can be brought to harbor in fresh form by the artisanal fishermen. Consequently, only a minor portion (25%) of the total production can be consumed as fresh fish and the rest has to be processed.

The majority of the workers at the Fisheries Research Institute are women, especially in the lab and in the quality control center. In addition, at least 25% of the staff engaged on data collection are women.

IV. WILDLIFE

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#### 4.1. Status of Wildlife in Burma

Burma is a country of unusual ecological diversity, rich in a wide variety of flora and fauna. But, as elsewhere, the natural environment is increasingly threatened by shifting cultivation, illegal hunting, uncontrolled use of highly toxic pesticides and other harmful influences resulting from steady growth of the human population. Satellite monitoring shows that forest cover, though still greater in proportion to the total land area than in most South-east Asian countries, is diminishing at a steady rate. The Javan rhinoceros has already become extinct here, and other species, including the economically important elephant, marine turtles and saltwater crocodile, are seriously threatened.

The Government, having realized that effective conservation action is urgently needed, has, with UNDP/FAO assistance, initiated a nature conservation program which will include establishment of national parks and other protected areas. Several suitable sites have already been identified in additions to the 14 Wildlife sanctuaries already in existence.

Much work yet remains to be done, particularly, in field research to determine the status and distribution of individual species. For the majority of species, relatively little is known of their current status in the country.

From what little we do know, it appears that most internationally threatened species are better off in Burma than elsewhere in the regions, although they are increasingly threatened by habitat loss (mainly due to agricultural encroachment), poaching, widespread misuse of pesticides, and even over-exploitation under officially sanctioned programs. Organized international trade is not currently a major problem (except in the case of elephant), although there are indications of increasing trade in wildlife and wildlife products originating in Burma.

The paucity of reliable, up-to-date data on the status of wildlife is due to a variety of factors, but primarily a lack of awareness (at least until recently) of the importance of wildlife conservation and nature conservation in general, and a consequent lack of trained personnel to formulate and implement conservation programs. This has not always been the case - Burma has long had a system of Wildlife Sanctuaries and a Wildlife Protection Act, but as a result of human encroachment many of these Sanctuaries are no longer viable, and due mainly to low staffing levels and poor motivation the measures in the Wildlife Protection Act as at present rarely enforced.

Nineteen mammal species occurring or possibly occurring in Burma are listed in the IUCN Red Data Books (see section 4.4) as endangered or vulnerable to extinction, as are 4 birds and 11 reptiles. Many others are listed as intermediate status or rare, and/or are included in CITES (see section 4.4).

#### 4.2. Legislation and Law Enforcement

The Forest Department was assigned responsibility for wildlife preservation under the Burma Forest Act of 1902. This Act designated wild animals as "forest produce" and provided for the making of rules to control hunting in Reserved Forests.

The first game sanctuaries were established in 1912 under the Wild Birds and Animal Protection Act 1912. Local Government was given the power to declare an area to be "a sanctuary for the preservation of animals"

The Burma Wildlife Protection Act, 1936 was so formed as to bring together under one Act the main protective provisions relating to Reserved Forests as well as to Sanctuaries. For example, section 5 of this Act prohibited the following acts in Reserved Forests (except for license-holders) :

- "(a) hunt, drive, stampede or willfully disturb any animal,
- or
- (b) remove any animal or part or product thereof."

These restrictions can be compared to those of section 4 which applies to sanctuaries:

- "No person shall in a sanctuary -
- (a) hurt any animal except with the special permission of the Local Government which shall be granted only for scientific purposes or to preserve the balance of animals;
- (b) drive, stampede or willfully disturb any animal."

The 1936 Act also specified " completely protected animals " whose hunting was prohibited even outside the sanctuaries and reserved forests. Most important of these animals were : rhinoceros, tapir, argus pheasant, and masked finfoot. An amendment of the Wildlife Protection Act (enacted in 1956) added thamin and peafowl to the list of completely protected animals. Furthermore, hunting of certain other species was prohibited on a seasonal basis.

The Burma Wildlife Protection Act, 1936, with minor amendments, still remains the basic legislation governing the conservation of wildlife. It, together with subsidiary legislation issued thereunder, provides inter alia for:

- a) the establishment of Wildlife Sanctuaries;
- b) prohibition of hunting within Reserved Forests without license;
- c) protection of certain species including rhinoceros, tapir, argus pheasant thamin, peafowl and masked tintoot wherever found;
- d) closed seasons for the hunting of various other species of both mammals and birds;
- e) prohibition of certain hunting methods;
- f) prohibition of import or export without license of any living animal, or any part or produce of rhinoceros or elephant;
- g) wide powers of enforcement including arrest and the seizure and confiscation of weapons and other articles used in commission of an offense.

No provision is made under the Act, nor, so far is known, under any subsidiary legislation, for any of the following:

- a) control of activities within a Wildlife Sanctuary other than hunting, for example trespass, settlement or damage to vegetation;
- b) protection of carnivores, including tiger, leopard, clouded leopard, golden cat, wild dog or bear;
- c) protection of certain other species clearly in need of either complete or partial protection; (Categories of completely protected or seasonally protected animals still exclude animals which, according to IUCN Red Data Books and CITES Appendix II, are vulnerable or may become threatened)
- d) establishment of either National Parks or any other category of protected area apart from a Wildlife Sanctuary.

Existing legislation dates from the pre-war colonial era and it is based on the protection of the individual species rather than the more modern concept of ecosystem conservation. Also, while protecting certain species (though not their habitats), certain other equally important species such as tiger and clouded leopard rank as pests and therefore are totally unprotected. New and more comprehensive legislation providing among other things for the establishment and management of National Parks and Nature Reserves and for the more effective protection of endangered species is urgently needed. It is important that such legislation should be in conformity with international law and usage, and in particular with the Convention on International Trade in Endangered Species (CITES).

Under existing legislation, the fauna in wildlife sanctuaries is protected but the habitat is not, with the result that many areas and species therein have suffered serious damage. Moreover, in most cases effective protection of wildlife has not been possible due to shortage of Forest Department Staff.

Wildlife in Reserved Forests enjoys a certain degree of legal protection and may not be hunted without a special permit. But here again, effective law enforcement is difficult due to staff shortages and the large numbers of firearms in the hands of the military and para-military People's Militia. It has been reported that members of the People's Militia hunt extensively with the .303 rifles with which they are provided by Government and for which black-market ammunition is readily available at about K.2.50 per round.

It is against the basic grain of Buddhist philosophy to kill living things. The harvesting of wildlife is hence seldom a sport in Burma. The motive is survival. The demand for red meat is high and the population pressure is increasing.

A study made in 1981 by Ofosu-Amaah and Gruppe, at the International Institute for Environment and Development (located in Washington D.C) listed the following obstacles to effective enforcement of protective legislation in Burma:

"Lack of manpower, insufficient capital, inter-agency competition, conflicting directives, legal ambiguities, uncertain jurisdiction, insufficiently harsh penalization, administrative inefficiency, local corruption, hostility towards central government officers, difficulties of travel and communication, public apathy and insensitivity."

#### 4.3. Existing and Proposed Wildlife Sanctuaries

Wildlife conservation has hitherto been the responsibility of the Forest Department. Apart from the reserved forests which total approximately 15% of the total land area, there are 14 wildlife sanctuaries. However, most are relatively small, their aggregate area being approximately 0.7% of the total land area.

Existing Sanctuaries appear of insufficient extent for the protection of Burma's varied wildlife resources. The fact that existing legislation does not safeguard vegetation, and some sanctuaries have apparently been partly logged, means that they are of doubtful value for ecosystem conservation.

In 1981, the Government, with assistance from FAO/UNEP, introduced a new Nature Conservation and National Parks project to ensure more effective protection of flora, fauna and natural landscapes, including establishment of national parks and other protected areas. Preliminary surveys of over twenty potential sites have been completed (June, 1982), and several have been identified as suitable for establishing national parks, nature reserves or sanctuaries. Other areas, particularly in northern Burma, still remain to be surveyed.

Under the NCNP project (see section 2.6.1.), 9 additional sanctuaries have been proposed in Burma to cover an additional 0.3% of the land area, increasing the total sanctuary area to 1% of all land. Compared to other Asian countries, this percentage is very low. (See Table 2 and Map 8 in Appendix A). For a brief description of existing and proposed wildlife sanctuaries, see Appendix B.

#### 4.4. Threatened Wildlife Species in Burma

In spite of the wide interest in Southeast Asian fauna, there exists no single authoritative survey of Burma's major wildlife. The most commonly used information on total numbers of species of mammals, birds, and reptiles and amphibians, is the following:

- a) Hundley (1981) listed 289 species of mammals as occurring in Burma;
- b) Smythies (1953) listed about 1000 species of birds as having been recorded in Burma. The technical staff of the FAO project collected distribution data on about 400 species during 1981-83, but many of the remaining 600 were not seen by their observers in the areas that they covered;
- c) Hundley (1964) and subsequent unpublished additions have listed 366 reptile species observed in Burma.

Although information on the total numbers of species is hard to update, the International Union for Conservation of Nature and Natural Resources (IUCN) does try to keep track of "threatened species" and "wildlife trade". The IUCN (with headquarters at Morges, Switzerland) is an independent non-governmental organization engaged in promoting scientifically based action directed towards sustainable use and conservation of natural resources. Funds for its activities are mainly provided by the World Wildlife Fund (WWF), which is the world's largest voluntary conservation organization raising funds world-wide for urgent conservation requirements. The headquarters of WWF are located at Gland, Switzerland.

In 1981, the IUCN set up the IUCN Conservation monitoring Center (CMC) with the main center in U.K.. The CMC has the task of providing information on the status of conservation world-wide to IUCN, the WWF, and to the Global Environment Monitoring System run by the United Nations Environment Program. This information is provided in the form of Red Data Books consisting of data sheets on threatened animals. Five categories of threatened animals are listed in the IUCN/CMC Red Data Books:

E = Endangered  
 R = Rare  
 V = Vulnerable  
 I = Indeterminate Status  
 K = Insufficiently known

Another publication of great interest that is produced by CMC relates to "wildlife trade". The Convention on International trade in Endangered Species of Wild Fauna and Flora (CITES) is designed to control trade in threatened species of animals by requiring both importing and exporting countries to issue permits for trade in such species. All parties to the convention are required to submit, to the CITES secretariat, annual reports detailing permits issued for trade in CITES-listed species. Two categories of threatened animals are listed in CITES publications:

CITES : Appendix I = Threatened with extinction  
 CITES : Appendix II = May become threatened

In Burma, the NCNP Project started in 1981, has been the only source of comprehensive data collection for internationally threatened wildlife species in Burma. Blower, who was the Chief Technical Adviser on the Project has written many papers (see Appendix D) and Salter, the wildlife Ecologist on the team has written a "Summary of currently available information on internationally threatened wildlife species in Burma". Salter's book is the most comprehensive book to date of this type, in Burma.

#### 4.4.1. Mammals

Data on distribution, status and population trends in relation to important species such as elephant, rhinoceros and tiger are either completely lacking or based on such out of date figures as to be of doubtful value. For example, while the Javan rhinoceros is now believed to be extinct in Burma, the Sumatran species is said to survive in certain areas such as Shwe-U-Daung, Tamanthi and Kahilu. But there has been no attempt to assess actual numbers in recent years, and whether or not the species survive at all in any of these areas seems uncertain.

The IUCN Red Data Book lists the following 7 species of mammals as "Endangered" in Burma which means they are in danger of extinction and their survival is unlikely if the causal factors continue operating:

- Bengal or Indian Tiger
- Indian Rhinoceros
- Sumatran Rhinoceros
- Javan Rhinoceros
- Malayan Tapir
- Fea's Muntjac
- Blue Whale

The main causal factors endangering mammals are:

- a) habitat destruction through shifting cultivation, spread of permanent agriculture and plantation forestry, and increased logging pressure on remaining forested areas;
- b) indiscriminate, uncontrolled hunting both for the pot and for trade in wildlife products;
- c) misuse of pesticides;
- d) overexploitation of economically important species.

According to the Asian Development Bank Report (1984), "populations of the more glamorous carnivores (especially tiger and leopard) have been decimated in recent years by the use of agricultural chemicals (notably Endrin) as poisons, triggered by an illegal trade in skins; and the poaching of ivory is increasing" (p.134).

The next category in IUCN Red Data Book is "Vulnerable" which refers to those species which are believed likely to move into the endangered category in the near future. The following 12 species of mammals are listed as "Vulnerable" in Burma:

- Asian Elephant
- Leopard
- Indochinese Tiger
- Clouded Leopard
- Water Buffalo
- Wolf
- Wild Dog
- Fin Whale
- Gaur
- Banteng
- Mask Deer
- Dugong

"Thamin" (a species of deer) is not listed as "Endangered" or "Vulnerable" in the IUCN Red Data Book, but it appears in CITES Appendix I which denotes "Threatened with Extinction". An amendment to the Wildlife Protection Act of Burma enacted in 1956 added "Thamin" to the list of "completely protected animals". Prior to that, in the Act itself (which was enacted in 1936), Thamin was in the category of "protected animals" and could be hunted with a license.

Conservation specialists working with the NCNP project attempted to gather current information on at least the larger species in each of the survey areas, and to obtain as much country-wide information as possible on those species that are internationally endangered with extinction, or that may presently become rare and endangered in Burma.

#### 4.4.3. Birds

No species is listed as endangered, but 4 species of birds are listed as "Vulnerable":

- Green Peafowl
- White-winged Duck
- White-eared Pheasant
- Peregrine Falcon

An amendment to the Wildlife Protection Act enacted in 1956 added "peafowl" to the list of "completely protected animals". prior to that, in the Act itself (which was promulgated in 1936), peafowl was in the list of "seasonally protected animals".

About one thousand bird species have been recorded from Burma (Symthies, 1953). This relatively high species diversity being due to the fact that the country extends into two biogeographic regions, each with different bird faunas. There are relatively few endemic species (Sayer, 1983).

There is as yet, little information on the status, distribution and ecology of individual species, though there is no evidence that any major species is seriously endangered, "apart from vultures, which have partially disappeared from most of Burma in recent years" (Blower, 1984).

The main threats to bird life are the conversion of wetlands to agriculture, the habitat of waterfowl and waders including the large number of migratory species which winter in Burma, hunting and

trapping, especially of pheasants and peafowl, and the use of pesticides such as Endrin (the use of Endrin is now prohibited), which is a serious threat to scavengers and seed-eaters. The principal conservation needs for birds are the protection of sufficient areas of natural habitat, especially wetlands, and research to obtain data on the status and distribution of individual species, particularly those which are either rare or endemic to Burma.

#### 4.4.3. Reptiles

According to the checklist prepared by Hundley (1964) and subsequent unpublished additions there are some 366 reptiles species known from Burma, comprising 4 crocodylians, 46 chelonians (tortoises, terrapins and turtles), 87 lizards and 229 snakes, and 37 species of amphibians comprising 35 frogs and toads, 1 salamonden and 1 apodid (NCNP Interim Report, 1983). Of these the crocodiles and marine turtles are the best known although even for these groups there are major gaps in available information. As far as is known there have been no recent systematic collections or observations on reptiles or amphibians in any area of Burma, and these groups as a whole are very poorly known.

The IUCN Red Book lists 9 species of reptiles as endangered in Burma:

- Siamese Crocodile
- Green Turtle
- Estuarine Terrapin
- Olive Ridley Turtle
- Leather Back Turtle
- Hawksbill Turtle
- Mugger Crocodile
- Gavia
- False Gavia

In addition, 3 species of reptiles are listed as Vulnerable:

- Saltwater Crocodile
- Burmese Python
- Loggerhead Turtle

Twenty-two Burmese reptiles are listed by CITES, of which the twelve listed above are common, and the remaining ten are the following:

- Burmese Swamp Turtle
- Three-keeled Turtle
- Indian Flap-shell Turtle
- Spring-tailed Lizard
- Indian Chamelion
- Indian Monitor
- Dumeril's Monitor
- Yellow Monitor
- Clouded Monitor
- Water Monitor

#### 4.4.4. Plants

Burma's flora consists of nearly 7,000 known species, not including ferns and lower plants (Hundley and Chit Ko Ko, 1961). Of these, 1,200 species are believed to be of trees. Conservation of this extremely diverse natural flora is important not only for aesthetic and scientific reasons but also as a reservoir of genetic resources, as yet largely unknown and untapped, but potentially of great benefit to man as sources of food, essential oils, resins, medicines and other valuable products, in addition to timber which is of great importance to the Burmese economy. The Forest Department, however, does not have data on the types and properties of these various species as yet.

Burma's unusual ecological diversity includes regions botanically among the world's richest, ranging from the rainforests of Tenasserim to the northern mountains of Kachin State where the flora of the himalayas and China meet and intermingle. During the first half of the century this latter area attracted the attention of several famous botanists of international repute who made comprehensive collections and discovered many rare species, particularly of rhododendrons, alpine plants and orchids. Nearly 100 endemic plant species have been described from the temperate rainforest belt of North Burma alone (Kingdon-Ward, 1957). James Keenan, another botanist who made a collecting expedition to northern Kachin State in 1961-62, concluded that it "must undoubtedly be one of the richest and most scientifically interesting areas in the world: of great importance not only to Burma but internationally" (Keenan, 1964).

That no Burmese species are listed in the IUCN Plant Red Data Book (1978) does not mean that none are endangered. Rather, it is a reflection on the lack of up to date knowledge of Burmese flora, particularly of the status of individual genera and species. Tree species which are reportedly endangered in the wild include the

spectacularly beautiful Amherstia nobilis of Tenasserim, of which only one natural stand is now said to survive and Taiwania cryptomeriodes, the Chinese coffinwood tree. It is now scarce in northern Burma, and elsewhere occurs only in Taiwan and an area in central China (Kingdon-Ward, 1957). Other commercially valuable species such as Limonia acidissima (thana'ka), Aquilaria agallocha (akyaw or "eagle-wood") and Santalum album (sandalwood) are becoming increasingly rare through over-exploitation.

There is also a long history of over exploitation of medicinal plants which are widely used in Burmese and Chinese medicine and of orchids popular as house plants and exported to dealers in Bangkok, Singapore and elsewhere in considerable quantities. As a result, orchids are collected from forests throughout the country, including Forest Reserves, and of course the rarer the species the more they are sought after. Of the 523 orchid species known to occur in Burma two, Ranthera inschootiana and Vanda coerulea, are listed in CITES Appendix I. There is, however, no up to date information either on their status or on that of other Burmese species. Other plant species and genera occurring in Burma and listed in CITES Appendix II are Dioscorea deltoides, all Ceropegia (1 species in Burma), all Euphorbia Spp (20), all Aloe Spp (21), all Cactaceae (4) and all Orchidaceae (533).

As with other forms of wildlife, the main threats to rare and endangered plants are habitat destruction and commercial exploitation, and the only effective means of conserving them in the long term is through the establishment of National Parks and Nature Reserves in which they enjoy full protection, supplemented by legal protection throughout the country of species which are especially vulnerable.

Currently, apart from the inadequate size of existing protected areas, both individually and in aggregate, they also fail to provide representative coverage of several important biota, including the northern temperate forests, the evergreen dipterocarp forests of Tenasserim, and the coastal areas including the Irrawaddy Delta and the Mergui Archipelago with its coral reefs.

Under existing legislation, which dates from the pre-World War II colonial era, the fauna in wildlife sanctuaries is protected but the habitat is not, with the result that many areas and species have become seriously damaged and threatened.

#### 4.5. Urgent Priorities

The previous section gives a brief description of threatened wildlife species in Burma, according to the IUCN Red Data Books and CITES I & II. From the available information, it is clear that the most urgent priorities are the conservation of specific species such as elephant, marine turtles, and saltwater crocodiles.

##### 4.5.1. Elephant (*Elaphas maximus*)

The elephant is of major economic importance to Burma for extraction of teak and other hardwoods, which are one of the country's main sources of foreign exchange. There are approximately 5,400 captive elephants in Burma, (the figure has now gone up to 6,000), most of which are employed in the timber industry. However, the annual reproductive rate among timber elephants is only about 5.3 per 100 breeding females, which, allowing for mortality, is insufficient to maintain this population without influx from the wild. Consequently, it is necessary to continue the capture of wild elephants at an average rate of about 120 per year.

Estimates of the wild elephant population in Burma range from 3,000 to 6,000, but observations in the limited areas, covered so far by surveys (John Blower) indicate that the lower figure is probably the more realistic. Mortality in capture operations is officially admitted to be about 20%, and may even be higher. There is also a significant amount of illegal capture and smuggling of elephants to Thailand, and also poaching for ivory (38 animals are known to have been successfully smuggled to Thailand in recent months and a further 11 were intercepted en route and confiscated). Therefore, while it is not yet possible to give any reasonable accurate estimate of actual numbers, it is certain that the overall annual catch from legal and illegal capture and poaching is appreciable.

In nearly all the areas so far surveyed the elephant population has been found to be appreciably lower than previous official estimates. It is therefore reasonable to assume that the overall population is also considerably lower than the official figure of about 6,000, and that with continuing catch, known and unknown, numbers are steadily declining.

#### 4.5.2. Marine Turtles

The five species of marine turtles reportedly occurring in Burmese coastal waters are as follows:

- Green Turtle (*Chelonia mydas*)
- Olive Ridley (*Lepidochelys olivacea*)
- Loggerhead (*Caretta caretta*)
- Hawksbill (*Eretmochelys imbricata*)
- Leatherback (*Dermochelys coriacea*)

Past records show that at the beginning of this century, 1.5 to 2 million eggs a year were being harvested from Thamihla Kyun (the most important turtle nesting island off the mouth of the Bassein river). The annual average catch today is only about 150,000, a 90% reduction (Blower, 1984). Many former nesting beaches are no longer visited by any turtles. Apart from egg collection, mature turtles are taken by fishermen, reportedly including the Fisheries Corporation trawlers, which catch them in their nets. Hawksbill turtles are subject to additional mortality through capture for their shells, which are made into combs and other ornamental objects that are sold locally. The price of raw shell to artisans in Rangoon is reportedly 1000-2000 kyats per viss (US\$ 75-150 per kg). In addition to "tortoise-shell" worked locally, an estimated total 1600 kg of raw tortoise shell was exported from Burma during 1977-78 (Mack et.al, 1981, cited in Salter, 1983, P.50). This represents a minimum of 440 and perhaps as many as 2,350 turtles.

From the enormous reduction in the number of eggs collected from Thamihla Kyun and elsewhere and the fact that many of the formerly well known nesting beaches are now unused, it is clear that turtle populations have declined markedly and that two species, the leatherback and the hawksbill, are endangered while the other three species must be considered seriously threatened. Leatherbacks are so rare that their occurrence should perhaps be considered accidental.

Under the Fisheries Act (1905) rights to collect turtle eggs from specified area can be leased or granted by the Government; conversely, collection of eggs from specified areas can also be prohibited. The turtles nesting on Thamihla Kyun and in the Moscos Islands also come under the provisions of the Burma Wild Life Protection Act (1936) as both of these areas are legally notified wildlife sanctuaries. The law is obviously not being enforced in either place, however, as virtually all eggs are collected. Similarly, hatching programs are not very effective as mortality of eggs and hatchlings is high.

#### 4.5.3. Saltwater Crocodile (*Crocodylus porosus*)

Formerly widely distributed in estuaries and tidal swamps of Arakan, the Irrawaddy Delta and Tenasserim, crocodiles have been heavily hunted for skins and are now very seldom seen. Another major factor in their decline has been the loss of habitat due to extensive clearing of mangroves for rice cultivation. There are, however, apparently still viable populations in the Irrawaddy Delta where the FC collects an average of about 500 hatchlings a year for their crocodile farm in Rangoon. Also, there are still possible viable populations in less disturbed coastal areas of Arakan and Tenasserim where there are still extensive areas of suitable habitat among the tidal creeks and mangrove swamps.

The FC has proposed that Meinmahla Kyun, an estuarine island about 130 km<sup>2</sup> in area in the Irrawaddy Delta, be declared a sanctuary for this species. The crocodile population is, however, very small with no sign of breeding. Restocking from the crocodile farm will therefore probably be necessary.

It is not known how many crocodiles are left in the wilds of Burma. Caughley's report in 1980, estimated about 4000 including at least 4 different species. There has been no subsequent survey in 1987, only one species has been identified, the *Crocodylus porosus*, which is also being bred at the Government's Rangoon Crocodile Farm.

#### The Rangoon Crocodile Farm

The Rangoon Crocodile Farm, opened in 1978, now has a 1000 crocodiles. Most of these were produced on the farm at a rate of 300-400 crocodiles per year. Only a few crocodile hatchlings are bought from private sources.

At present, there are 37 employees at the farm. Only 3 of these have some technical expertise, and are graduates of the Zoology department of Rangoon University. All other staff are engaged in office work, feeding, cleaning, handling, etc. The assistant manager of the farm is a woman.

Lack of consistent incubation facilities and lack of constant thermostatically controlled temperature leads to a high loss of eggs and reptiles.

At present, the farm has no incubation facilities, and they are using some chicken incubators for the very young, who suffer most from heat loss. In the breeding pond (holding 81 mature crocodiles,

ratio 3 females to 1 male), they try to recreate semi-natural habitat. The eggs are kept in natural nests built by the animals and improved upon by the workers. Plastic sheeting is used to cover the nests for extra warmth. The temperature of each nest is taken each day. Each breeding female produces 20-70 eggs once a year in the breeding season. Only 50% of these eggs hatch. The incubation period is about 90 days.

Of the 50% eggs that hatch, only 75% will make it to a mature size animal of 5 ft. That means, that this year, they have 800 eggs in 18 nests. Only 400 of these will hatch successfully. Only 300 of these will make it to 5 ft. It takes about 5 years for a crocodile to grow 5 ft. long, growing at an average rate of a foot a year. The newly hatched crocodile is about 10-11 inches long.

The mortality is highest after hatching, during the first year after birth. The main reasons for this are inadequate temperature regulation, inadequate feed, lack of basic medicines, no veterinary specialist on the staff at the farm, etc.

Another major problem is the transport and shipment of the mature crocodiles, in other words, marketing. Due to the Buddhist philosophy, the farm prefers to ship the crocodiles out live to the respective markets, the biggest of which is Singapore. The week before the field trip to the farm in July, 200 crocodiles were shipped out to Singapore. They are packed live in large wooden boxes and handed over to the Singapore authorities at the airport/dock. Once delivered, the responsibility of the farm ends and the Singapore authorities are responsible for their well-being. It is hence not known whether there is any mortality or stress to the animals during transportation.

At present, the farm/FC receive US\$ 120 per live crocodile, about 5 ft. in size. This is roughly equivalent to K 840. The main market is Singapore, which acts as a kind of broker in South and Southeast Asia.

The FC realizes that this is not a very profitable market for their animals, but are unable to explore alternative marketing channels due to the CITES regulations. Apparently, CITES requires proof that marketing of any species is carried out only when the country/ organization in charge can prove that its marketing is not going to further endanger the species. This is a problematic justification for Burma in the case of the crocodile, not only because it is assumed to be endangered, but also because there is no reliable data available to disprove it.

It may be more profitable to market the skin and parts of the crocodile separately. However, this will require processing the crocodiles here in Burma. The farm and FC are experimenting with 3 crocodiles to explore this avenue. 3 crocodiles have been sent to the tanning department of Industry I or II on an experimental basis to see if they can be successful and if this practice may be more cost-effective in the long run.

Plans are still under way for making Meinmahla Kyun a sanctuary for crocodiles. (See Appendix B for short description of Meinmahla Kyun.) However, this has not yet materialized since there has been some changes in management. Hence, at present, there is no protection for the crocodile, except incidentally in Reserved areas. Making Meinmahla Kyun a sanctuary will require coordination with the Forestry Department.

Should a sanctuary be made for the crocodile, the farm will be an excellent source which can be used to restock the depleted wild. It is therefore crucial that funds are available to keep the farm going.

#### 4.5.4. General

Measures now required to maintain viable populations of individual species of flora and fauna in Burma can be summarized as follows:

1. Protection of wildlife communities and habitat through constitution and protection of appropriate National parks, Nature Reserves and Wildlife Sanctuaries, and through implementation of a coordinated forestry and agricultural development policy that takes into account wildlife and habitat management needs.
2. Formulation and enforcement of new legislation to protect economically important and/or threatened wildlife species. This should include provision for adequate controls on international trade, and eventual signature of CITES.
3. Development of a research and management capability, to gather information on and monitor wildlife populations and habitats.
4. Immediate development of management plans for economically important threatened species. The most pressing need is for rational management (which can include sustained yield exploitation) of elephant, marine turtle and crocodile

populations. Under present levels of exploitation there is the very real possibility that local or even national populations of these and others threatened species will be lost.

#### 4.6. Institutions, Staff and Training

The Forest Department is responsible for Wildlife Protection in Burma, and the Wildlife Protection Act (1936) was developed from the Forest Act (1902). U Saw Han, the Deputy Director General of the Forest Department is also the head of the Wildlife Protection Division. There is no special distinction made for wildlife protection, and consequently the division is subject to the same staffing and other constraints, as well as training procedures as the rest of the Forest Department. (see Section 2.7 in Forests for details).

#### 4.7. Role of Women

No special role of women can be observed in relation to wildlife in Burma, other than women staff employed by the Forest Department Wildlife Protection Division, and the projects related to this issue, most notably the NCNP Project. In many of the wildlife sanctuaries, women are almost exclusively employed as veterinarians and in environmental education centers. This could be further encouraged and training provided.

V. AGRICULTURE

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Agriculture programs in Burma cannot be covered adequately in the present study as the subject is too vast. Some mention has been made throughout of how the agriculture sector effects and is effected by other activities which fall under other sectors, with the overall effect that the biological diversity is both positively and negatively influenced. Two examples to note are, first, the destruction of the mangrove forests in the delta due to the extensive use of the area for rice cultivation. The other is the degradation of forests and forest land by the shifting cultivators in the hills. The crop diversification program in the plains is attempting to introduce a variety of crops suitable for the dry zone, such as wheat, maize, sorghum, sesamum, groundnut, sunflower, cotton, etc., in order to use the land to its maximum advantage, and also to minimize the degradation of the area by local inhabitants.

Four areas of particular interest have been selected, which fall under the agriculture sector, and on which some information was available.

### 5.1. Shifting Cultivation

Shifting Cultivation is practiced all over the tropical world. To some of the families involved it is a tradition, a way of life which they have been accustomed to for generations and which has so far provided them with basic needs. For others, it is a relatively new experience and to many of the families in this group the only remaining alternative to survival is to grow their own food in the forest.

To the forester shifting cultivation means poor land use and deforestation. In Asia-Pacific region some 73 million hectares are classified as forest fallows, which is the term used for areas derived from clearing by shifting cultivation (FAO, 1986). Almost all of the countries in the region mention shifting cultivation as the main reason for deforestation.

Shifting cultivation is, however, not an isolated phenomenon causing deforestation. It represents the whole way of life of the communities depending upon it. There is therefore a need to study all aspects - technical, social-cultural, economic - in order to find alternatives which are compatible with the way of life and acceptable economically.

In Burma, though there is no accurate data on extent of use of shifting cultivation, it is commonly regarded as the major source of deforestation. According to an FAO/UNDP estimate (1981) at least 27% of the forest area in Burma is affected by shifting cultivation.

According to both the Forest Department and the Agriculture Corporation, this problem of shifting cultivation is considered acute, especially in the hilly areas of northern Burma.

Limited practice of shifting cultivation is recognized under the Forest Act (1902), as specified under section 10 Sub-section(2):

"The practice of shifting cultivation shall be deemed a privilege subject to control, restriction and abolition by the President of the Union, without payment of compensation and unless otherwise expressly permitted in the notification issued under section 18 (which specifies the boundaries of reserved areas), such cultivation shall be practiced only by the person to whom such permission is granted".

In practice, the Forest Department and Agriculture Corporation staff find that the people in hilly areas are carrying on more or less indiscriminately with shifting cultivation, mainly due to their basic need for food, and also because of the shortage and unwillingness of staff to restrict them.

The Agriculture Corporation has introduced a program of terraced farming in selected areas of Burma, to contain the practice of shifting cultivation and change the traditional habit of hill people. As yet, however, the area covered by this program is very small compared to the magnitude of the problem. Table 5.1. below shows the investment in terraced farming and area developed in selected areas of Burma.

Table 5.1. Investment in Terraced Farming and Developed Area

State & Division	Investment (Ks. 1000)	Developed area (in acres)	Duration of Program
KAYA	53	199	2 yrs.
CHIN	918	2409	16 yrs
SAGAING	351	781	10 yrs
MANDALAY	45	58	2 yrs
SHAN	636	1737	9 yrs
<b>TOTAL</b>	<b>2003</b>	<b>5184</b>	-

Source: Agriculture Corporation, 1987

In the Chin State and northern Sagaing hills, as much as 80% of the land area is used for shifting cultivation, using slash and burn technique to claim forest land. In Shan and Kaya States, the percentage is considerably lower, at approximately 20%.

The main problem with the terraced farming, according to Agriculture Corporation Extension Division is the non-mechanization of the operations. All terraces have to be made manually and this takes a lot of time and labor. On average, a farming household is able to dig and terrace 1 acre of land per year. While the plot is being prepared, the household carries on with the old practice of slash and burn. Another factor that delays the progress is that the top soil is lost when terracing the slopes. As the sub-soil is not so rich in nutrients, and under the program no provision is made for the supply of rich black soil or fertilizer, the farmers have to wait for a few years to allow the soil to regain its nutrients.

Extension agents of the AC are carrying out an education program for the farmers in shifting cultivation areas, with courses on soil conservation, soil erosion, soil fertility, conservation issues, etc. It is not clear what the attendance to these is, but it has been observed that no women ever attend these education classes.

As part of the terraced farming program, when the degree of slope is too steep for terracing, the AC is encouraging the planting of coffee and fruit trees to reclaim degraded land and stop erosion.

## 5.2. Claiming of Mangrove Forests for Rice Cultivation

It has been observed that over the delta area of Burma, mangrove forests have gradually been cut down and destroyed to prepare the land for rice cultivation. Rice cultivation in Burma has had a very high priority and 3.3 million acres in the delta are currently used. Despite this massive effort, Burma's total production of rice is declining and though Burma is still self-sufficient in rice, the total amount available for export has been substantially reduced in recent years.

The expansion of rice cultivation in the delta has had a devastating effect on the mangroves. Also according to Caughley (1980), it will result in the elimination of crocodiles from these areas because:

1. Their nesting habitat will be destroyed.

2. The supply of nutrients to the rivers and the recycling of those nutrients, currently mediated by the mangroves, will be cut off. The effect will be to reduce the number of fish and prawns in the rivers and hence reduce the food available to crocodiles.
3. The mangroves are necessary as breeding areas for fish and prawns. Removal of mangroves directly, or indirectly by changing the tidal regime, will inevitably reduce breeding of these species. This again will reduce the food available to crocodiles.

The last two effects have implications beyond crocodiles. The key to the ecology of the Delta's biological system is the mangrove forests. If these are interfered with the long-term consequence is likely to be a marked drop in the catch of fish and prawns. Since the Delta people's life is based largely on fishing, and the economy of Burma is dependent partly on yield of prawns and fish, the long-term economic and social consequences of this scheme may well be detrimental.

Any attempt to raise the yield of carbohydrate (rice) from the Delta is liable to be at the expense of the present high yield of protein (fish and prawns). That equation should be considered carefully to ensure that if Burma is to gain a horse it does not give an elephant in exchange.

In the last few years, two policies have been established to check this devastating trend. Firstly, the foreign exchange from the sale of teak has risen substantially, reducing the emphasis on rice sales. At the same time increased harvesting of teak has placed increasing pressure on the natural forest thus creating a corollary problem. Secondly, Chairman U Ne Win has expressed some concern over the plight of the mangroves, possibly because his son-in-law is the newly appointed Director General of the Fisheries Corporation. The Chairman has issued orders to control their destruction. This may have been triggered by the relative advantage of harvesting prawn and shrimp from the delta land at 5,000-10,000 kyats per acre compared with rice which fetches a meager 600 kyats per acre.

Burma could well gain foreign exchange worth US\$ 1,500 per hectare of paddy land, harvesting a very modest 150 kg of shrimp per hectare. With very little extra care, e.g., pumping water in and keeping predators out, the total yield could easily go up to 400 Kg

of shrimp per hectare. Such a program could also be very useful for women's participation by generating employment and training for women in brackishwater prawn/shrimp culture related activities.

### 5.3. Orchids

There is a long history of over exploitation of orchids, popular as house plants and exported to dealers in Bangkok, Singapore and elsewhere in considerable quantities. As a result, orchids are collected from forests throughout the country, including Forest Reserves, and of course the rarer the species the more they are sought after. Of the 523 orchid species known to occur in Burma, two, *Ranthera inschootiana* and *Vanda coerulea* are listed in CITES Appendix I. (FAO/UNDP, NCNP Interim Report, 1983, P.89). There is, however, no up to date information either on their status, or on that of other Burmese species. It can be assumed however, that with rapid deforestation, wild species of orchids are also depleting.

The Agriculture Corporation has opened an orchid nursery in Mingaladon (just outside Rangoon) and another one in Fallam, Chin State, in order to conserve and develop orchid species of Burma. Most of the wild orchid species in Burma are found in Chin, Kachin and Shan States.

The Mingaladon Nursery, 20 acres in size, was started in 1967 under the Timber Corporation. At that time, its main purpose was the collection of wild orchids. In 1983, the nursery changed over to the Agriculture Corporation and an orchid lab was established for ovu-culture, tissue-culture and the development of hybrid orchids from the wild forest species. The Fallam Nursery opened in 1957, is only 1.5 acres in size.

The main objective of the Mingaladon Orchid Farm is to develop orchid flowers for local use. The species of orchid cultivated in Mingaladon Nursery are given in Table 7 Appendix A, and include the two mentioned above which are classified as threatened with extinction by CITES I. The sale of hybrid seedlings is also encouraged. Some efforts are being made to export the wild and hybrid species, but the AC is finding this very difficult due to lack of knowledge an international marketing channels, and also due to the tough competition provided by Thailand.

Should the orchid farm expand, it is a promising area for the participation of women. Currently, almost half the staff employed at the farm are women. The educational level of orchid farm staff is 10 B.Sc. graduates in Agriculture, 1 B.Sc. Botany and 1 B.Sc. Chemistry. Of these, 5 B.Sc. Agriculture and 1 B.Sc. Botany are women.

#### 5.4. Plants for Indigenous Medicine

Burma's flora is assumed to consist of nearly 7000 species, though this cannot be verified. There is also a long history of over exploitation of medicinal plants which are widely used in Burmese and Chinese medicine.

According to the FAO/UNDP, NCNP Project Interim Report (1983), "commercially valuable species such as Limonia acidissima (thana'ka), Aquilaria agallocha (akyaw or "eagle wood") and Santalum album (sandalwood) are becoming increasing rare through over-exploitation".

A few years ago, the Agriculture Corporation started a nationwide program to use plants for indigenous medicine. Under the program, 22 existing seed farms and nurseries have introduced plants with medicinal value. Of these, the farm in Pa'an, which is the largest, concentrates only on "medicinal" plants. In all other farms, the plants are mixed with other horticultural crops. Some of the largest farms are located at Maymyo, Karen State, Pa'an, Thandaung, Mon State, Irrawaddy Division and Rangoon. The demonstration center in Rangoon is over 20 years old and contains at least 200 species. Some of the 22 farms are very small and contain only 1 or 2 species.

The main objective of the program is to provide indigenous medicine for local use, and some for export, mainly to China. Until recently, Burma was importing important spices, such as cloves, nutmeg and black pepper. But under the program a sufficient quantity of these can be grown locally.

The training center at Hlegu provides training for all field crops, including medicinal plants. U Sein Hla Bo, Assistant General Manager (Horticulture) is in charge of the program and has been trained in Japan. Additionally, three other staff have received short-term training in India and Indonesia. Relatively few of the staff under this program are women, though they are obvious users of the products, especially thana'ka.

**VI. RECOMMENDATIONS**

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It would be beyond the scope of this report to make specific, technical recommendations for the preservation of biological diversity in Burma. Therefore four broad areas are proposed forests, fisheries, wildlife and agriculture that merit AID support. Those areas where women's role would be particularly enhanced are identified. The recommendations presented below give AID the option of selecting and designing in-depth proposals for relatively small-scale participation.

### 6.1. Forests

1. Training for the Forest Department staff in the following areas: extension services management, conservation education, data gathering and documentation, land-use planning, community participation in environmental maintenance. Women would be equally suitable as men for all of the above training courses.
2. Data gathering on tree types and location, deforestation and its causes, impact of community activity on environment, land-use pattern, use of fuelwood, energy-use in the home, potential role of extension agents. It goes without saying that gender issues should be included in all data gathering, as well as the data should be gender-specific.
3. Conservation education for extension agents, Forest Department staff including staff at the village council level, and for the community at large.
4. Material and guidelines on development of forest legislation as well as on management and enforcement of laws.
5. Pilot agroforestry programs in selected area, such as the Alanndaw Kathapa National Park, which will be the first National Park of Burma and contains in its vicinity a few villages. The park is thus ideally suited for a small-scale pilot scheme.
6. Special attention to women's role in forests such as: use of forest resources, socio-economic constraints, time and energy spent in firewood collection, participation in Forest Department activities such as nurseries, environmental education, research, data collection, and training.

## 6.2. Fisheries

1. Training for staff at Fisheries Corporation and Department of Fisheries networks in the following areas: aquaculture, handling of post larvae and juveniles of prawn and shrimp before harvesting, quality control, extension services management, technology transfer, data collection and documentation.
2. Conservation and development of threatened species such as marine turtle, saltwater crocodile and giant freshwater prawn.
3. Training in international marketing and information on marketing channels, especially for use by the Rangoon Crocodile Farm.
4. Assistance in data collection and documentation, especially offshore biomass surveys on variety and location of fish. This may be best accomplished if Burma joins the BOBP Program.
5. Brackish water prawn culture in the delta area, especially in paddy fields that have high saline content. The economic gains of substituting the harvesting of prawns for rice per acre are extremely high.
6. Modernization and mechanization of fishing equipment of private artisanal fisherfolk. Same sort of credit scheme could be set-up for this through the Village Councils.
7. Role of women in fisheries: at the community level, fisherwomen and their access to fishing gear and markets, processing of fish for sale, time-use patterns of fisherwomen; at the staffing level, aquaculture, research, data processing, quality control, new product development e.g. fish feed, extension services, etc.

## 6.3. Wildlife

1. Management plans for economically important threatened species.
2. Material and training in conservation, development and capture/ collection of threatened species such as elephant, crocodile, turtle, orchid, etc.
3. Material and training in development of wildlife legislation and its enforcement by extension agents, forest rangers, etc.

4. Upgrading of research and management capabilities of wildlife division, paying special consideration to wildlife habitat management needs.
5. Training and recruitment of women in research, data collection and compilation, as veterinarians in wildlife sanctuaries and national parks, and as trainers in environmental education centers.

#### 6.4. Agriculture

1. Upgrading and expansion of activities at Mingaladon Orchid Farm, especially in the lab, for research and data collection, hybrid species development, and marketing channels. These activities could be specifically designed around women's participation, as women are already carrying them out in the limited capacity to which the activities presently exist.
2. Agroforestry programs to encourage terraced farming, environmental conservation, land-use planning, and for new employment and income-earning opportunities. The direct involvement of women in the design and implementation of such programs is critical, as is the need to remember the role of women as primary users of forest/agriculture resources, as forest/land conservators and managers, and as income earners/users in the home.