

THREATENED PROTECTED AREAS OF THE WORLD

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THREATENED PROTECTED AREAS OF THE WORLD

Commission on National Parks and Protected Areas
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APPENDIX I

Summary Description of Threats to Other Sites Considered for Inclusion on the IUCN List of Threatened Protected Areas

1. AFROTROPICAL REALM

Djoudj National Park, Senegal
Mt. Nimba Strict Nature Reserve, Ivory Coast/Guinea/Liberia
Simien Mt. National Park, Ethiopia
Boma National Park, Sudan
Gorongosa National Park, Mozambique
Ouadi Rime/Achim Reserves de Faune, Chad
Central Kalahari Game Reserve, Botswana
Mkomazi Game Reserve, Tanzania
Lochinvar and Blue Lagoon National Parks, Zambia
Foret du Day National Park, Djibouti

2. INDOMALAYAN REALM

Thung Yai and Huai Kha Khaeng Wildlife Sanctuaries, Thailand
Klias National Park, Malaysia (Sabah)
Manas Wildlife Sanctuary, Bhutan and Manas Tiger Reserve, India
Silent Valley National Park, India
Gir National Park, India
Kerinci-Seblat National Park, Indonesia

3. AUSTRALIAN REALM

4. NEOTROPICAL REALM

La Amistad/Talamanca National Park, Costa Rica
Rio Platano Biosphere Reserve/World Heritage Site, Honduras
Corcovado National Park, Costa Rica
The Park System of Bolivia
Kaieteur National Park, Guyana
Laguna de Tacarigua National Park, Venezuela
Amazonia National Park, Brazil
Rio Trombetas Biological Reserve, Brazil
Darien National Park, Panama
Montego Bay Marine Park, Jamaica

5. NEARCTIC REALM

Wrangell/St. Elias National Park, USA
St. Matthew Island Natural Wildlife Refuge, USA
Indiana Dunes National Lakeshore, Cuyahoga Valley
National Recreation Area, USA
Wood Buffalo National Park, Canada

6. PALAEARCTIC REALM

Vanoise National Park, France

APPENDIX II

Data Sheets for the World's Twelve Most Threatened Protected Areas

A. INTRODUCTION

"It is during its second century that the (parks) movement will encounter the full force of pressing rival claims to lands, of direct dangers through pollution, of degradation through overuse by a too mobile and interested population, and of aggravated management problems as parks become more isolated from the wild country".

Max Nicholson, Second World Conference on National Parks, 1972.

"In case after case, what once appeared securely protected is increasingly beset by a litany of threats from within and without. The litany is long and growing, as human demands for commodities and the impacts of population growth, technology, and changing human value systems create challenges for protected area administrators and for human society itself which would have been unimaginable even a few years ago".

Wm. Gregg, International Symposium, on the Biosphere, 1984.

Today, no protected area in the world is immune from threats to its integrity. A wide range of stresses, both from external sources (e.g. upstream pollution, civil unrest), and internal sources (inappropriate management, human disturbances), are affecting the natural values for which many areas were established. With over 3,000 protected areas on the 1984 UN List of National Parks and Protected Areas, it is a demanding task to monitor the stewardship of the world's protected areas and to determine the nature and causes of these stresses, where they are most severe, and what corrective actions could be taken.

As stated in the Bali Action Plan (Activity 3.4), IUCN will prepare on an annual basis, a List of the World's Most Threatened Protected Areas. The intent of the exercise is to create public awareness of the various dangers that confront protected areas in all areas of the world and to marshal support for retaining or regaining the integrity of the area.

The reasons for compiling the list are: (1) to raise public awareness and funds for improved conservation practices; (2) to focus efforts on priority areas; and (3) to institute a reporting system to gauge progress. It is suggested that the list and a report of progress be presented at 3-yearly intervals rather than annually, as the effect of corrective programmes of action cannot be judged within a single year. A follow-up progress report would then be issued at the 1987 IUCN General Assembly.

B. THREATS TO THE WORLD'S PROTECTED AREAS

On the basis of submissions from members and from the Conservation Monitoring Centre (CMC), and a review of files and literature on protected areas

currently under threat, an indicative list of 43 sites has been compiled. From information available to IUCN by October 1984, a wide range of causal factors were identified. No threats were reported from protected areas in the Oceanian or Antarctic Realms and none were identified in the eastern section of the Palaearctic. It is acknowledged that this first attempt at compilation is incomplete and that a continuing effort to maintain a register of areas will be required.

In total, 113 threats were reported from the 43 sites. These are classified in 13 categories on Table 1. Many areas are subject to more than one threat. The Table also points out the relative importance of different threats in the different realms.

It is evident that many threats to protected areas are obvious while others are hard to detect or measure. In many cases the appropriate remedial action may not be feasible, or perhaps it is unknown. Even where solutions are apparent they may be difficult to achieve due to political, administrative or fiscal constraints. Further, throughout the world, existing laws are proving inadequate to address a broad range of new environmental threats which result from regional influences which often transcend national boundaries. In particular, inappropriate regional land uses and acid deposition are adversely affecting many protected areas.

C. CRITERIA FOR EVALUATING THE "MOST THREATENED" SITES

Although it is intended to keep a "running register" of all protected areas under serious threat, a condensed list of 12 has been selected as a representative "short list". The list has a wide geographical spread and includes areas which are symptomatic of the different categories of threats outlined in Table 1.

The selection of the final 12 sites involved the following screening process: (1) all CNPPA Realm Vice-Chairmen were asked to rate the most threatened areas in their Realm; following which (2) a final selection panel consisting of CNPPA Chairman, Executive Officer, and five Secretariat staff including WWF decided the composition of the final list. The List is an arbitrary one and is a composite assessment made on the basis of the following six criteria:

- a) Documentation - sites without adequate information on the precise nature of the dangers and what to do to relieve them will not be considered.

TABLE 1: SUMMARY OF THREAT CATEGORIES BY REALM

Threat Category	Realm (No. of areas reporting threat)						Total 43
	Afrotropical (13 areas)	Indonesia (8 areas)	Australian (1 area)	Neotropical (13 areas)	Nearctic (5 areas)	Palaeartic (3 areas)	
Inadequate management resources	6	7	-	3	-	-	16
Human encroachment	4	5	-	4	-	-	13
Change in water regime or hydro development	2	4	-	3	1	2	12
Poaching	5	1	-	4	-	-	10
Adjacent land development	3	1	-	4	2	-	10
Inappropriate internal development (e.g. roads)	1	2	1	4	-	1	9
Mining/prospecting	4	1	-	4	-	-	9
Livestock conflicts	4	1	-	4	-	-	9
Military activities	5	2	-	1	-	-	8
Forestry activities	3	3	-	1	-	-	7
Acid deposition/pollution	-	-	-	-	2	2	4
Degazettement/downgrading	-	2	-	-	2	-	4
Exotic species invasions	-	-	-	1	-	-	1
Total:	37	29	1	33	7	5	110

- b) Conservation value - what is the relative value of the area in relation to other comparable areas? (World Heritage sites and other areas with high diversity are given higher ratings).
- c) Imminence - what is the imminence or the real prospect of the threat? (Longer term or suspected potential threats will be of less urgency than ascertained dangers).
- d) Severity - how significant is the threat? (Sites with more than one threat and sites where large areas and several species will be affected will be rated high).
- e) Practicability - how amenable to corrective action is the threat? (Cases where the "end point" has passed or where there is no practicable solution will assume lesser attention. Also considered here is the receptivity of government and expected local support).
- f) Need for international support (including financial or moral means) - has this been granted in the past?, is additional support warranted?, are other conservation organizations involved?

D. RATING OF SITES

Based on these six criteria, all 43 sites on the indicative threatened list are rated in Table 2. From this list the highest ratings of threatened protected areas by realm are:

<u>Realm</u>	<u>Site</u>	<u>Location</u>	<u>Rating</u>
Afrotropical -	Garamba National Park,	Zaire	(13)
	Tai National Park,	Ivory Coast	(13)
	Ngorongoro Conservation Area,	Tanzania	(13)
Australian -	Cape Tribulation National Park,	Australia	(14)
Indomalayan -	Mt. Apo National Park,	Philippines	(14)
	Kutai Game Reserve,	Indonesia	(14)
Nearctic -	Pennecamp Coral Reef State Park/ Key Largo National Marine Sanctuary,	USA	(13)
Neotropical -	Manu National Park,	Peru	(15)
	Juan Fernandez National Park,	Chile	(15)
	Araguia National Park,	Brazil	(14)
Palaeartic -	Durmitor National Park,	Yugoslavia	(14)
	Krkonoše National Park,	Czechoslovakia	(13)

TABLE 2: RATING OF INDICATIVE LIST OF THREATENED PROTECTED AREAS

Realm and Site	Location	Documentation (A=adequate or I=insufficient)	Conservation value (1-3)	Imminence of Threat (1-3)	Severity of Threat (1-3)	Practicability of action (1-3)	Need for inter- national support (1-3)	Total (Max. 15)
<u>A. Afrotropical</u>								
Garamba NP	Zaire	A	3	3	2	2	3	13
Djoudj NP	Senegal	A	3	1	2	2	3	11
Ngorongoro CA	Tanzania	A	3	2	2	3	3	13
Tai NP	Ivory Coast	A	3	3	3	1	3	13
Mt. Nimba SNR	Ivory Coast/ Guinea/Liberia	A	3	3	2	1	2	11
<u>Lochinvar/Blue</u>								
Lagoon NPs	Zambia	A	2	2	2	2	2	10
Mkomazi GR	Tanzania	A	2	1	3	1	2	9
Kalahari GR	Botswana	A	2	2	2	2	2	10
Foret du Day NP	Djibouti	A	2	2	2	1	1	8
Simen NP	Ethiopia	I	-	-	-	-	-	-
Ouadi Rime/Achim	Chad	I	-	-	-	-	-	-
Gorongosa NP	Mozambique	I	-	-	-	-	-	-
<u>B. Australian</u>								
Cape Tribulation NP	Australia	A	3	3	3	2	3	14
<u>C. Indomalayan</u>								
Mt. Apo NP	Philippines	A	3	3	3	2	3	14
Kutai NP	Indonesia	A	3	3	3	2	3	14
Manas TR	India/Bhutan	A	3	1	2	2	3	11
Gir NP	India	A	2	1	2	2	2	9
Silent Valley	India	A	3	1	2	3	2	11
<u>Thung Yai/Huai</u>								
Kha Khueng WS,	Thailand	A	3	2	2	2	3	12
Kerinci-Seblat NP	Indonesia	A	3	2	2	2	2	11
Klais NP	Malaysia	I	-	-	-	-	-	-

TABLE 2: RATING OF INDICATIVE LIST OF THREATENED PROTECTED AREAS (Continued)

Realm and Site	Location	Documentation (adequate or insufficient)	Conservation value (1-3)	Imminence of Threat (1-3)	Severity of Threat (1-3)	Practicability of action (1-3)	Need for inter- national support (1-3)	Total (Max.15)
<u>D. Nearctic</u>								
Pennecamp/Key Largo NMS	USA	A	3	3	3	3	1	13
Wrangell/St. Elias NP	USA	A	3	1	1	2	1	8
Cuyahoga/Indiana Dunes NRA	USA	A	1	1	2	2	1	7
Wood Buffalo NP	Canada	A	3	1	2	2	1	9
St. Matthews NWR	USA	I	-	-	-	-	-	-
<u>E. Neotropical</u>								
Manu NP	Peru	A	3	3	3	3	3	15
La Amistad NP,	Costa Rica	A	3	2	2	3	3	13
Rio Platano BR,	Honduras	A	3	2	2	2	2	11
Corcovado NP	Costa Rica	A	3	3	2	2	3	13
Darien NP	Panama	A	3	2	2	2	3	12
Araguia NP	Brazil	A	3	3	3	2	3	14
Amazonia NP	Brazil	A	3	2	2	2	3	12
Rio Trombetas BR	Brazil	A	2	2	2	2	2	10
Juan Fernandez	Chile	A	3	3	3	3	3	15
Montego Bay MP	Jamaica	A	2	3	2	3	3	13
Bolivia NPs	Bolivia	I	-	-	-	-	-	-
Kaieteur NP	Guyana	I	-	-	-	-	-	-
Laguna Tacarigua NP	Venezuela	I	-	-	-	-	-	-
<u>F. Palaearctic</u>								
Durmitor NP	Yugoslavia	A	3	2	3	3	3	14
Krkonoše NP	Czechoslovakia	A	2	3	3	2	3	13
Vanoise NP	France	A	2	2	2	1	2	9

THREATENED PROTECTED AREAS OF THE WORLD

PALAEARCTIC REALM

- 19. KRKONÖSE
- 20. Vanoise
- 21. DURMITOR

KEY

△ **MANU** Twelve most threatened areas

● **Darlen** Other threatened areas



NEARCTIC REALM

- 1. St Matthew Is
- 2. Wrangell/St Elias
- 3. Wood Buffalo
- 4. Indiana Dunes
- 5. JOHN PENNECAMP/KEY LARGO

NEOTROPICAL REALM

- 6. Montego Bay
- 7. Rio Platano
- 8. La Amistad/Talamanca
- 9. Corcovado
- 10. Darien
- 11. Laguna de Tarcarigua
- 12. Kaletour
- 13. Rio Trombetas
- 14. Amazonia
- 15. **MANU**
- 16. **ARAGUAIA**
- 17. Bolivia
- 18. **JUAN FERNANDEZ**

AFROTROPICAL REALM

- 22. Ouadi Rimé/Ouadi Achim
- 23. Djoudj
- 24. Mt Nimba
- 25. **TAI**
- 26. Simen
- 27. Forêt du Day
- 28. Boma
- 29. **GARAMBA**
- 30. **NGORONGORO**
- 31. Mkomazi
- 32. Lochinvar/Blue Lagoon
- 33. Central Kalahari
- 34. Gorongosa

INDOMALAYAN REALM

- 35. Gir
- 36. Silent Valley
- 37. Manas
- 38. Thung Yai/Huai Kha Khaeng
- 39. Kerinci-Seblat
- 40. Kilas
- 41. **Mt APO**
- 42. **KUTAI**

AUSTRALIAN REALM

- 43. **CAPE TRIBULATION**

E. SUMMARY DESCRIPTION OF THE WORLD'S 12 MOST THREATENED PROTECTED AREAS

A short status report of the 12 areas chosen to represent the threats to the world's protected areas is given below. A full data sheet for each area is given in Appendix II. Appendix I provides a similar status statement for the other 31 areas considered.

Garamba National Park, Zaire

In November 1984, at the World Heritage Committee meeting in Buenos Aires, this area is expected to become the first natural site to be placed on the List of World Heritage in Danger. This has been at the request of the Zaire Government with the evaluation done by IUCN and approved by the World Heritage Bureau. A full conservation status report has been completed with a detailed outline of corrective measures now underway through a joint IUCN/WWF/Frankfurt Zoological Society/World Heritage 3-year project totalling US \$550,000. The basic threat is the reduction from poaching of the last viable wild population of northern white rhinos, Ceratotherium simum cottoni, which now are estimated to number only 11 (reduced from an estimated 1300 in 1963). The species has also been eliminated from its former habitat in Tchad, Sudan and Uganda and is making a "last ditch" stand in Garamba.

A secondary threat is poaching of other species, particularly elephant, which have been reduced from 22,000 in 1976 to 8,000 in 1983. The rehabilitation programme is providing technical expertise, equipment and supplies necessary to reinforce law enforcement capabilities and to restore park management practices. However, this has been hampered by park rangers who have gone on strike due to lack of payment of local salaries (October 1984).

Whether the project will succeed in maintaining a viable population of the rhino is moot. The fact that a last attempt involving the collaboration of various groups is underway is a dramatic illustration of conservation action at the field level. WWF and IUCN, through HRH Prince Phillip, have made high level interventions on the issue which are being considered at this moment.

Sources: Reports from IUCN/WWF Garamba Project and African Rhino Specialist Group.

Tai National Park, Ivory Coast (also Biosphere Reserve)

Various field mission reports have highlighted several serious problems with this important World Heritage site. Approximately two-thirds of the park is said to have severely suffered at the hands of poachers, gold prospectors and illegal settlers. Some 800 people have moved into the park and despite attempts by the park staff and the army to remove them, they still remain. There is very little discipline of park staff, no on-site management, and totally inadequate material resources. A management plan for the park has been prepared but is not being implemented. Apart from technical constraints on management of the Tai, the political and administrative context within which this takes place is far from satisfactory. There is little support from the central office or the judiciary.

There are some cultivation plots in the buffer zone, and forest exploitation in the buffer zone and in the park, particularly in the north and along the road bordering the southern boundary where extensive felling is taking place. Theoretically, this is a 'fôret classé', but vast blocks are being clear felled with an enormous waste of valuable timber. Crops such as cocoa, coffee, maize, coco yam, sweet potato and okra are then planted, with cash

crops taking up more and more room. Since independence this region has become the principal producer of rough timber. A perimeter road designed to define the boundaries and make protection more effective has had the reverse effect, opening up significant portions of the park to timber contractors, shifting cultivators and poachers (who often include local officials).

In 1977, there were said to be many elephants, conspicuous even in the buffer zone. Now only a few remain, probably due to a combination of disturbance and poaching. There is insufficient staff to deal with the extensive poaching that takes place. Other disturbances include gold prospecting in the centre of the park and an impending dam project at Soubre which could severely effect the park by bringing more people into the region. There is a lack of means to carry out effective management, and research has been more theoretical than management-orientated. Timber exploitation remains a potential threat to the park as the forest resource of Ivory Coast is becoming depleted.

Short-term action has been taken in the form of a visit by HRH Prince Bernhard of the Netherlands, to Ivory Coast in 1981, when he drew to the attention of the President, the threats to the Tai forest. A long term assistance project also needs to be drawn up which will require a conservation commitment from the highest political level as well as funds for resettlement, staff training, equipment and technical assistance. This would require in the order of up to US\$500,000 and a commitment from the Government to protect the property. The matter is being pursued within the context of the preparation of a national conservation strategy for the country for which World Heritage funds have been allotted.

Sources: Field reports, IUCN Mission report, Ambio X(2-3).

Ngorongoro Conservation Area, Tanzania (also Biosphere Reserve)

The conservation status report prepared by IUCN on this World Heritage site led to a request to the Unesco representative of Tanzania, to place the area on the World Heritage List in Danger. The Government has conducted an internal review of management and have agreed to the Danger listing and have requested external support.

The threats to the NCA are subtle and long term in nature and result from inadequate management resources. Equipment and trained manpower are in short supply and the area is in a state that can be referred to as "benign neglect". The slow but incremental decline in various aspects of the area's operation can only be arrested if higher standards of management are implemented. Measures suggested by IUCN's evaluation were (1) re-affirmation of budgetary and political support from the parent Ministry, (2) completion and adoption of the revised management plan, and (3) provision of external support for equipment, training and technical assistance.

The threats to the NCA are not as dramatic as other areas and are of a less immediate nature. However, as the NCA is one of the highest priority sites in Africa for protected areas it deserves extra attention and full support. Several initiatives are underway as a result of the identification of the problems by the World Heritage Committee and the situation is being closely monitored by the Government of Tanzania.

Sources: Site visit, College of African Wildlife Management, Correspondence with Chief Conservator, and University of Dar es Salaam.

Mt. Apo National Park, Philippines

As one of the 10 parks selected by the ASEAN member countries as a "Heritage Park", Mt. Apo has outstanding botanical values and is habitat for the last population of the disappearing Philippine Eagle. The park has suffered in recent years as a result of illegal logging, encroachment by shifting cultivators and the establishment of permanent squatter settlements. In addition, the Philippine Government is reclassifying 32,000 ha of illegally cleared land within the present park boundaries for agricultural development. The park is not under an effective management regime and few regulations are enforced. Another complication is the presence of insurgents in the park. A recent drought and uncontrolled fire have also been detrimental to 30% of the park. It is estimated that only half of the park is still viable as a natural reserve.

IUCN/WWF have sent an intervention letter to the government (8 June 1984) to suggest that a conservation status review of the park be undertaken. This would involve consolidating boundaries, building public support, and preparing a regional integrated resource management plan. The Bureau of Forest Development in the Philippines is pressing for an amendment to the reclassification proclamation to exempt the remaining forest areas from settlement.

Apo is a priority park from a number of standpoints and an effort to control and manage what still remains is merited.

Sources: Eagle Project Field Reports; news clippings.

Kutai Game Reserve (proposed National Park) Indonesia

The Reserve is affected by timber concessions, oil (PERTAMINA) and mineral exploitation with associated access road construction, and lack of effective management aggravated by the conflict between conservation and development interests. There is pressure from local settlement encroachment (over 2000 families reside in the east portion) and associated logging operations which was affecting some 10,000ha in 1983. Current developments for the region (1983) include the construction of a logging road which will bisect the reserve; coalmining the Bungalon area and transmigration settlements in the region also have negative impacts.

In May 1983 one of the most destructive forest fires ever to occur destroyed 3.5 million ha of forest in E. Kalimantan. The fire was the combined result of hundreds of slash and burn cultivators and was intensified by drought conditions induced by El Nino and exacerbated by the effects of selective logging.

Most of Kutai's original 200,000 ha was extensively damaged by this fire, particularly the portions which had previously been cutover or selectively logged. One tract of primary forest of 60,000 ha within the park did not burn though many canopy trees died from the drought. Portions of this, however, continue to be logged both under concession and illegally by local villagers.

Although it was officially announced at the World Congress on National Parks in Bali in 1982 that Kutai would be upgraded to national park status this has not yet occurred. It has been suggested in the systems plan for protected area in Kalimantan that Kutai was not as biologically rich in species as other areas on the island and due to existing human activities in the area it had already been altered to the point where national park status was inappropriate. Alternate lowland sites for protected areas (e.g. Melinau) in the lowland forest zone were suggested.

Suggestions for actions that have been made include:

- redefine boundaries to identify and salvage remaining unburned forest land and declare a national park for that area;
- include a portion of the adjacent burned forests for use in study of recovery and succession;
- cancel all logging concessions immediately in the remaining primary forest area;
- clearly mark boundaries of the new area and institute management measures which would protect it;
- establish an alternative site for protection of a representative sample of Kalimantan lowland rain forest.

The integrity of the Kutai Game Reserve has been seriously affected by human activities in the reserve and subsequently by fire. It provides an object lesson in inappropriate selection of an area for a reserve, ineffective management when it became a reserve, and the combined effects of a major disruptive event and world publicity to bring the issue to light.

Sources: IUCN/WWF project field reports by Wirawan and Leighton, Asiaweek, 13 July 1984.

Cape Tribulation National Park, Australia

This park was declared in 1981 by the Queensland Government to protect a unique combination of tropical rainforest, mangrove and coral reef. A further extension of boundaries to form a "Daintree tropical rainforest World Heritage Wilderness Area" has been proposed by the Australian Conservation Foundation.

The park is threatened by the intention of a local municipal council to construct and upgrade a 30 km road through the park. Sufficient impact surveys and environmental studies have not been carried out and bulldozers have begun the work. Apart from damage to the forest itself there is widespread public concern that the road would become a through road and encourage resource development of surrounding lands. The introduction of the cinnamon fungus disease into the heart of the forest is another feared impact.

In response to an IUCN intervention on the issue, the Environment Minister replied that the Federal government was opposed to the road but that responsibility lies with the Queensland Government and the local council. The Federal Government has since offered the Queensland State Government A\$1 million to prepare a management plan for the Cape York rainforests.

The threats illustrate a classic case of acting locally without thinking globally or even nationally. It is presumed that the road issue will be resolved within the country and that even if a high standard road is constructed, environmental safeguards and significant additions to the park area will be included as a compensatory measure. Due to the high biological value of the area and the particularly severe impacts of the road, an international expression of serious concern is needed to reinforce national efforts to limit road plans, expand the park, and pursue agreement to nominate the area for World Heritage status.

Sources: Members letters, news articles, Australian Conservation Foundation.

John Pennecamp Coral Reef State Park and Key Largo National Marine Sanctuary, USA

In Pennecamp park the current threats are water turbidity, caused by dredging, and land-filling. In the early 1970s, the corals within the park were found to be still healthy although some damage was noted on reefs outside the boundaries. Divers and snorkellers have caused physical damage on Pennecamp reef. Pollution has also caused problems and lead and mercury may be accumulating at the John Pennecamp Reef marina. The importance of preserving the mangroves and sea grasses to trap sediment and prevent increased turbidity within the park must be stressed. Recent plan to build 3,500 condominiums along a 16km section of adjacent land bordering both John Pennecamp and Key Largo Coral Marine Sanctuary has given cause for serious concern. If the development proceeds, an impact study has suggested that the coral reefs will be significantly affected by degraded water quality and further overuse.

In the adjacent Key Large Coral Reef Marine Sanctuary, pollution is a potential threat. In 1975, the greater Miami area pumped 84 million gallons of sewage a day into surrounding marine waters and it is thought that much of this travels southwards to the Keys. The ocean outfall at Plantation Key, just south of Key Largo, pumps 700,000 gallons of secondary treated sewage a day, and there are two outfalls that dump sewage into Largo Sound. Studies at Carysfort Reef revealed high mortality rates of corals. Recent agricultural and industrial growth in south Florida has increased the potential for pollution from insecticides, herbicides and industrial chemicals. Evidence of oil pollution from vessel traffic through Hawk Channel and off the Marine Sanctuary increases yearly.

National recognition as a national marine sanctuary has had the effect of intensifying public use of the area. Heavily used areas of reef are in a distinctly poorer conditions than more remote regions, probably largely due to anchoring and concentrated dive pressure. Boat groundings have also caused serious damage. Spearfishing and collecting of coral, shells and archaeological artifacts still occurs, although illegal.

The scarcity of the large molluscs Strombus gigas and Pleuroploca gigantea reflects high collecting pressure in past years. Explosives were used for fishing at Carysfort Reef from about 1900 to the early 1950s. Damage throughout that period was severe but recovery has been fairly complete. Litter is a problem in many areas.

Both the park and the sanctuary are areas of national importance and are only remnants of natural systems that were common in the area before the turn of this century. One action that must be taken is to convince the Florida State Government to disallow the condominium development. A detailed report on other protective measures required has been prepared which include increases in regulating authority, enforcement and funding.

Sources: International Wildlife, May-June 1984; Florida Dept. of National Resources "Effects of Boat Traffic and Land Development on Key Largo's Coral Reefs and Adjacent Marine Environment"; CMC.

Manu National Park, Peru (also Biosphere Reserve)

Ranging from the alpine grasslands of the Andes to the rainforests of the Amazon there is probably no other single protected area in the world with a diversity of ecosystems and species that compares to Manu. At the same time, there is probably no other park that is faced by such a wide range of threats.

First, the Peru Government is considering construction of a major road along the Manu River through the park. The road is essentially for the promotion of settlement, forestry, agricultural and ranching and will effectively divide the park and affect much of its natural habitats.

Second, oil and mineral exploration are being conducted and new concessions have been applied for and issued.

Third, a canal project would connect two of the watersheds in the park with another from outside which would affect streamflows, allow boat access, and remove some forest land.

Fourth, a Dominican Mission has applied for a logging concession in the park and intends to establish a settlement to provide for workers as a part of an evangelical programme for native peoples.

There is much controversy surrounding the various proposals and a "technical committee for the defence of Manu National Park" has been formed by a coalition of conservation, anthropological and university groups. IUCN has also sent a letter of intervention to the President and a WWF-funded IUCN project is supporting management of the park.

Various actions to avert the above threats have been suggested. These include:

- increase measures to increase public awareness of the impacts of the development;
- revision and implementation of a management plan for the park;
- suggest alternate route for the proposed road;
- encourage World Heritage nomination for the park;
- strengthen capabilities of field managers;
- support efforts of the local Manu Committee.

Sources: Field reports, correspondence, news clippings, Taraxacum 3(2).

Araguaia National Park, Brazil

Brazil's third largest national park (562,312 ha) makes up a major portion of the largest fluvial island in the world in the Araguaia River. Located in a transition zone between the savanna and the Amazon forest, the park is rich in faunal diversity.

During the dry season, squatters with 30,000 domestic livestock enter the park which is an illegal practice for which the management plan has suggested the solution of a fence. Land rights, however, are still disputed. But the major threat is a 66 km road now under construction through the middle of the park. The road will be used only part of the year for transport of rice and alcohol through the park. It will have unfortunate effects on the hydrology and will disrupt wildlife migratory patterns. Increased pressure for agriculture and grazing is also anticipated.

Much construction damage is already apparent and amelioration measures have not been undertaken. Officials of Brazil's National Parks Department have requested mitigative measures for improved drainage and possible relocation of

the road outside the park as well as funding to allow more intensive patrols and implementation of the management plan for the park.

Source: Field reports, CMC.

Juan Fernandez National Park, Chile (also biosphere reserve)

This park, established in 1935, consists of three main islands 650 km off the Chilean coast in the Pacific Ocean. The islands have a unique and highly endemic flora, the result of the isolation of the islands for 60 million years.

Currently the resources of this park are under threat from three interrelated factors: introduced animals, alien flora, and severe erosion.

Herbivorous mammals - goats, cattle, horses, donkeys, pigs, sheep, rats and rabbits - have all been introduced (in some cases as early as 1574) causing irreparable grazing damage. Other introduced animals include the coatimundi Nasua narica, the four-eyed sapito Pleuroderma thaul and the vineyard snail Helix pomatia. The most urgent needs are to reduce the numbers of feral cattle and sheep on Robinson Crusoe island and goats on Alexander Selkirk island.

Erosion caused by livestock grazing is the second threat. This is most serious and most difficult to control on the steep volcanic terrain. Some 46% of Robinson Crusoe island is considered affected, especially in the east and around Cumberland Bay. Native forest survives in high ridges and steep ravines. In many other places bedrock is exposed. Regeneration is unlikely to occur because of the presence of weedy alien species. The decline of Luma forest on Robinson Crusoe island has led to widespread repercussions proving detrimental to many species including the Juan Fernandez Tit-tyrant, endemic to the island. In the late 1970s there was an attempt to construct a road across Robinson Crusoe Island, which was abandoned because of the environmental hazards involved. Similar erosion problems exist on Alexander Selkirk Island.

Alien flora is the third threat. Introduced plants such as the Chilean Maqui Aristotelia chilensis and a bramble Rubus ulmifolius have become dominant and have extensively over-run plant communities. The native myrtle Ugni selkirkii is being rapidly replaced by the introduced U. molinas. On the dry treeless 'prados' of west Robinson Crusoe Island, several species of European grass and thistles are widespread.

In addition to these three threats, there has been selective felling of native trees, especially of the chonta palm J. australis and the sandalwood tree S. fernandezianum, now thought to be extinct.

There are a number of corrective actions that the Corporacion Nacional Forestal (CONAF) is attempting to undertake which have been outlined in the 1976 management plan for the park. These include ex situ propagation of endangered plants and some erosion control measures. Under the IUCN/WWF Plants Programme these attempts would be reinforced and a public awareness component added. Controls on domestic stock and removal of feral animals is another priority task. Methods for eradication of alien flora also need to be improved and general protection and management of the park also strengthened. Some \$300,000 is required to carry out these measures.

Sources: Ohio State University Report; Environ. Cons. 11(1); CMC, WWF.

Durmitor National Park, Yugoslavia

The core of this park and World Heritage Site is the Tara Canyon through which flows one of the last wild rivers of Europe. The park is under threat from two sources that would significantly detract from or remove this feature altogether.

One problem arises from a lead processing factory 20 miles upstream from the Canyon. The current holding tanks for storage of waste waters rich with heavy metals are due to fill in 1985. As it is not possible to provide new tanks and as 2,000 workers would lose jobs if the plant were closed down, the government has opted to discharge wastes into the Tara River. A conservation symposium held in Montenegro declared that if this happens, the river would become biologically dead.

The second threat is from a hydro-electric project planned for the gorge. An alternative scheme which would not affect the Canyon has been presented by the Yugoslavian Institute for Nature Protection, but the Government has not yet announced a decision.

Both of the above threats to this site are of serious consequence and the World Heritage Secretariat has sent a formal expression of concern to the Yugoslav representative to Unesco.

Source: Field reports, World Heritage Secretariat.

Krkonoše National Park, Czechoslovakia

In a recent study on air pollution effects on national parks in central Europe this park was shown to be the most seriously threatened. Fully half of the 32,000 ha forested area of the park is heavily damaged and 1000 ha of forest is already dead. The nearby Krkonose National Park in Poland is also seriously affected but not as severely as the Czechoslovak Krkonôse.

Control of air pollution emissions from the various industrial centres of central Europe is the only corrective action that can be taken.

Source: Members draft report on acid rain.

APPENDIX I

**SUMMARY DESCRIPTION OF THREATS TO OTHER SITES CONSIDERED
FOR INCLUSION ON THE IUCN LIST OF THREATENED PROTECTED AREAS**

1. AFROTROPICAL REALM

The constraints for effective management of protected areas and priorities for action for this Realm have been spelled out in the "Victoria Falls Action Plan" as coordinated by Walter Lusigi at the 22nd Working Session of CNPPA held in Zimbabwe. The threatened areas listed below are a reflection of the effects of these constraints and stem from lack of policies, finances, trained manpower, equipment, public awareness, planning and the pressure from population. Military activities and civil unrest are factors beyond the control of the protected area agency but are major disruptive events in several of the sites.

Djoudj National Park, Senegal

This is another World Heritage site for which IUCN has prepared an evaluation for the World Heritage Bureau and for which the Government of Senegal has requested inscription on the List of World Heritage in Danger. The basic threat is disruption of the water regime due to dam construction which is seriously reducing its viability as habitat for the established 3 million Palaearctic migrant waterfowl that use the park. Remedial measures in the form of dikes and a diversion canal have been suggested by consultants but these would add some US \$1 million to the cost of the project. Another US \$200,000 is needed for emergency measures to prevent the total dessication of the wetland which is rapidly disappearing.

The situation has been temporarily relieved due to a washout of the downstream Kheune barrage which has allowed water to flow in and replenish small lakes in the park.

The Djoudj presents a case where one country supports an internationally important resource and where conservation considerations must be included in development costs.

Sources: IWRB and IUCN Field Reports; Director General, Senegal National Parks.

Mt. Nimba Strict Nature Reserve, Ivory Coast, Guinea, Liberia

Under similar threats as Tai National Park. There is poaching and some cultivation. The main threat is from massive iron-ore mining which has been going on in the southern part of the chain in Liberia. About 6,000 ha are in danger. Roads, wells and mineshafts have been built and workshops and townships established in what has been a strict nature reserve since 1944. Hundreds of square metres of soil have been removed over large areas and, as a result, many streams for miles around are fouled with heavy metal runoff, particularly ferruginous rock debris. The areas designated as a World Heritage Site excludes both the Liberian sector already badly degraded by mining and intensive poaching, and the northern Guinean part, already disturbed by mining activities and threatened by more. But these two areas could serve as a buffer zone for the World Heritage Site if hunting were strictly controlled. It is proposed to study the best way of rehabilitating this zone as an artificial park after the exploitation. There is a lack of resources and management.

The integrity of the Mt. Nimba area is deteriorating rapidly and irretrievably. An international campaign to restore the site is required. Cooperation with the adjoining States of Liberia and Ivory Coast as previously suggested by IUCN is also a necessity.

Sources: Field reports; Ambio 12(3-4).

Simien Mt. National Park, Ethiopia

This World Heritage site was abandoned by park staff late in 1983 for security reasons. Status of the Walia ibex population and maintenance of the park management infrastructure of which much had been provided through IUCN/WWF and the World Heritage Fund is not known. IUCN has had second hand assurance from security forces that "no trees are being felled or animals hunted without explicit permission" but the actual situation on the ground has not been determined.

Insufficient documentation on actual impacts is available. Until reliable information can be obtained, it is not possible to assess the situation on the ground, and no action programme can be devised.

Sources: Correspondence with Horn of Africa and Aden Council, Field report.

Boma National Park, Sudan

Another case of military activity resulted in bombing and pitched battles at park headquarters and kidnapping of park staff. All equipment donated by the Frankfurt Zoological Society to this important and newly developing park was destroyed during the battles and the project and staff have been withdrawn.

The park is a high security risk area and no recent reports on its status have been received. IUCN has received information that the Sudan People Liberation Movement kills elephants to feed their army but that conservation activities will be restored when the political situation is resolved. There is also poaching and illegal settlement by the local Murle tribe. Meanwhile, the Boma plateau exists in a delicate and unmanaged state at the whim of soldiers and at the edge of anarchy.

As much of it is inaccessible for most of the year and wildlife populations are large, the Boma may be resilient enough to survive a period of civil unrest.

Sources: Field report.

Gorongosa National Park, Mozambique

Another case where unconfirmed reports state that the park has been taken over by rebel forces and abandoned by park staff. Former visitor facilities are now used as a base for "resistance fighters".

It has been difficult to obtain a report from the field on the actual condition of the area. Unless further documentation is received, the threats to the park cannot be assessed.

Sources: Field report.

Réserve de Faune de Ouadi Rimé - Ouadi Achim, Chad

The most serious problems are poaching by nomads (with horses, dogs and nets), motorised hunters and military personnel and grazing and consequent exclusion of wild fauna from the best pastures. Prior to 1979 there was inadequate equipment for surveillance, and guard stations were sited on the edge of the reserve. The opening of new deep wells near the wintering quarters of the addax and oryx has increased poaching pressure as it improves accessibility, as well as increasing the number of domestic animals. Since 1979 because of the security problems which have totally disrupted this region, all personnel have left the area, and all equipment has disappeared.

Central Kalahari Game Reserve, Botswana

There is one permanent settlement surrounding a borehole that was drilled in 1965. This has led to a congregation of people in one area, most of whom no longer lead a traditional way of life. Pressure on reserve grasslands from expanding populations. Fences erected to prevent the spread of foot and mouth disease cut across traditional game (particularly antelope) migration routes. The decline in herd size can also be attributed to the construction of water boreholes, vital to migratory wildlife, which are heavily utilised by the human and livestock populations in areas outside the reserve, and the recent severe drought. The problem is exacerbated by the fact that the EEC is providing heavy cattle export subsidies. Mineral prospecting, a high level of poaching and the proposed trans-Kalahari railway are also problems.

Further documentation has been requested to provide more specific details on the extent of the impacts and obstacles that are preventing the Game Department from dealing with the issues. Until these are available it is not possible to prepare a remedial action programme.

Sources: Field Report, Botswana Notes and Records (13): 111-118, 15(107-110).

Mkomazi Game Reserve, Tanzania

Bordering on the Tsavo National Park in Kenya the Mkomazi (including the Umbwa Game Reserve) has been effectively transformed into a cattle ranch over the past 10 years. Waterholes, originally provided to provide dry season water for wildlife are now the focus for Masai pastoralists who have brought thousands of cattle and goats into the area. Along with settlements, overgrazing and lack of management, poaching has been effective in extirpating at least six species in the reserve (including black rhino). Cutting of the gallery forest along the Umbwa River has also removed an important habitat. Tourist hunting in the reserve is still allowed but is not popular as very few trophy species remain.

The Mkomazi is a case study of the consequences of unplanned and inappropriate management, lack of political will, and the additive effects of incremental depletions. Although Mkomazi was an important buffer and extension for the Tsavo National park and was itself proposed for national park status only 10 years ago, it is now only partially viable as a game reserve and the eastern portion should probably be released for other land use purposes.

Sources: Site visit.

Lochinvar and Blue Lagoon National Parks, Zambia

Threats to these nearby areas are a complex mix of the effects of upstream and downstream hydro developments (Kafue Dam), surrounding land use pressures, poaching, commercial fishing, domestic stock overgrazing, and military use of one of the parks. The Zambia National Park and Wildlife Service states that no management efforts are being directed to either area and a recent field review of conditions in Lochinvar states that it is "no longer functioning as a national park".

Both parks have always been contentious areas and both lack the existence of Africa's greatest conservationist -- the tsetse fly. Although WWF provided the funds for purchase of Lochinvar in 1965 the area today is much more heavily populated and subject to severe land use conflicts. Eland and impala have been extirpated.

In the Blue Lagoon National Park problems include uncontrolled bush fires, cattle grazing and poaching of animals and fish. The expanding population of Lusaka has increased poaching pressure on the park and poaching started in the Lechwe area on the western boundary in 1980. The south-eastern corner of the park was permanently flooded from 1977-1981 as a result of the Kafue Gorge Dam. Now flood regime is influenced by regulation at the Itezhi Itezhi dam which may damp the flood peaks and lows. Hunting (particularly of zebra and lechwe), grazing and fishing are the major activities in the game management area and settlements are sparse but increasing. Since October 1976, the park has been a security area and has been closed to visitors.

An overview of the situation in the park and an evaluation of the effects of the Kafue hydro scheme is now being prepared by scientists from the University of Zambia. It is essential to receive these reports before proceeding to recommend conservation action.

Sources: Field reports, University of Zambia, WWF-UK Mission Report, NPWS 1981 Annual Report, Zambia Journal of History, No. 1.

Forêt du Day National Park, Djibouti

This is a small relic patch of forest (1/30th its former size) that is Djibouti's only protected area and is home for a rare gamebird, the Djibouti Francolin. The forest is continuing to be slowly degraded by livestock overgrazing, and removal of trees for firewood. At the current rate of loss it will have disappeared by 1995. An additional threat is a plan to construct houses for government officials in the remaining forest area. An intervention letter from ICBP to the President was sent (6 June 1984).

The case presents another example of deteriorating habitat with accompanying species loss. The local authorities attribute the degradation of the forest to climatic change but these are exacerbated by man-induced influences.

Sources: ICBP Field missions report.

2. INDOMALAYAN REALM

Threats to protected areas in the Indomalayan Realm are of a different nature than those in other realms. The major threats are encroachment and the construction of hydro dams which would affect four of the seven sites. As the world's richest biotic region and one which has the densest population (approximately 2 billion) the realm is providing many critical test cases of the role of protected areas in society. Although there has been a dramatic rise in the number of protected areas established since 1970 it is also well known that few of them are effectively managed and thus have only a tenuous chance of surviving in the long term. An action plan for the Realm is currently being drafted by Samar Singh the CNPPA Regional Vice Chairman for presentation at CNPPA's Working Session in India, in February 1985. This plan will more clearly define the basic constraints to management and therefore assist in evaluating the threats illustrated in the sample cases below.

Thung Yai and Huai Kha Khaeng Wildlife Sanctuaries, Thailand

"The area is one of the wildlife treasure chests of the world" according to IUCN's "The World Greatest Natural Areas". It is threatened by a dam which would be located at the edge of the Sanctuary and would flood 14,000 ha of valuable lowland. The two Sanctuaries would be bisected and ungulate migratory patterns disrupted.

The Nam Choan dam proposal would be funded with loans from the World Bank who have undertaken a comprehensive environmental impact assessment. This assessment includes an outline of measures for mitigation in the event that the Government of Thailand decides to proceed with the project.

Apart from the dam proposal the two sanctuaries are not currently under an effective management regime, insurgents are present in the area, and no management plans exist. Several hill tribes are engaged in opium trade.

There is no doubt that this area (as well as the adjacent area in Burma) is of sufficient size and has features which make it the most outstanding protected area in the country. This has been recognised and mentioned by HRH Prince Phillip in his recent mission to Thailand.

Options for action will depend on a Government decision expected soon. If the dam is approved, full support for all mitigative measures should be included in the project. If the dam is not approved, support for implementation of effective management will be required.

Sources: Newspaper reports, correspondence with World Bank and WWF-Thailand, IUCN Asian Elephant Group.

Klias National Park, Malaysia (Sabah)

This area was established as a national park in 1978 to protect an outstanding mangrove and coastal zone area. For purposes of a pulp and paper mill and plantation forestry it was degazetted 2 years later and regazetted as a Forest Reserve in 1981. As a partial compensatory measure Tabin Wildlife reserve was created. A campaign for reinstatement of the park has affected government plans for the venture and environmental safeguards would be added.

As Klias seems now committed for alternate extractive land uses, there is little hope in reversing the decision.

Sources: Project files.

Manas Wildlife Sanctuary (Bhutan) and Manas Tiger Reserve (India)

These 2 contiguous protected areas, rich in wildlife and a focus for Project Tiger, are threatened by two dams which have been proposed within the Bhutanese sanctuary. In addition to flooding a large part of the sanctuary, road and canal construction, along with changes in hydrology, would radically alter the reserve's intrinsic values.

The dam proposal is one element of a number of planned management projects for water development schemes in the foothills of the Himalayas. The dam is under preliminary consideration now by the India Ministry of Irrigation and an environmental impact study is being prepared by the India Ministry of Environment.

The importance of the 2 Manas reserves is suggested by its inclusion in IUCN's booklet on "The World's Greatest Protected Areas" and the Government of India has indicated it will propose the Tiger Reserve for World Heritage status. If there are stronger indications that the dam is being actively considered and that the Bhutanese authorities are in agreement, a heated debate can be anticipated. Until the threat is firmly ascertained, however, it would be premature to place it on the final list at this time.

Sources: Field report, newspaper articles, and Conservation in Bhutan, IUCN, 1981.

Silent Valley National Park, India

This area "is one of the few remaining areas of isolated and undisturbed rain forest in India" (Biol. Cons. 29 (1984) 283). The Kerala State Government plans to build a hydro dam here that would inundate 670 ha of the core of the park. Another 300 ha would be cleared to house 8000 workers plus families for the construction period. If this should occur, the remaining forest and the impact on wildlife resources would be terminal.

The IUCN General Assembly in Ashkhabad in 1978 passed a resolution encouraging protection of the valley but plans and the controversy continue. Plans to proceed with the dam are temporarily shelved and a "watching brief" is being kept over the issue.

Sources: WWF Monthly Report, November 1980, Biol. Cons. 29(1984) and field report.

Gir National Park, India

The Gir forest is the only remaining habitat for the Asiatic lion. Resident Maldhari graziers are the main disturbing factor. Prior to 1974, when a one metre high stone barrier encircling the reserve was completed, over 50,000 cattle grazed in the reserve during dry periods. The cattle greatly reduced the quality of grazing for wild animals. The Maldharis have also destroyed a considerable amount of forested land for and domestic purposes and there is much illegal removing of trees. They are now being resettled outside the Sanctuary and this, to some extent, has alleviated the situation. However, the buffer areas surrounding the main forests have increasingly come under the plough with consequent conflict between wildlife and farmer. The lions are been vulnerable to epidemics because of their concentration in one area. The Forest Department is implementing a project to establish a second area for Gir Lions in Barda Forest near Porbander, covering 19,231 ha in both Junagadh and Jamnager districts. The Gujarat Irrigation Department is pressing for the construction of a dam which would flood over 400 ha of the Gir area, in addition to causing great disturbance during construction (1982). It would also affect the dispersal area for prey species. A further disturbance to the area was the loss of 2 million trees during a cyclone in November 1982.

Sources: Environ. Cons. 10(4), Animal Kingdom, October/November 1980.

Kerinci-Seblat National Park, Indonesia

This huge 1.48 million ha ASEAN heritage park in south-west Sumatra is a rich tropical rainforest containing an abundant fauna including the most significant remaining habitat for the endangered Sumatran rhino.

The greatest danger threatening the park is the continued incursions caused by logging roads and illegal land clearing and settlement. The Provincial Planning body (BAPPEDA) has proposed two new major roads which would cut through the interior of the park and open it up to further encroachment. Further, a recent survey (August 1984) by the West Sumatra Forest Service and the Governor of Aceh Province revealed the great extent of existing land clearing.

The situation is exacerbated by a shortage of park guards and management presence.

Action is needed to discourage BAPPEDA from further road development. Resettlement of squatters or at least prevention of expansion is also required. A more active guard force is a prerequisite to more effective management.

Source: WWF/IUCN Field Reports, Jakarta Post, 29 August 1984.

3. AUSTRALIAN REALM

Over the years there have been a number of highly publicised threats to protected areas in this realm from various sources including uranium mining and hydro development. As the conservation lobby in the country is strong and effective, most major threats have been averted.

4. NEOTROPICAL REALM

An overview of the pressures facing protected areas in this realm was presented in the Future Directions address given by CNPPA's Vice Chairman Marc Dourojeanni at the Bali Congress. The categories of threats were: colonisation within the areas, highway development, mineral and oil exploration, dam construction, resource extraction, native populations inside parks, external pollution, and pressures from tourism. Also as the IUCN/WWF Regional Coordinator has noted: "Population growth and land scarcity are major long term problems which will undoubtedly put more pressure on protected areas in the years to come. The current economic crisis in the region is greatly compounding problems. Conservation agency budgets and personnel rolls have been slashed and many quick-fix resource utilization schemes have been cooked-up which could affect wildlands".

La Amistad/Talamanca National Park, Costa Rica

There are several Indian Reservations near or contiguous with the area and man's impact in these is considerable, with about 10,000 people maintaining their traditional lifestyles with free-range grazing, hunting, fishing and use of medicinal plants. Two routes for an interoceanic pipeline which would transport crude oil from California to the US East coast markets are being considered by the Costa Rica government. One of the routes would pass through a 4 km section of the park. A Commission of Enquiry is currently reviewing the alternatives and is due to report in the near future. The pipeline issue is a highly contentious one and is being hotly debated in Costa Rica. Oil exploration in the Talamanca reserve is a problem, as is the forest loss and soil degradation in the Ujarras, Salitre and Cabagra area. Land squatters on the Pacific side of Costa Rica are known to exist. Parts of the buffer zone have been affected by shifting cultivation and forest use. Without outside help it will not be possible for the rangers to control poaching archaeological site looters and squatters. The adjacent Panamanian section of the park has not yet been created and a new road is allowing increased access from this direction.

Threats to the Amistad/Talamanca thus are varied and pending. Encouragement should be given to creating the adjacent park in the Panamanian sector and instituting a management programme. Some support for training and equipment is being received through WWF and the World Heritage Fund.

Sources: Field reports, news articles, World Heritage Secretariat.

Rio Platano Biosphere Reserve/World Heritage Site, Honduras

This is Honduras' only large protected area and is threatened by three developments. The most immediate problem is posed by plans to resettle about 4000 Nicaraguan Miskito Indians on the border of the reserve's buffer zone. It is feared that the Miskitos, who are subsistence agriculturalists and hunters, will rapidly spill over into the reserve. Colonisation is also approaching the reserve's southwest borders.

A potential plan to construct a military road through an isolated section of the reserve's buffer zone has been temporarily stalled due to international pressure and the threats include plundering of archaeological remains and potential timber exploitation.

Some assistance is available through WWF and the World Heritage Fund but this will not be sufficient to avert the identified threats.

Source: Field representative report, World Heritage Secretariat.

Corcovado National Park, Costa Rica

In the past 3 years this park has been invaded by an estimated 1000 gold panners who have caused much habitat and faunal destruction. They are armed and use hunting dogs. On various occasions park rangers and civil guards have carried out operations to arrest and expel the miners who have promptly returned. The Central Bank of Costa Rica has set up gold buying stations near the park border.

Pressured by politicians and openly threatened by miners, rangers have had to abandon control over sizeable areas of the park. As road access improves to the peninsula where the park is located, these problems will grow.

The Costa Rica Park Service is sending a special commission to the park to produce a strategy to deal with these threats. Action proposals will await the outcome of the mission.

Sources: Field Representative report.

The Park System of Bolivia

Due to extreme restrictions in budgets and other pressing social and economic commitments, the government of Bolivia has ceased active management of the country's 10 national parks and 5 nature reserves. With no funds or equipment, the few staff members remaining are unable to undertake any management or law enforcement in these areas.

The consequences of these restrictions and longer term implications are obviously severe and not known in detail but illegal settlement, poaching, livestock grazing and removal of trees are known to occur. A 1980 Field Study sponsored by USAID and an overview report by CNPPA have outlined the many steps that need to be taken to implement management in what have been to date only "parks on paper". If these are to be followed up, a multi-million dollar international rehabilitation programme would be required. At the moment only the US Nature Conservancy and the 50-member Bolivian Wildlife Society are attempting to carry out limited projects in the country.

Sources: Field report from Bolivia Wildlife Society, USAID "Bolivia-State of the Environment and Natural Resources", Rodriguez/CNPPA Parques nacionales y Otras areas protegidas en Bolivia.

Kaieteur National Park, Guyana

A report has been received that this park has been closed to visitors and is now only in use by the military and by high government officials as a private hunting reserve. It has not been possible to substantiate this report or to obtain any up-to-date information on the status of the area.

Laguna de Tacarigua National Park, Venezuela

This park is reported to be under serious threat from siltation due to river channelisation and artificial opening of the lagoon mouth. Illegal grazing and hunting are also known to occur. No further details are known.

Source: CMC.

Amazonia National Park, Brazil

This one million ha park consists primarily of rainforest. There are various problems with lack of personnel and funding as well as extensive gold prospecting in the park. The main current threat is a proposal to open a calcium mine within the park which would initially affect some 8,000 ha. An assessment mission is required to determine the exact nature and severity of these threats.

Source: Field Report.

Rio Trombetas Biological Reserve, Brazil

An important forest containing primates and a high diversity of birds and riverine fauna will be affected by a dam on the Trombetas River. The main impact of this dam will be on the nesting areas of 5-8,000 Amazon River turtles which are dependent on natural flooding cycles. The Reserve is the most important site in the Realm for this species.

Agreement with the hydro dam authorities on maintenance of critical flooding levels is required if this major resource of the park is to be maintained.

Source: Field Report.

Darien National Park, Panama

This area constitutes the only remaining gap in the entire Pan-American Highway, which is under construction and would bisect the Park. This would open up the area for settlement and would greatly increase the danger of transmitting foot and mouth disease from South American cattle into Central America. The influx of people could lead to uncontrolled forestry and agriculture and hunting resulting in deforestation, soil erosion and disruption of the fragile ecological equilibrium. Some precautions and regulations for the potential impact have been implemented. The towns of El Real and Boca de Cupoe are very close to the area and the majority of their inhabitants have small farms inside the Park. There are very limited areas of agriculture and disturbed forest near the Chocoe and Cuna Indian villages, principally along river courses.

Various provisions to control the effects of the new road are proposed and a management plan for the park suggests others. Support for implementation of these measures and monitoring of the development process will be required.

Source: CMC, Explorers J. December 1980, CATIE Field Report.

Montego Bay Marine Park, Jamaica

The park is a small (50 ha) but potentially important marine reserve adjacent to a major tourist development. It is one of the few reefs left undamaged by recent hurricanes and could form the nucleus of a marine park system for the country.

Although the park has been in existence since 1974 and is protected by law, no management presence enforces regulations.

Large colonies of Black Coral are rare as a result of previous collection. Snorkellers and divers may take coral, guides have also been observed taking coral. Collecting of corals is so severe that few colonies of the pillar coral remain undamaged. The branching corals also suffer severe damage but their comparatively high growth rate means that they recover fairly rapidly. If the rate of damage increases however, serious degradation may occur.

The fish population is depleted, presumably through overfishing. Numerous fish traps are placed in the Park by local fishermen. Spearfishing is common with snorkel and SCUBA divers who take even small fish, wounded fish are a common sight and all the fish tend to be wary and difficult to approach. Considerable damage is probably being caused by anchors and badly placed fish traps, boat groundings and propeller damage also seem to have affected corals in some places.

The park may in the long run be affected by pollution and sediment from the airport swamp drainage channel to the north of the park, which carries dirty water and oil in considerable quantities after heavy rain, two storm gullies which pass through Montego Bay and enter the sea to the south of the Park, often carrying pollutants, and the Montego River which carries the outflow of a major sewage treatment plant.

The Park may have been affected by dredge and fill activities in the development of the water front at Montego Bay but this has proved difficult to assess. Montego Bay is the largest town on the north coast and urban development and heavy population pressure may be expected to affect the reefs.

A recent WWF/IUCN survey has suggested that a buffer zone should be created around the park to expand the area covered to approximately 225 ha. Within the buffer zone, limited fishing by means of trap and line, but not net or speargun, would be permitted. Pot fishermen would need a permit to use the area and would be restricted in the number of pots and mesh size used. Boat use in the area would not be restricted and sand anchoring, whilst being encouraged, would not be enforced. Other park regulations would apply. Initial management steps for the park should be:

1. Placement of responsibility for early development of the park and appointment of a Marine Park Advisory Committee.
2. Allocation of funds and creation of a budget.
3. Appointment of an on-site manager.
4. Hiring of suitable wardens.
5. Review of existing legislation protecting the park including consideration of proposed buffer area. In particular fishing should either be totally prohibited by making the possession of fishing gear or fish an offence or it should be controlled by restricting the numbers of fish traps and mesh size used. Spearfishing should be prohibited and legislation and its enforcement for the taking of marine organisms should be improved. Further restrictions on boat use are needed, anchoring should be controlled and mooring buoys installed.
6. Development of recreation facilities, public education and advertisement.
7. Development of research and monitoring programmes.

5. NEARCTIC

Protected areas in this realm are subject to a unique set of management problems, but funds and manpower resources to solve them are greater than all the other realms combined. Public interest and support as well is at a high level and have acted to avert many serious threats to the system over the years.

One of the countries in the realm, the USA, has completed an exhaustive survey of threats to its protected areas. In the "State of the Parks" report all areas were reported to be under at least one of 73 types of threat. In turn, states have carried out even more detailed assessments. It is also known that a number of areas administered as Wildlife Refuges are also in serious danger.

As the concern here is to highlight the major threats being experienced by the most significant areas, a full listing of management problems identified in these reports are not repeated here.

Wrangell/St. Elias National Park, USA

In this international World Heritage site Senate Bill 5.49 has proposed that 2.4 million acres of the park would be open to recreational trophy hunting. IUCN has no documentation on the significance of this threat and has written for further information on the issue.

St. Matthew Island Natural Wildlife Refuge, USA

1600 ha of land in this Sanctuary is to be withdrawn to allow construction of an oil production and exploration base. 250 people will be resident on site, a deep sea harbour would be dredged and undersea pipelines from offshore drilling rigs would bring oil to storage tanks on the island. Disruptions of seabird nesting areas and marine mammals are expected to be major. Although a land exchange arrangement has been made as part of the approval process it has not been one favourable to wildlife.

The reversibility of the withdrawal is being tested in the courts by various US conservation groups.

Source: Oryx 18(2).

Indiana Dunes National Lakeshore, Cuyahoga Valley National Recreation Area, USA

Both these sites are surrounded by industrial, commercial and residential activities and as a result, numerous conflicts exist with or because of adjacent uses. Air and water problems are common. In a study of air pollution effects on 10 protected areas of the Great Lakes region, it was found that these areas were rated in most danger and that environmental alterations from sulphur dioxide and ozone as well as visibility reductions are most serious. Typical acid rain effects on vegetation and aquatic life and atmospheric haze have been measured and resource values are diminishing at a steady rate. Unless major reductions in pollutant loadings occur, there may be significant future effects.

The "simple" prescription is alleviation of air pollution impacts through clean air legislation which requires awareness of the problem and pressure on the US Congress to act.

Source: Environ. Cons. 10(4) Winter, 1983, 303-313.

Wood Buffalo National Park, Canada

The Province of Alberta is actively considering construction of a hydro dam on the Slave River adjacent to this World Heritage site. \$40 million have been spent on feasibility studies. The dam would flood a portion of the park and would have particularly serious effects on the area. It is not certain how the dam might affect the nesting site of the whooping crane (80 km away from the dam) but losses due to flight impacts with transmission lines would be expected. Changing water levels in the Peace-Athabasca delta areas would disrupt an internationally important waterfowl nesting area as well. Buffalo would be affected by reduction in grazing areas and require a change in migratory patterns.

A detailed critique of the project is being prepared by a collection of interest groups called the Slave River Coalition, and a formal environmental assessment is underway by a Federal panel. Parks Canada has also stated its objection to the construction of the dam as it is presently envisioned.

The dam on the Slave River is still in the feasibility study stage and there is much activity on both sides. If the proponents of the dam affirm their intention to proceed (which may not be for another 10 years) Wood Buffalo would certainly be considered for the World Heritage in Danger List.

Source: Nature Canada, January, March 1983.

6. PALAEARCTIC REALM

Although this is the largest Realm in the world it has the smallest proportion of its area under protected status and has the fewest reported threats. The western part of the Realm has already been profoundly affected by man and the few natural landscapes remaining are under pressure primarily from external sources such as illustrated in the cases below.

Vanoise National Park, France

Vanoise National Park is currently threatened by 2 proposed developments. The first of these is a series of 3 hydro dams on which work has already begun with extensive and disruptive exploratory construction. One of the dams would flood 9.5 ha of the central zone of the park and inundate a forested slope which is a relatively rare habitat type, and provides important winter range habitat for several wildlife species. The site has been altered by the EDF (road and tunnel construction) without prior approval from the park authorities, or authorization to proceed with the dam.

Another of the dam sites is proposed at Cru which is a site in the peripheral zone of the park unique in that it is one of the last valleys still in a quasi-natural condition. It contains high scenic values and is attractive to walkers. Significant landscape modifications at the site of the dam have already taken place which have resulted in unsightly scars and which would require extensive rehabilitation if the valley was to be restored to a natural condition.

The third dam site is at a lower elevation at a town in the peripheral zone but its impacts are not judged to be as severe as the two higher dams.

An impact study of all 3 dams has been prepared by the EDF but it has been judged inadequate by the courts and the approval for the dam delayed until it is finalized.

It should be noted that approval for further work on the dam may not be obtained for reasons of increased foreign exchange requirements which may preclude construction.

Ski lift development which would connect Val d'Isere with the small village of Bonneval is another major threat to the Vanoise. Lifts would be constructed within the central zone of the park to allow this expansion. A citizens committee in Bonneval is lobbying against the proposal.

Both the hydro and ski lift developments are important from a precedent setting standpoint, as it is felt that, if approved, other French national parks would be placed under similar threats. (Note: IUCN has sent a letter of intervention to President Mitterand on threats to all five national parks in France). Suggested corrective actions are:

1. To persuade the courts, EDF and the French Government that at least 2 of the hydro dams should be reconsidered for environmental reasons.
2. To insist that EDF be responsible for remedial work to repair damage to the sites during exploratory work.
3. To lobby against the construction of ski lifts within the central zone of the park.
4. To support the efforts of the Federation Française des Sociétés de Protection de la Nature, the Club Alpine Française and the Bonneval citizens group in opposing further alterations which would detract from the integrity of the Vanoise National Park and its potential for future World Heritage status.
5. To use the Vanoise National Park as a case study to illustrate inappropriate administrative structure (e.g. local mayor and EDF Vice-President are in control of the management of the park) which will never allow the park to be an autonomous and professionally managed unit.
6. To suggest public awareness measures to solicit wider public support for national parks in France (possibly through involvement of WWF-France?).

Sources: Site visit, news articles, correspondence.

APPENDIX II

DATA SHEETS FOR THE WORLD'S TWELVE MOST THREATENED PROTECTED AREAS

Prepared by

Protected Areas Data Unit

Conservation Monitoring Centre

October 1984

NAME Parc national de Garamba

MANAGEMENT CATEGORY II (National Park)

World Heritage Site (Criteria: iii, iv)

BIOGEOGRAPHICAL PROVINCE 3.5.4 (East African woodland/savanna)

LEGAL PROTECTION The World Heritage Nomination document notes that the park 'has had the status of 'integral nature reserve' since its creation as a national park according to the terms of the 1933 London Convention' (sic). Limited settlement and hunting of small game for meat using spears and other traditional weapons but not guns, is allowed in reserves surrounding the park.

DATE ESTABLISHED Established by decree on 17 March 1938, primarily to protect the northern white rhino and northern savanna giraffe. Since 22 August 1969 the park has been governed by Decree No. 69/041. Designated as a World Heritage Site in 1980.

GEOGRAPHICAL LOCATION In Uele District, northeast Zaire. On the Sudan border (Nile-Zaire watershed). 28°48'-30°00'E, 3°45'-4°41'N.

ALTITUDE 710-1,061m

AREA 492,000ha. Contiguous in the north to Lantoto Game Reserve in Sudan. Surrounded in Zaire by 3 hunting areas totalling about 1,000,000ha: Reserve Azande (west), Reserve Mondo (east) and Reserve Gangala (south).

LAND TENURE Central Government

PHYSICAL FEATURES A vast undulating plateau which is part of an ancient peneplain. Some inselbergs (generally of granitic formation) and sizeable marshland depressions. The largest rivers are the Dungu, Aka and Garamba. Tropical climate with semi-moist rainy season (March to November) and long dry period (November to March) during which temperatures range from 15°C to 35°C and hot dry north-easterly winds are common. Mean annual rainfall about 1,500mm.

VEGETATION The densely wooded savanna, gallery forests and papyrus marshes of the north and west gradually give way in the south to a less wooded savanna which merges into grassy savanna. The main species of the treeless grasslands are Loudetia arundinacea, Panicum and Hyparrhenia, which in August are over 2m high with the tallest grass Urelytrum thyrsoides at over 5m. The savanna woodlands are often dominated by Albizia sp. with predominant species including Bauhinia, Dombeya, Erythrina and coral trees. Gallery forests and forest patches contain Irvingia smithi, Chlorophora excelsa, Klainedoxa sp., date palms, khayas Khaya senegalensis, fig Ficus sp. or rubber, waterberry and flambeau trees. The marshlands are dominated by Papyrus sp. and Mitragyna africana. Forests are predominantly Khaya senegalensis, Chlorophora excelsa and Klainedoxa sp.

NOTEWORTHY FAUNA The park contains probably the last viable natural population of square-lipped or northern white rhino Ceratotherium simum cottoni (E). The elephant Loxodonta africana (V) are a unique population representing an intermediary form on the cline between the forest and savanna

sub-species, L. a. cyclotis and L. a. africana. Other mammals include northern savanna giraffe Giraffa camelopardalis congoensis (occurring nowhere else in Zaire), hippo Hippopotamus amphibius, buffalo Syncerus caffer, hartebeest Alcelaphus sp., kob Kobus kob, waterbuck K. ellipsiprymnus, chimpanzee Pan troglodytes (V), olive baboon Papio anubis, colobus Colobus sp., vervet Cercopithecus aethiops and 5 other species of monkey, 2 species of otter, 5 species of mongoose, golden cat Felis aurata, leopard Panthera pardus (V), lion P. leo, warthog Phacochoerus aethiopicus, bushpig Potamochoerus porcus, roan antelope Hippotragus equinus and 6 other antelope species.

ZONING The park contains 2 zones of control: the eastern sector (Nagero Station) and the western sector (Gangala-na-Bodio Station). However, the management plan recommends 3 zones of control: North, East and West. The park is surrounded by 3 hunting areas which act as buffer zones on the east, west and north (totalling about 1 million ha): Mondo-Missa in Faradje and Aba zones controlled by Nagero Station; Gangala-na-Bodio in Faradje and Dungu zones; and Azande in Dungu zone.

CONSERVATION MANAGEMENT There are 22 patrol points on the boundary. Weapons for anti-poaching are MAUSER 1952 rifles (soon to be replaced by automatic 30mm carbines) but there are few anti-poaching patrols and arrests are minimal. The proposed third sector of control in the north administered by an additional station (Berudua) would improve protection in the northern area bordering Sudan. 5 surveillance posts have been set up in the surrounding hunting areas in an attempt to control the hunting. Garamba is famous for the African Elephant Training School at Gangala-na-Bodio, southwest of the park. However, there are reports of imminent closure of the centre due to lack of funds. A WWF project is being carried out which will provide the technical advisors, equipment and anti-poaching supplies necessary to restore the infra-structure, management and anti-poaching capability of the park.

DISTURBANCES OR DEFICIENCIES Elephant numbers fell from about 22,000 in 1976 to about 8,000 in 1983 and numbers of many other species declined considerably after the political unrest in the 1960s. The square-lipped rhino numbered 259 in 1975 but have been threatened by recent fighting in Sudan and Uganda. A 1983 intensive aerial survey aided by ground counts involving 150 guards has revealed only 15-20 individuals (WWF News 24). There has been a massive increase in poaching in the park in recent years and this now threatens the surviving rhino population. The management plan is apparently weak and needs modification. Weaknesses include lack of co-ordinated management of the two sectors of control and the relatively unprotected northern boundary on the Sudan border. Control needs to be improved in the surrounding hunting areas. Park management practices, once recognised as among the finest in Africa, have deteriorated to a level that will result in irreversible degradation of resources. The park lacks trained personnel, equipment, vehicles, supplies and funds.

VISITOR FACILITIES High potential for tourist development in the area of the Elephant Training School as part of a coordinated project to rehabilitate Garamba.

SCIENTIFIC RESEARCH No recent information

SPECIAL SCIENTIFIC FACILITIES It is planned to establish a research laboratory at Nagero.

PRINCIPAL REFERENCE MATERIAL

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STAFF Core staff include: head curator at Gangala-na-Bodio, curator at Nagero and about 180 guards throughout the park. 4 duty gamekeepers and their families at each of the 22 patrol points are responsible for surveillance on the boundary (1980).

BUDGET No information

LOCAL PARK OR RESERVE ADMINISTRATION Head Curator, Parc National de la Garamba, Gangala-na-Bodio, or Institut Zairois pour la Conservation de la Nature, 13 Avenue des Cliniques, Kinshasa Gombe, BP 868 Kinshasa 1.

DATE 1984

NAME Parc national de Tai

MANAGEMENT CATEGORY II & IX (National Park and Biosphere Reserve)

World Heritage Site (Criteria: ii, iv)

BIOGEOGRAPHICAL PROVINCE 3.1.1 (Guinean Rainforest)

LEGAL PROTECTION Total. The buffer zone has the legal status of a managed Fauna Reserve. Tai Forest itself is under the responsibility of the Minister of Forests.

DATE ESTABLISHED Declared as a Forest and Wildlife Refuge in 1926 by the French administration. National Park status on 28 August 1972 by Presidential Decree 75-545. Reduced by 20,000ha (N'Zo Reserve) on 21 March 1973 by Decree 73-132. Redefined by Special Decree 77-348 of 3 June 1977 which added a 20,000ha buffer zone around the park. The area was part of a Forest Refuge under a decree of 16 April 1926, then part of a 425,000ha Fauna Reserve under a decree of 7 August 1956. Accepted in April 1978 as a Biosphere Reserve and in 1982 as a World Heritage Site.

GEOGRAPHICAL LOCATION In southwest Ivory Coast about 200km south of Man and 100km from the coast. Between the Cavally River (which marks the western border with Liberia) and the Sassandra River on the east. In the Districts of Guiglo and Sassandra. 5°15'-6°07'N, 7°25'-54'W

ALTITUDE 80-623m (Mount Nienokoue)

AREA 330,000ha plus 20,000ha buffer zone. Contiguous to N'Zo Faunal Reserve (73,000ha)

LAND TENURE Central Government

PHYSICAL FEATURES An area of ancient peneplain comprising a sloping area of granitic rock broken by several inselbergs formed by volcanic intrusions, including Niénkoué hills in the south. A large zone of schists runs southwest to northeast across the park, dissected in places by tributaries of the watercourses which run parallel to it. Ferralitic soils of generally low fertility but more fertile gleysoils in the south. There are two distinct climatic zones of an equatorial transitional type. Rainfall ranges from mean of 1,700mm in the north to 2,200mm in the south reaching a peak in June with shorter wet season in September followed by a marked dry season from December to February. Small temperature range of 24-27°C due to oceanic influence and the presence of forests. High relative humidity 85-90%.

VEGETATION The park is the last remaining portion of the vast primary forest that once stretched across present-day Ghana, Ivory Coast, Liberia and Sierra Leone. There is a gradation from north to south, with the southern third of the park being the moistest and richest area, especially of leguminous trees. This humid tropical forest has a high level of endemism with over 150 species (16%) identified as endemic to the Tai region. The park contains some 1,300 species of higher plants of which 54% occur only in the Guinea zone. Vegetation is predominantly dense evergreen ombrophilous forest of a Guinean type characterised by tall trees (40-60m) with massive trunks and sometimes large buttresses or stilt roots. Large numbers of epiphytes and lianes form an important element in the lower horizons including Platycterium spp.,

Nephrolepis biserrala, Drymaria sp. and Asplenium africanum. Two types of forest can be recognized: the poorer soils of the north and southeast support species such as the palm Eremospatha africana, ebony Diospyros mannii, Parinari chrysophylla, Chrysophyllum perpulchrum and Chidlowia sanguinea; and the 'Sassandrian' forest in the southwest dominated by the most water-demanding species of ombrophiles: ebony Diospyros and Mapania with numerous endemic species especially in the lower Cavally Valley and the Meno and Hana depressions near Mont Niénokoué. Gilbertiodendron spendium occurs in the swamp forest. Plants which were thought to be extinct such as Amorphophallus staudtii have been discovered in the area. Since commercial timber exploitation ceased in 1972, the forest has recovered well.

NOTEWORTHY FAUNA The fauna is fairly typical of West African forests and the park contains 47 of the 54 species of large mammal known to occur in Guinean rainforest including 5 threatened species. Mammals include mona, white-nosed and diana monkeys Cercopithecus mona, C. nictitans and C. diana, black and white, red and green colobus monkeys Colobus polykomos, C. badius and C. verus (R), sooty mangabey Cercocebus torquatus, chimpanzee Pan troglodytes (V), giant, tree, and long-tailed pangolins Manis gigantea, M. tricuspis and M. longicaudata, golden cat Felis aurata, leopard Panthera pardus (V), elephant Loxodonta africana (V), bushpig Potamochoerus porcus, giant forest hog Hylochoerus meinertzhageni, pygmy hippo Choeropsis liberiensis (V) (the only viable population remaining in the Ivory Coast), water chevrotain Hyemoschus aquaticus, bongo Tragelaphus euryceros, buffalo Syncerus caffer and an extraordinary assemblage of forest duikers including Jentink's Cephalophus jentinki (E), banded duiker or zebra antelope C. zebra, Ogilby's C. ogilbyi, black C. niger, bay C. dorsalis, yellow-backed C. sylvicultor and royal antelope Neotragus pygmaeus. Forest rodents include Lophuromys sikapusi, Malacomys edwardsi and Graphiurus murinus. Also recorded in the park is Dephomyys defua which is characteristic of secondary forest. Birds include white-breasted guineafowl Agelastes meleagrides (E), Nimba flycatcher Melaenornis anna marulae (I), western wattled cuckoo-shrike Campephaga lobata (V), yellow-throated olive greenbul Criniger divaceus (V). Almost 1,000 species of vertebrate have been identified.

POPULATION There are two main groups of inhabitants in the area: the rural Bakoué and Kroumen on the forest edge with only marginal impact on the forest and the aboriginal Baoule who are responsible for most of the forest destruction.

ZONING The park is almost completely surrounded by a buffer zone of about 5km width. Tai Zone de Protection where agriculture is allowed but new plantations or any settlement are prohibited. To the north the Réserve de Faune du N'Zo acts as a buffer.

CONSERVATION MANAGEMENT There is a management plan for the area. Timber concessions have been withdrawn from the large companies.

DISTURBANCES OR DEFICIENCIES There are some cultivation plots in the buffer zone, and forest exploitation in the buffer zone and in the park particularly in the north and along the road bordering the southern boundary where extensive felling is taking place. Theoretically, this is a 'fôret classé', but vast blocks are being clear felled with an enormous waste of splendid timber. Crops such as cocoa, coffee, maize, coco yam, sweet potato and okra are then planted, with cash crops taking up more and more room. Since independence this region has become the principal producer of rough timber. A perimeter road designed to define the boundaries and make protection more effective has had the reverse effect, opening up significant portions of the

park to timber contractors, shifting cultivators and poachers (many of whom are local officials). In 1977, there were said to be many elephants, conspicuous even in the buffer zone. Now only a few remain, probably due to a combination of disturbance and poaching. There is insufficient staff to deal with the extensive poaching that takes place. Other disturbances include gold prospecting in the centre of the park and an impending dam project at Soubre which could severely effect the park by bringing more people into the region. There is a lack of means to carry out effective management, and research has been more theoretical than management-orientated. Timber exploitation remains a potential threat to the park as the forest resource of Ivory Coast is becoming totally exhausted.

VISITOR FACILITIES Visitor facilities are proposed in only one zone near Djiroutou which comprises mainly secondary forest resulting from previous forestry and agricultural activities.

SCIENTIFIC RESEARCH The park is the site of the MAB project on the effects of human interference within the natural forest ecosystem. In this vast research project carried out under the auspices of the University Institute for Tropical Ecology, there is great international scientific cooperation as exemplified by the Ivory Coast, French, Italian, German and Swiss teams presently working together on various research programmes. The site and research project have great potential for training and scientific study. ORSTOM has worked here for a number of years. Ivorian research into forest termites. Included as project under IUCN/WWF Plants Campaign 1984-1985. At present (1984), there is a Dutch team surveying the area, using an ultra-light aircraft to photograph low altitude in order to identify drying trees for use as timber.

SPECIAL SCIENTIFIC FACILITIES There is an ecological station in Andrenisrou basin in the core zone and the Federal German team base at Fedfo camp in the buffer zone. Also MAB station 18km S E of Tai village. Consists of several prefabricated houses, communal kitchen, 2 well-equipped laboratories and electric generator. Controlled and financed nationally and managed by 2-3 Ivorian personnel.

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STAFF About 100 staff from the Ministry of Water and Forest Resources plus members of the University Institute of Tropical Ecology.

BUDGET 1981-85 100 million francs CFA. 1982 WWF Tropical Forest Campaign grant of US\$127,350 towards implementation of the management plan and purchase of a 4-wheel drive vehicle, 5 motorbikes, a motorboat, radio telephones and other essential equipment. German technical assistance.

LOCAL PARK OR RESERVE ADMINISTRATION Ministère des Eaux et Forêts, Direction des Parcs Nationaux et reserves analogues, BP V 178, Abidjan.

DATE 1982

NAME Ngorongoro Conservation Area

MANAGEMENT CATEGORY VIII & IX (Multiple Use Management Area and Biosphere Reserve)

World Heritage Site (Criteria: ii, iii, iv)

BIOGEOGRAPHICAL PROVINCE 3.5.4 (East African woodland/savanna)

LEGAL PROTECTION 25-30% with total protection. Grazing in the remaining area. Hunting prohibited

DATE ESTABLISHED 1959 by Ordinance No. 413 as amended by the Game Parks Law (Miscellaneous Amendments) Act No. 14 of 1975. Accepted as World Heritage Site 1979. Approved as part of Serengeti-Ngorongoro Biosphere Reserve in 1982.

GEOGRAPHICAL LOCATION In the Arusha Region of northern Tanzania, southeast of Serengeti National Park. 2°30'-3°30'S, 34°50'-35°55'E.

ALTITUDE Under 1,500m to 3,648m

AREA 828,800ha. Contiguous to Serengeti National Park (1,476,300ha) and close to Lake Manyara National Park (32,500ha). Serengeti is contiguous to Maswa Game Reserve and Maasai Mara National Park in Kenya. Biosphere Reserve 2,305,100ha. World Heritage Site 809,440ha.

LAND TENURE Government

PHYSICAL FEATURES The open plains of the eastern Serengeti rise to the crater highlands of the volcanic massifs of Loolmalasin (3,587m) and Oldeani (3,168m) dating from the late Mesozoic-early Tertiary period. Ngorongoro Crater is one of the largest inactive, unbroken, unflooded calderas in the world with a mean diameter of 16-19km, crater floor of 26,400ha and a rim soaring to 400-610m above the crater floor. The formation of the Crater and other highlands are associated with the massive rifting which occurred to the west of the Gregory Rift Valley. The conservation area also includes Empakaai crater and Olduvai Gorge famous for geology and associated palaeontological studies. Because of the great amplitude in relief and the dynamics of air masses, there is a great variation in the climate of the area: In the highlands it is generally moist and misty and temperatures can be as low as 2°C in the semi-arid plains, but can often go up to 35°C. Rainfall is seasonal and follows the altitudinal gradient. Annual precipitation varies from under 500mm on the arid plains in the west to 1,400mm along the forested slopes in the east.

VEGETATION A variable climate and diverse landforms have resulted in several distinct habitats. Scrub heath and the remains of dense montane forests cover the steep slopes. The crater floor is mainly open grassy plains with alternating fresh and brackish water lakes, swamps and two patches of Acacia woodland; Lerai Forest, comprising dominant tree species Acacia exathophloea and Rauvolfia caffra; and Laiyanai Forest with Cassipourea malosana, Albizia gummifera and Acacia lahai. The area includes undulating plains covered in grass which become almost desert during periods of severe drought. These grass and shrublands are rich and support very large animal populations. Rhinos, for instance, dine on over 160 species of plants in the Crater. The upland woodlands contain Acacia lahai and A. [seyal].

NOTEWORTHY FAUNA There is a large population of wild ungulates in the crater including wildebeest Connochaetes taurinus, zebra Equus burchelli, eland Tragelaphus oryx, gazelles Gazella granti and G. thomsoni, black rhino Diceros[bicornis] (V) (at least 20; the Ngorongoro Crater represents the only visible breeding population of rhinos left in northern Tanzania) and hippo Hippopotamus amphibius (very uncommon in the area). The crater also has the densest known population of lion Panthera leo. On the crater rim are giant forest hog Hylochoerus[meinertzhageni] (very rare in the area), buffalo Synceros caffer, elephant Loxodonta africana (V), mountain reedbuck Redunca[fulvorufula] and leopard Panthera pardus (V). Serengeti migrants including over one million wildebeest are numerous on the plains. Serval Felis serval and waterbuck Kobus ellipsiprymnus occur in Lerai forest. Particularly common in the reserve are lion Panthera leo, cheetah Acinonyx[jubatus] (V), hunting dog Lycaon pictus (V), hartebeest Alcelaphus[buselaphus], and spotted hyaena Crocuta crocuta. Birds include ostrich Struthio camelus, kori bustard Ardeotis kori, lammergeyer Gypaetus[barbatus], Verreaux's eagle Aquila[verreauxi], Egyptian vulture Neophron percnopterus, rosy-breasted longclaw Macronyx amerliae and lesser flamingo Phoeniconaias minor (on the lake in Ngorongoro crater and Lake Ndutu). Sunbirds in the highland forest include golden winged sunbird Nectarinia reichenowi and eastern double collared sunbird N. mediocris. Papilio sjoestedti (R), sometimes known as the Kilimanjaro swallowtail, flies in the montane forests of Mt. Meru, Mt. Kilimanjaro and Ngorongoro in north-eastern Tanzania. It has a very restricted range but is well protected in national parks.

CULTURAL HERITAGE The NCA has several palaeontological and archaeological sites dating from the Niocene to the recent past. The major archeological features fall under four major headings: Olduvai gorge, Laetoli site, Lake Ndutu site and the Nasera Rock Shelter. The variety and richness of the fossil remains, including those of early hominids, has made Ngorongoro one of the major areas in the world for research and study on the origin and evolution of the human species. Olduvai Gorge archaeological site has produced valuable evidence of the history of early man including the skull of the earliest known hominid Homo habilis (Zinjanthropus) and human footprints of the Pliocene era, as well as fossil bones of long-extinct animals. The various archaeological and palaeontological findings make the area a repository of sequential data for the last 15,000 years, extending back about four million years. This combination makes the area globally unique. It is a museum and a laboratory of the cultural and technological development of man through time and space.

POPULATION There is considerable controversy about the exact number of people in the NCA partly because pastoral people, being mobile, are difficult to enumerate but about 18,000 Maasai (20 percent of the total number in Tanzania) live there with some 126,326 cattle and 140,337 goats and sheep which graze approximately 70-75% of the conservation area. There are no inhabitants in Ngorongoro and Empaakai Craters or the Forest.

ZONING Ngorongoro Crater is a specific use zone where only game viewing is allowed.

CONSERVATION MANAGEMENT The Ngorongoro was first established as a conservation area to benefit the Maasai. The Ngorongoro Conservation Area Ordinance of 1959 created the Ngorongoro Conservation Area Authority (NCAA) which was charged with ensuring multiple land use there to assist in "conserving and developing its natural resources" but it ultimately failed to

function because of lack of rapport between the government officials and the Maasai. By 1960, a draft management plan was prepared, which was revised in 1962 and further reviewed. In 1961 the Prime Minister, Julius Nyerere issued the "Arusha Manifesto". The Tanzanian government is now conducting a pioneer experiment in multiple land use (one of few such areas in Africa) which reconciles the interests of wildlife, Maasai pastoralists and conservation. Cultivation was banned in 1976 due to perceived incompatibility with wildlife conservation. Forest areas protect the local water catchment, soils and vegetation. Ngorongoro Conservation Area Management Plan proposals have been submitted but have been rejected by the Chief Conservator because the proposed plan is regarded as going beyond its terms of reference. Some animals such as buffalo, wildebeest and zebra migrate out of the crater during periods of drought and considerable effort is being made to prevent the migration routes from being encroached upon by settlements and agricultural developments. Efforts have been made to control poaching with the aid of FZS, AWF, TWPF, WWF and the police.

DISTURBANCES OR DEFICIENCIES About 5% of the area has been degraded by trampling and overgrazing. There is poaching, mainly of black rhino and leopards, but lack of equipment and fuel, as well as the rough terrain, make this difficult to suppress effectively. There is no conclusive evidence to indicate that the pastoralists alone are responsible for this poaching threat. Wildebeest have increased to 1.3 million due to control of rinderpest in cattle, but this has brought problems as wildebeest carry the cattle disease malignant catarth fever which kills cattle (although it has little effect on wildebeest). There are uncontrolled fires in grassland areas and in Empaakai crater in particular.

VISITOR FACILITIES There are several lodges around the crater and vehicles and guides can be hired from the Authority to go into the crater.

SCIENTIFIC RESEARCH Various studies based at Serengeti Wildlife Research Centre including monitoring of climate, vegetation and animal populations. The level of research into human and range ecology is extraordinarily low.

SPECIAL SCIENTIFIC FACILITIES The Serengeti Wildlife Research Centre in the contiguous National Park provides a research station and accommodation for scientists, although it has not been used to its full capacity since 1974. The centre is now the responsibility of the newly established Tanzania Wildlife Research Institute.

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STAFF 408 staff (1984)

BUDGET No information

LOCAL PARK OR RESERVE ADMINISTRATION Ngorongoro Conservation Area Authority,
PO Box 1, Ngorongoro Crater.

DATE 1984

NAME Mount Apo National Park

MANAGEMENT CATEGORY II (National Park)

BIOGEOGRAPHICAL PROVINCE 4.26.13 (Philippines)

LEGAL PROTECTION

DATE ESTABLISHED 1936. Selected by the Association of South East Asian Nations (ASEAN) Group as a Heritage Park.

GEOGRAPHICAL LOCATION On the Davao Gulf of the southeast coast of Mindanao Island, Southern Philippines. The park lies to the southwest of Davao township. 6°58'N, 125°17'E (Mt. Apo)

ALTITUDE Up to 2,954m (Mount Apo)

AREA 72,814ha

LAND TENURE State

PHYSICAL FEATURES The park encloses Mt. Apo and Mt. Sibulan, both of volcanic origins and with barren, sparsely vegetated upper slopes.

VEGETATION Includes one of the last remaining patches of virgin rain forest, mostly confined to areas above 12,000m with one small area occurring at 823m in a large deep valley near Todaya. 3 Begonia species are recorded for this primary forest but none occur in cleared areas.

NOTEWORTHY FAUNA This park is one of the last remaining strongholds of the endemic Philippines eagle Pithecophaga jefferyi (E) with a surviving population of some 300 birds.

POPULATION Numerous communities of unemployed "squatters" have become settled in the area. Mount Apo is the ancestral home of the Bogobos people (numbering 10,000 within the park)

CONSERVATION MANAGEMENT There is no effective management regime and few of the National Park's protective regulations are enforced. In 1984 IUCN/WWF recommended several measures to improve management including the consolidation of boundaries, programmes to increase public support and the preparation of a regional integrated resource management plan.

DISTURBANCES, DEFICIENCIES AND MANAGEMENT PROBLEMS In 1983 the Government announced that it was intending to sell off between 30,000 and 50,000ha of the 72,814ha park. A large proportion of land to be sold is already extensively (and illegally) cleared and settled by "squatter" communities, but the demarcation is unplanned and some of the last remaining virgin forests (prime habitat for the Philippines eagle) will also be put on the market together with the eagle's captive breeding centre. The Bureau of Forest Development in the Philippines has pressed for the amendment of the Presidential Proclamation through the Ministry of Natural Resources so that all forested areas will be preserved for the eagle. They have yet to succeed (1984). Other threats include illegal logging and encroachment by shifting cultivators. Some 30% of the park was damaged during the drought and subsequent forest fire of 1982/83

and it is estimated that only half of the park area is still viable as a natural reserve.

SCIENTIFIC RESEARCH Mt Apo was visited in 1976 as part of the survey of Philippines Begonia populations (Sands, 1976)

SCIENTIFIC FACILITIES None

REFERENCES

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Sands, M.J.S. (1976). Begonias and their diminishing environment in the Philippines. Mimeo. Royal Botanic Gardens, Kew.

STAFF In 1976 shared a staff of 12 based at Davao with other reserves in the region.

BUDGET

LOCAL ADMINISTRATION Parks and Wildlife Office, Davao

DATE

NAME Kutai National Park
Taman Nasional Kutai

MANAGEMENT CATEGORY II (National Park)

BIOGEOGRAPHICAL PROVINCE 4.25.13 (Borneo)

LEGAL PROTECTION Fauna fully protected, habitat "managed"

DATE ESTABLISHED Declared a Nature Reserve on 10 July 1936 by the Sultan of Kutai (Zelfbestuurs Besluit No, 80-22) and as National Park at the Bali National Parks Congress in October 1982.

GEOGRAPHICAL LOCATION It is situated on the southside of Sengata River (which forms the northern boundary) on the east coast of East Kalimantan Province (Indonesian Borneo), 70km north of Samarinda. 0°-0°35'N, 117°10'-117°30'E

ALTITUDE 0-300m

AREA 200,000 ha. An extension west of Banumuda is proposed.

LAND TENURE Government owned, managed by Directorate of Nature Conservation

PHYSICAL FEATURES Kutai is in a low, undulating part of the country, dominated by low north-south hills of Miocene clay and sandstone, with occasional coal seams and oil lenses in the sandstones of the east, overlain by Quaternary alluvials in the west. There are a few limestone outcroppings in the south. Most rivers flow eastwards, with the Sengatta river and tributaries draining the northern third, Santan river and tributaries the southern third; west of the main range of hills, the Mememang river flows westward into the giant Mahakam. The eastern end and northern reserve boundaries follow the natural coastline and the Sengata River respectively. Soils are red-yellow podsolics derived from acidic sedimentaries of deep clay alluvials. Rainfall averages between 1,900-2,300 mm per year, with no dry months.

VEGETATION Vegetation classes: lowland rainforest (92%); riverine forest (3%); swamp forest (3%); mangrove forest (3%). The rainforest here is lowland dipterocarp forest, with different sub-types on the sandstone hills and ridges (dominated by Shorea and other dipterocarps) and on the alluvials (also with many dipterocarps, plus Koodersidiodendron pinnatum, Sindora coriacea, Schimo walichii, Vitex pubescens and numerous lianas and climbing palms). Mangroves occur along the coast and at the mouth of the Sengatta river. There are small patches of fresh water swamp forest, including Dillenia, Lithocarpus and Terminalia and in the south, a specialized limestone flora, including Magnolia, Diospyros and Ixonanthes. Kutai is the best reserve for the conservation of 'ulin' Eusidoerxylon zwagerii and its associated species found on the lower slopes in the western portion of the reserve. The flora is extremely rich in large trees; 180 species have been recorded in just 1.2 ha. Uncommon plants include Podocarpus rumphii, Citrus macroptera and Platyterium ridleyi.

NOTEWORTHY FAUNA Superb habitat for primates, with at least 10 species present, including the Borneo endemics proboscis monkey Nasalis larvatus, the long-tailed or crab-eating monkey Macaca fascicularis, Sunda Island leaf

monkey Presbytis aygula and Bornean gibbon Hylobates muelleri, (population density of 12 per sq. km, one of the highest reported), also important habitat of the orang utan Pongo pygmaeus (E). (population density of 3 per sq. km, also relatively high). Other less common primates are pig-tailed macaque Macaca remestrina, silvered leaf monkey Presbytis cristata, tarsier Tarsius [bancanus], and, possibly, maroon leaf monkey P. rubicunda, and whitefronted leaf monkey P. frontata. Among the more common mammals in the study area are the numerous deer, including the mouse deer Tragulus nape, barking deer Muntiacus muntjak, sambar deer Cervus unicolor. The wild pig, Sus barbatus, is also very common. Other animals include the sun bear Helarctos malayanus, the flying lemur Cynocephalus variegatus, the leopard cat Felis bengalensis, monitor lizard Varanus salvator, porcupine, marten, otter, squirrels, bats, treeshrews, civet cats, snakes. The Banmuda area, proposed as an extension to the north, is the only known habitat of the Asian two-horned rhino Dicerorhinus sumatrensis in Kalimantan. Another Red Data Book species is the clouded leopard Neofelis nebulosa (V), Borneo's largest cat. The reserve is extremely rich in birds, with some 150 species from 47 families recorded, including 83% of all forest-dwelling species recorded from all of Borneo; notable species include the Argus pheasant Argusianus argus, the rare crested fireback pheasant Lophura ignita, 8 species of hornbills (Bucerotidae), 17 sunbirds (Necatriniidae), 22 cuckoos (Cuculidae) and 18 woodpeckers (Picidae). Estuarine crocodile Crocodylus porosus (E) may also occur.

CONSERVATION MANAGEMENT A management plan was prepared in 1979 (funded by WWF). WWF Project 1524 involves the revision of the Kutai Nature Reserve Management Plan (for 1984). It has been recommended (1983) that the west and south boundaries should be revised from their present straight line form to fit topographical features and hence make patrolling easier. The boundaries also need to be clearly marked and maintained.

ZONING None proposed

POPULATION There are some 2,392 families believed to be living in the eastern portion of the reserve. The degree of disturbance caused is unknown.

DISTURBANCES OR DEFICIENCIES Continuing timber concessions, oil (PERTAMINA) and mineral exploitation with associated access road construction, lack of effective management aggravated by the conflict between conservation and development interests. There is pressure from local settlement encroachment and associated logging operations which was affecting some 10,000ha in 1983. Current developments for the region (1983) include the construction of a logging road from Sengata (north) to Bontong (south) bisecting the reserve, coalmining the Bungalon area and transmigration settlements in the region. A major forest fire swept through lowland East Kalimantan in February/March 1983 destroying some 3.5 million ha of forest. The fire was the combined effect of hundreds of slash and burn cultivators and was intensified by the 1982 drought induced by El Nino and the effects of selective logging. Damage to the eastern half of Kutai Reserve was serious but many pockets of unburnt forest have survived. One tract of 60,000ha did not burn though many trees died from the drought. Portions of this, however, continue to be logged both under concession and illegally by local villagers.

VISITOR FACILITIES Little reported

SCIENTIFIC RESEARCH Orang utans (Rodman, 1970-1); macaques (Wheatley, 1974-6); primates (M. Leighton, 1977-9); phenology of forest trees (D. Leighton, 1977-9); ecological survey (Tribinarko, 1974-6).

SPECIAL SCIENTIFIC FACILITIES Primate research station at Sengatta, maintained by University of California at Davis and University of Washington, due to be expanded and upgraded.

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STAFF 32, including 2 supervisors, 19 guards, 11 administrative.

BUDGET Rp 28,980,000 (US\$ 46,742) from government in 1979, plus about US\$ 14,000 from WWF. 1982 US\$68,550 funding for WWF Project 1687 (2 year duration)

LOCAL PARK OR RESERVE ADMINISTRATION Waltam Sinaga, Section Head (Kepala Seksi), Jl. Kusuma Bangsa, PO Box 1, Samarinda, East Kalimantan.

DATE 20 September 1979

NAME Cape Tribulation National Park

MANAGEMENT CATEGORY II (National Park)

BIOGEOGRAPHICAL PROVINCE 6.1.1 (Queensland Coastal)

LEGAL PROTECTION Total

DATE ESTABLISHED Thornton Peak National Park established in 1939 and then extended to include Cape Tribulation. Whole area declared Cape Tribulation National Park in 1981.

GEOGRAPHICAL LOCATION North of Mossman. 16°10'S, 145°52'E

ALTITUDE 120-1,380m

AREA 17,100ha

LAND TENURE Government

PHYSICAL FEATURES Carboniferous - grey porphyrite, muscovite biotite and microcline granite, micaceous greywacke siltstone slate, chert, basic volcanics, rich red soil. Low dune and swale mosaic behind beach. Freshwater swamps adjacent to mangrove swamps. Rainfall approximately 4,000mm.

VEGETATION Unique combination of rainforest, mangrove and freshwater swamps. There is a complete altitudinal transect of rainforest with fern thickets and tussock grassland at high altitudes, complex mesophyll vine forest (on eutrophic soils) and nothophyll evergreen vine forest (on oligotrophic soils) at medium altitudes, and extensive evergreen forests and swampy mangrove forests at low altitudes. Several new flora types were found at high altitudes.

NOTEWORTHY FAUNA No information.

ZONING Contains a scientific area

DISTURBANCES OR DEFICIENCIES Threatened by the proposal of a local municipal council (Douglas Shire Council) to construct a 30km road through the park. A hundred metre strip of land either side of the road has been exised for council development. Sufficient surveys and environmental studies have not been carried out and bulldozers have already begun work (1984). Apart from the damage to the forest itself, there is widespread concern that the road would become a through road and encourage resource development of the surrounding lands.

SCIENTIFIC RESEARCH

SPECIAL SCIENTIFIC FACILITIES

PRINCIPAL REFERENCE MATERIAL

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STAFF No information.

BUDGET

LOCAL PARK OR RESERVE ADMINISTRATION National Parks and Wildlife Service of
Queensland, Cairns, Queensland.

DATE 1984

NAME John Pennekamp Coral Reef State Park

MANAGEMENT CATEGORY No category assigned

BIOGEOGRAPHICAL PROVINCE 8.12.04

LEGAL PROTECTION Commercial fishing is allowed with hook and lines, nets and traps for lobster and stone crab are permitted, as is recreational hook-and-line fishing

DATE ESTABLISHED Established in 1961, the first underwater park in the US.

GEOGRAPHICAL LOCATION Florida, from Key Largo seaward to the 4.8[km State territorial limit. Adjacent and landward of the Key Largo Coral Reef Marine Sanctuary.

ALTITUDE

AREA

LAND TENURE

PHYSICAL FEATURES The east end of Rodriguez Bank, an elongated mound (2654[m(x[854[m) supporting Rodriguez Key, lies within the park. It shows distinct zonation of flora and fauna.

VEGETATION A zone of red algae, Goniolithon is found in shallower water, adjacent to a zone of Thalassia testudinum and the calcareous algae, Halimeda. Rodriguez Key supports a dense forest of Rhizophora mangle.

NOTEWORTHY FAUNA Porites clivaricata dominates in a well defined zone, 0.3-1.2[m deep, on the windward margin of the bank. The colonies are not attached to the substrate but are wedged against each other or held by the intergrowth of sponges and green algae.

ZONING

CONSERVATION MANAGEMENT

DISTURBANCES AND DEFICIENCIES Turbidity, caused by dredging, and land-filling. In the early 1970s, the corals within the park were found to be still healthy although some damage was noted on reefs outside the boundaries. Divers and snorkellers have caused physical damage on Pennekamp reef. Pollution has also caused problems and lead and mercury may be accumulating at the John Pennekamp Reef marina. The importance of preserving the mangroves and sea grasses to trap sediment and prevent increased turbidity within the park must be stressed. Recent plan to build 3,500 condominiums along a 16km section of adjacent land bordering both John Pennekamp and Key Largo Coral Marine Sanctuary has given cause for serious concern. If the development proceeds, an impact study has suggested that the coral reefs will be significantly affected by degraded water quality and further ones use.

VISITOR FACILITIES

SCIENTIFIC RESEARCH

SPECIAL SCIENTIFIC FACILITIES

PRINCIPAL REFERENCE MATERIAL

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- CNPPA Summary Status Report (1984). Threatened Protected Areas of the World. (draft)

STAFF

BUDGET

LOCAL PARK OR RESERVE ADMINISTRATION

DATE

NAME Key Largo Coral Reef Marine Sanctuary

MANAGEMENT CATEGORY No category assigned

BIOGEOGRAPHICAL PROVINCE 8.12.04 (Everglades)

LEGAL PROTECTION NOAA regulations permit both sport and commercial fishery with hook and line. Spiny lobster and stone crabs may be taken with woodtraps in accordance with plans outlined by the Regional Fishery Management Council. The removal or destruction of any natural reef feature or marine life (other than spiny lobsters and stone crabs) or other materials is prohibited. There is a blanket prohibition on cutting, displacing or breaking off bottom formation or growth. Dredging, filling, excavating, building, and the discharge of refuse and other pollutants are banned. Tropical fishes cannot be taken. Divers are forbidden to handle or stand on coral formations. Constraints have been placed on the operation of boats in the area to ensure that neither the watercraft nor their anchors damage coral. Regulations are issued under the authorities of section 302 (f), 302 (g) and 303 of the Marine Protection, Research and Sanctuaries Act, 1972.

DATE ESTABLISHED Designated a marine sanctuary on December 18, 1975, by the Federal Government.

GEOGRAPHICAL LOCATION Florida, about 90 km from Miami. Extends from the 4.8 km offshore boundary of the John Pennekamp Coral Reef State Park (contiguous to Key Largo). The northern boundary borders on the Biscayne National Monument. 24°58'-25°19'N, 80°8'-80°25'W.

ALTITUDE About half the sanctuary lies 30-91 m below sea level.

AREA 25,900 ha

LAND TENURE State property

PHYSICAL FEATURES This area comprises the approximate northern limit of reef growth along the mainland coast of the Western Hemisphere, and is recognised as an outstanding example of patch and outer bank coral reefs. It consists of a shallow submerged shelf of sand and Thalassia beds, punctuated with patch and bank reefs. The main formations occur at depths of less than 37 m. It is uniquely located where the scarcity of tidal passes through the Keys restricts mixing of colder turbid less saline Florida bay water with warm Florida current water, keeping the environment of the reef stable. The Keys continuous land mass provides a natural barrier to pollutants, turbidity and cold freshwater. Visibility in the sanctuary is 15-25 m unless the sediment is stirred up by wave action. The bank reefs include Molasses (one of the most complex and productive reefs in the sanctuary), French, Elbow and Carysfort reefs and Grecian Rocks, Key Largo, Dry Rocks and Turtle Reef. Many show spur and groove development. Reef height is usually less than 7.6 m, and averages about 3-4.5 m. These areas are highly diversified often showing distinct zonation. 5 zones have been identified: back reef, a reef flat, an Acropora zone, a Millepora zone and a rubble zone. A deep reef extends to 40 m seaward of the main reef zone. Beyond it, Lithothamnion cobble zone is found, extending to 55 m depth and characterised by an absence of hermatypic corals. The reef flat occupies approximately a third of the reef and is composed mainly of Acropora shingle and dead colonies in situ. Seaward of the

reef flat are two terraces. Both terraces are incised by grooves generally lined at the bottom with coarse sand and rubble. Sand and sediments are scattered throughout the area.

VEGETATION A major portion consists of sea grass beds, dominated by Thalassia testudinum. Syringodium filiforme grows in deeper areas, either forming monospecific sparse zones, or mixed with T. testudinum.

NOTEWORTHY FAUNA 516 fish species have been recorded, many of commercial value. Strombus gigas and Pleuroploca gigantea (Horse conch) are found occasionally on sand areas. Panulirus argus is of prime commercial interest. P. guttatus and Seyllarides aequinoctialis are also found in Florida waters but their small adult size and scarcity make them uneconomical to harvest commercially. Menippe mercenaria, the stone crab is of commercial importance. The hawksbill turtle Eretmochelys imbricata (E) is often seen around the reefs. Coral cover is generally high (80-90%) and reef epifauna is abundant with many gorgonians and soft corals. 35 species of coral are known from the Sanctuary. In the less turbulent areas, thickets of A. cervicornis and Porites porites are found in varying abundance. In some areas, massive head corals develop, dominated by Montastrea annularis. Other common species are Diploria strigosa, D. labyrinthiformis, Colpophyllia natans, Montastrea cavernosa and Siderastrea siderea. Less common species on bank reefs include Agaricia agaricites, Porites astreoides, Mycetophyllia lamarckiana, Colpophyllia spp., Dichocoenia stokesi, Eusmilia fastigiata, Meandrina meandrites and Mussa angulosa. Millepora complanata is important on some bank reefs.

ZONING

CONSERVATION MANAGEMENT Responsibility for management of the Marine Sanctuary lies with the National Oceanic and Atmospheric Administrations (NOAA) Office of Coastal Zone Management. Up to 20% of the Marine Sanctuary area may be closed to the public by NOAA at any time to allow the living resources to recover from overuse or to provide for scientific research. NOAA sets management objectives for the sanctuary, designs and implements research programmes, issues permits and oversees monitoring and enforcement of the regulations. It provides technical briefing material, designs and implements public information programmes, and provides administrative and emergency on site support. The state of Florida Department of Natural Resources provides an onsite manager, responsible for evaluating permit applications, co-ordinating with the US Coast Guard surveillance and enforcement, providing case documentation for notices of violation and submitting semi-annual reports to NOAA. Surveillance is carried out using the same personnel and facilities as for the John Pennekamp Coral Reef State Park. Violators are subject to civil penalties of up to US\$ 50,000 under Federal Public Law 92-532. A management plan has been produced to ensure the long-term viability of the area, and covers issues such as public education, environmental monitoring, regulatory enforcement and monitoring needs. Brochures and pamphlets have been produced for visitors to the sanctuary. A coral reef resource survey of the sanctuary has been co-ordinated by the OCZM and an environmental assessment and biological inventory is being organised jointly by the OCZM and the Florida Dept. of Natural Resources. CNA (1981) designated the sanctuary a Habitat Area of Particular Concern (HAPC).

DISTURBANCES AND DEFICIENCIES Hurricane Donna in 1960 and Hurricane Betsy in 1965 caused considerable damage to some areas, but the reefs recovered in a few years on each occasion. Pollution is a potential threat. In 1975, the greater Miami area pumped 84 million gallons of sewage a day into surrounding

marine waters and it is thought that much of this travels southwards to the Keys. The ocean outfall at Plantation Key, just south of Key Largo, pumps 700,000 gallons of secondary treated sewage a day, and there are two outfalls that dump sewage into Largo Sound. Studies at Carysfort Reef revealed high mortality rates of corals. Recent agricultural and industrial growth in south Florida has increased the potential for pollution from insecticides, herbicides and industrial chemicals. Evidence of oil pollution from vessel traffic through Hawk Channel and off the Marine Sanctuary increases yearly. National recognition as a national marine sanctuary has intensified public use of the area. Heavily used areas of reef are in a distinctly poorer conditions than more remote regions of the park, probably largely due to anchoring and concentrated dive pressure. Boat groundings have also caused serious damage. Spearfishing and collecting of coral, shells and archaeological artifacts still occurs, although illegal. Key Largo was found to have a higher species diversity of fish than a more isolated reef at Las Aves, Venezuela, possibly due to the greater complexity of the reef and the proximity of mangroves and seagrass beds, but it had a lower number of large individuals, possibly due to the effects of spearfishing on groupers, snappers and barracuda. The scarcity of the large molluscs Strombus gigas and Pleuroploca gigantea reflects high collecting pressure in past years. Explosives were used for fishing at Carysfort Reef from about 1900 to the early 1950s. Damage throughout that period was severe but recovery has been fairly complete. Litter is a problem in many areas. Recent plan to build 3,500 condominiums along a 16km stretch of land, bordering both John Pennekamp Coral Reef State Park and Key Largo. If the development proceeds, an impact study has suggested that the coral reefs will be significantly affected by degraded water quality and further over-use.

VISITOR FACILITIES Tourism is crucial to the economy of the Keys and the reefs are a major attraction for the 400,000 holiday makers who come sport fishing and diving each year. (Total usage may be greater as visitors arriving by boat from elsewhere are not recorded). Access to the sanctuary is by boat only, from a variety of facilities on Key Largo, including boat charterers, dive centres and marines. Glass bottom boats take non-divers to Molasses Reef. Swimming, snorkelling, scuba and skin diving, photography and recreational boating are encouraged. Most of the users who visit the reefs concentrate around Dry Rocks, Molasses Reef and a few other locations at the southern end of the sanctuary, opposite the area of greatest urbanisation on Key Largo. Use of Carysfort Reef has increased however due to the development of a marina directly opposite it on Key Largo. Wrecks provide interesting dive sites. Carysfort Reef Lighthouse is an additional attraction for visitors. There is also hook and line fishing. Species taken include groupers, mackerel, dolphin, snappers, hogfish, tarpon, pompano, jacks and bonefish. Spiny lobsters and stone crabs are also taken. Annual catch statistics are not available.

SCIENTIFIC RESEARCH The northern tract reefs have a long history of scientific research which is encouraged in the sanctuary, although a permit must be obtained from NOAA. Periodic monitoring of the physical environment and assessment of the biological community is carried out. A geological study has been conducted to determine the reef's past growth and to outline its geological history. Other studies underway or planned include water quality monitoring, permanent life history monitoring to study growth, recruitment and other factors; biological inventories; periodic assessments of coral mortality, disease and other damage; surveys of lobster and stone crab populations; deepwater surveys using submersibles. NOAA has compiled a bibliography of published scientific research for the area. Annual growth

rates of Montastrea annularis have been determined. A decrease in growth rate was found between 1953 and 1968 which coincides with the increased dredge-and-fill activities in the Florida Keys at that time; the slight increase in growth rates after 1968 can be correlated with a reduction in these activities. Transplantation and growth experiments have been carried out on Acropora cervicornis within the park.

SPECIAL SCIENTIFIC FACILITIES

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STAFF

BUDGET

LOCAL PARK OR RESERVE ADMINISTRATION

DATE

NAME Manu National Park

MANAGEMENT CATEGORY II & IX (National Park & Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 8.5.1/8.35.12 (Amazonian/Yungas)

LEGAL PROTECTION Reserve area protected but no legal protection for the Influence Zone. Rational use of timber permitted within Manu National Forest (included in the reserve).

DATE ESTABLISHED 29 May 1973 by Supreme Decree 0644-73-AG. Created a Biosphere Reserve in 1977. Includes Manu National Forest, established by Supreme Resolution 442-1973.

GEOGRAPHICAL LOCATION Lies in the upper Amazon area of Peru, close to Cusco, the old Inca capital. It includes part of the most eastern mountain range of the Andes and of the lowland region of Amazonia. Located in the provinces of Manu and Paucartambo, in the districts of Madre de Dios and Cusco respectively. The area is bounded on the north and east by the Divortium Aquarum, separating the catchment basins of the Rivers Piedras and the Camisea from the River Manu. It also includes the Manu National Forest, the left bank of the River Alto Madre de Dios and the Atalaya-Tres Cruces highway. 11°19'-13°02'S, 71°07'-72°26'W

ALTITUDE 240-4,000m

AREA 1,881,200ha (including National Park of 1,532,806ha)

LAND TENURE Both the park and the National Forest are state property. The area between the National Park, the National Forest and the left bank of the River Alto Madre de Dios is state property which can, following negotiation be made over to the Agrarian Sector (Agrarian Reform etc.). Influence Zone local community ownership.

PHYSICAL FEATURES Varied relief from high "tablelands" to low forest on flat ground forming the typical abrupt relief of "yungas". Geological background largely belongs to continental sediment. The park consists mainly of the high and low Manu river basin with steep slopes and deep river canyons. The biosphere reserve includes the whole of the hydrographic catchment area of the River Manu and part of the catchment area of the River Alto Madre de Dios. Because it covers a wide range of ecosystems, the climatic parameters of the park are varied: medium annual temperature 20°C-24°C in lowland forest, 5°C in higher parts. Rainfall 1,500mm-3,000mm. High humidity.

VEGETATION Ranging from the alpine grasslands of the Andes to the rainforests of the Amazon, there is probably no other protected area in the world with the diversity of ecosystems and species that compares with Manu. Contains nearly all the ecological formations of eastern Peru: humid forest, humid sub-tropical forest, very humid sub-tropical forest, and very humid low mountain forest, with their respective flora and fauna. This area is consequently the most exclusive and representative in the Amazon basin. As the reserve extends over such a wide range its vegetation is extremely varied. Mahogany, Swietenia sp and Cedrela sp., and the palm Phytelephas macrocarpa stand out in the very humid wet forests. Other important species include cedar, capirona, cético, lupuna and quinilla. There are also numerous species of palms, grasses, shrubs and epiphytes. Some botanists claim that Manu has more plant species than any other protected area on earth.

NOTEWORTHY FAUNA There is an interesting contrast between the species living in the high mountains and those living in the plains. Among the most important are the following: anteater, wolf ("lobo de rio"), tigrillo, jaguar Panthera onca, coloured deer, sachavaca, grey deer, white tailed deer Odocoileus virginianus, Andean guemal Hippocamelus antisians, dwarf brocket deer Mazama chunyi, spectacled bear Tremarctos ornatus, (V) giant armadillo Priodontes giganteus, (V) puma Felis concolor and pampas cat F. colocolo (occasionally), ocelot F. pardalis, (V) spectacled caiman Caiman [crocodilus] [crocodilus] (V), black caiman Melanosuchus niger (E), two species of river turtle, giant otter Pteronura brasiliensis, (V) white lipped peccary Tayassu pecari, twelve species of primates including howler monkey Alouatta sp., capuchin monkey Cebus sp, Emperor tamarin Saguinis imperator (I), red uakari Cacajao [rubicundus], (V) squirrel monkey Saimiri sp. and spider monkey Ateles [sp.], boa, black lizard, white lizard, numerous species of snakes including vipers. There is probably over 800 bird species in the park (about a quarter of the Latin American total) including: Hoatzin Opisthocomus [hoatzin], macaw Ara spp., yellow-rumped cacique Cacicus cela, Andean condor Vultur gryphus, jabiru stork Jabiru mycteria, Tremarctos [ornatus], sparrowhawk, cashew bird, herons, owls. Andean lapwing Vanellus resplendens, white-winged cinclodes Cinclodes atacamensis, flocks of buff-necked ibis Theristicus caudatus and green-winged teal Anas crecca inhabit the small lakes. The Andean flicker Colaptes rupicola is also present. Approximately 850 bird species have been recorded. The indigenous fishes are well represented in the rivers.

ZONING The area of the reserve containing the National Forest and part of the National Park constitutes the core zone; the buffer zone comprises the area of land traditionally used for agriculture and stock-raising.

CONSERVATION MANAGEMENT There is a management plan for the National Park.

DISTURBANCES OR DEFICIENCIES A wide range of threats. The government is considering the construction of a major road along the Manu River through the park. The road is essentially for the promotion, settlement, forestry, agriculture and ranching and will effectively divide the park. Oil and mineral exploration are being conducted and new concessions have been applied for. A canal project would connect two of the watersheds in the park which would affect streamflows and allow boat access. A Dominican Mission has applied for a logging concession and intends to establish a settlement for workers. An American company has recently been granted a gold prospecting concession which, if it proves lucrative, could lead to a gold rush. This would cause enormous problems for the park. Timber encroachment by the local population is another problem. Tourism is very light within the core zone.

SCIENTIFIC RESEARCH Studies conducted at the Coscha Cashu and Panahua Biological Station have been concerned with wildlife (Melanosuchus niger, birds and primates by foreign universities; Pteronura brasiliensis by the National Agronomy University of La Molina) as well as the indigenous Machiguenga community living in the park (bio-anthropological studies). Intensifying studies could help evaluate natural resources for the purpose of their adequate management. In addition, the protection of the National Park will allow comparative studies with zones modified by man. Research programme but no monitoring programme.

SCIENTIFIC FACILITIES Biological station in Cashu laguna. Guard posts can be used as cabins for bird watching etc. Vehicles for ground/water exploration. Sierra zone is relatively accessible, being only six hours by road from Cuzco. However, the distance to the lower forest zone by outboard motor boat requires 16 hours (2 days).

PRINCIPAL REFERENCE MATERIAL

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CNPPA Summary Status Report. (1984). Threatened Protected Areas of the World. (draft)

STAFF 3 professionals, 2 technicians, 27 park guards

BUDGET 1979: approx. US\$ 65,000; 1980: US\$ 100,000; 1981: aprox. US\$ 160,000. 1982: WWF/IUCN Tropical Forest Campaign sponsored the building of guard posts, training of rangers and equipment to protect the area from illegal settlers, hunting, logging and gold mining. 1983-85: W.W.F. Tropical Forest Campaign grant of US\$ 150,000

LOCAL PARK OR RESERVE ADMINISTRATION Centro de Datos para la Conservacion, Departamento de Manejo Forestal, Universidad Nacional Agraria, La Molina. Apartado Postal 456, Lima, Peru.

DATE 1983

NAME Araguaia National Park

MANAGEMENT CATEGORY II (National Park)

BIOGEOGRAPHICAL PROVINCE 8.30.10 (Campos Cerrados)

LEGAL PROTECTION Total

DATE ESTABLISHED 31 December 1959 by Federal Decrees 45,570 and altered by Decree 68,873 (5 July 1971) and 71,897 (1 March 1973)

GEOGRAPHICAL LOCATION Ilha do Bananal, 750km northwest of Brasilia, west central region, Goias state. 9°00'-10°50'S, 49°56'-50°37'W

ALTITUDE 200-240m

AREA 562,312 ha (2,000,000 ha were proposed in the original act (the entire Ilha di Bananal) but the effective size was still only 3000 ha in 1972)

LAND TENURE It is hoped that ownership of land will be transferred to Goias state soon.

PHYSICAL FEATURES The park includes part of the 2,000,000 ha island of Bananal, the largest fluvial island in the world. The main parkland, situated between the mainstream of the Rio Araguaia and a smaller branch, is flat, composed of quaternary fluvial sediments on Mesozoic sandstones, and is covered with numerous permanent lakes and seasonally flooded plains.

VEGETATION A transition zone between the woody savanna or "Cerrados" and Amazon forests. Gallery forests along the river banks and a large forested area at the northern end. Scattered marshland, and seasonally flooded grassland.

NOTEWORTHY FAUNA The fauna, like the vegetation, is transitional, and includes giant anteater Myrmecophaga tridactyla (V), maned wolf Chrysocyon brachyurus (V), bush dog Speothos venaticus (V), giant otter Pteronura brasiliensis (V), jaguar Panthera onca (V), puma Felis concolor, marsh deer Blastocerus dichotomus (V), pampas deer Ozotocerus bezoarticus, American tapir Tapirus terrestris, harpy eagle Harpia harpyia (R), hyacinthine macaw Anodorhynchus hyacinthinus, anaconda Eunectes murinus, South American river turtle Podocnemis expansa and arapaima Arapaima gigas. IUCN (1977) also record giant armadillo Priodontes giganteus (V) and black-fronted piping guan Aburria jacutinga (E).

ZONING Intangible, Primitive, Extensive Use, Intensive Use, Recuperation, and Special Use Zones.

DISTURBANCES OR DEFICIENCIES Protection is not enforced, with free-ranging domestic animals present, land tenure problems and poaching. In December 1982, the President of Brazil formally allowed the building of a road through the centre of the Park. No details are available on the impacts of this road.

VISITOR FACILITIES Major tourist areas are outside the park in the central and southern parts of Bananal Island. Provisional headquarters is at Macaubas where there is an airstrip and a port for small boats.

SCIENTIFIC RESEARCH No information.

SPECIAL SCIENTIFIC FACILITIES Housing is available for scientific research workers.

PRINCIPAL REFERENCE MATERIAL

de Miranda Bastos, Humberto. Parque Nacional do Araguaia - Informe Turistico Management Plan.

CNPPA Summary Status Report (1984). Threatened Protected Areas of the World (draft)

Cartography 1:50,000, aerial photos.

STAFF 1 director, 1 technician, 12 park guards.

BUDGET No information.

LOCAL PARK OR RESERVE ADMINISTRATION Levi Vargas, Director of the Park, Rua 229, no. 95 Setor Universitario - 74.000 Goiânia-Goias.

DATE 20 May 1981

NAME Juan Fernandez National Park

MANAGEMENT CATEGORY II & IX (National Park & Biosphere Reserve)

BIOGEOGRAPHICAL PROVINCE 5.4.13 (Southeastern Polynesian)

LEGAL PROTECTION Total, administered by the Chilean Forestry Service (CONAF). General prohibition on the exploitation of flora and fauna, especially the felling of chonta palms (*Juania australis*) and tree ferns on Robinson Crusoe island. Decree 1310, 18 August 1954, limits livestock raising and exploitation of forests; Decree 619, 15 September 1954, prohibits hunting.

DATE ESTABLISHED National Park established 16 January 1935 by Decree 103. Accepted as Biosphere Reserve is January 1977.

GEOGRAPHICAL LOCATION The whole of the Archipelago consisting of Robinson Crusoe, Alexander Selkirk and Santa Clara islands and all the islets in the area, with the exception of about 44ha occupied by the town of San Juan Bautista, Robinson Crusoe island. 650km from the Chilean coast in the Pacific ocean, 33°41'S, 78°47'-80°47'W.

ALTITUDE 0-1,650m

AREA 18,300 ha. Reassessment of the islands has suggested that the true area is closer to 9,000 ha (Robinson Crusoe 4711 ha, Alexander Selkirk 4464[ha, Santa Clara 223 ha)

LAND TENURE 97% state property, 3% private (concentrated around San Juan Bautista)

PHYSICAL FEATURES The archipelago is volcanic in origin and consists of steep and rugged mountain ranges with deep ravines. There are various types of lava, some 400m deep. Robinson Crusoe island (22km by 7km) has a 20km mountainous central ridge rising to 900m (El Yunque) and dividing arid treeless 'prados' (western) and moist-zone habitats. Santa Clara, lying 2km south-west of Robinson Crusoe is dry and uninhabited. Alexander Selkirk island (11km by 6km) rises to a high plateau dissected by deep ravines with forest extending to about 700m and a peak of 1,650m (Los Inocentes). Vertical veins of basalt run through Robinson Crusoe island and are continued through to the neighboring Santa Clara. The great block which apparently once formed the 3 islands, was split by an undersea eruption during the tertiary period. The climate is maritime with average monthly temperatures fluctuating by less than 6°C (average 15.2°C). Annual rainfall 1,289mm, 75% of which occurs during the winter. Average relative humidity 76.5%

VEGETATION The islands are characterised by a variety of unusual growth forms and nearly 60% endemism among the vascular species. 146 species of native flowering plants have been recorded, including 1 endemic family (Lactoridaceae), 10 endemic genera and 97 endemic species. The ferns and fern allies are represented by 54 species, 19 of which are endemic, *Thrsopteris*, one of 4 genera of tree-ferns, forms the endemic monotypic family Thrsopteridaceae. There is also 67% endemism in phanerogams. Most spectacular is the evolution of the *Compositae*, the majority of which have a shrubby or arborescent growth-habit on the islands as compared with their mainland counterparts; out of 30 species, 28 are endemic, eg. the cabbage trees *Dendroseris*. Temperate, but humid forests grow in the elevated parts of the islands and favour woody growth-habit in a number of families more

commonly associated with herbaceous species eg. Selkirkia (Boraginaceae), Wahlenbergia (Campanulaceae), Chenopodium (Chenopodiaceae) Plantago (Plantaginaceae), Eryngium (Umbelliferae) and Boehmeria (Urticaceae). By contrast 2 species of the composite genus Robinsonia have the unusual habit and habitat of epiphytes on tree ferns. Adaptive radiation occurs in Robinsonia and, more strikingly in Dendroseris, Phoenicoseris, Heperoseris and Rea. Other notable Fernandez genera showing speciation are Blechnum, Peperomia, Gunnera, Haloragis, Eryngium, Solenum and Wahlenbergia. The distance between the islands of Robinson Crusoe and Alexander Selkirk has led to the marked insular confinement. Only 27 species of phanerogams are common to both islands. Of the endemics, 50% are confined to Robinson Crusoe, 33% to Alexander Selkirk, and 1% to Santa Clara. Among those restricted to Robinson Crusoe are 2 formerly economic species - the chonta palm Juania [australis (R)] and the native sandalwood Santalum fernandezianum (Ex). Also notable is Lactonia fernandeziana (E) which belongs to a primitive monotypic family and Yunquena terzii, which is only known from the 3ha summit area of El Yunque. According to Skottsberg (1952), the vegetation of Robinson Crusoe island can be divided into the following communities: a steppe community (prados) consisting of Gramineae such as Stipa fernandeziana and Piptochaetium bicolor; an evergreen scrub community of Chilean myrtle Ugni selkirkii and the tree fern Blechnum cycadifolium; a sub-antarctic forest with Nothomyrica fernandeziana (the most wide-spread tree), Fagara mayu, Drimys winteri var confertifolia, Juania australis, Berberis corymbosa and the Juan Fernandez apple tree Boehmeria excelsa in the lower reaches of the zone, and grading upward to associations such as Cuminia fernandeziana, C. eriantha, and Gunnera peltata. Alexander Selkirk island is characterised by grasses and the Juan Fernandez tobacco Nicotiana cordifolia, the endemic umbellifer Eryngium sarcophyllum and rare examples of hardwoods - Sophora fernandeziana (V), S. [masafuerana] (E) and Luma forest Myrceugenia fernandeziana, which are only known from Alexander Selkirk. There is also a temperate Magellanic element, particularly in the uplands of Alexander Selkirk, which includes Acaena, Drimys, Empetrum, Escallonia, Gunnera, Pernettya, Ranunculus, eg. R. [caprarum] [(E possibly Ex), Rubus, and Ugni. Santa Clara is treeless with Gramineae such as S. fernandeziana, P. bicolor, and the rare endemics Solanum [robinsonianum], Dendroseris litoris and D. pruinata.

NOTEWORTHY FAUNA There are a few native species and some introduced. The Juan Fernandez fur seal Arctocephalus philippi (V) is the most important mammal. Birds include the Juan Fernandez tit-tyrant Anairetes fernandezianus, the Juan Fernandez remoliner Cinclodes oustaleti, the masafura rayadito Aphrastura masafuerae, the masafuera eaglet Buteo polyosoma exsul, the Juan Fernandez humming bird Sephanoides fernandensis, the Juan Fernandez buzzard Falco sparverius fernandensis and the nuco Asio flammeus suinda. The marine fauna is very rich and diverse, including the lobster Vasus frontalis (which sustains the economy of the island), the Juan Fernandez cod Hectoria oxygeneios, the atherine Basilichthys fernandezianum, the white sea-bass Sciaea fasciata, horse mackerel Trachurus murphy and the hake Merluccius gayi.

POPULATION Robinson Crusoe Island - settlement of San Juan Bautista at Cumberland Bay in north east, outside park boundary, population 510 (1983). Alexander Selkirk Island - seasonal fishing settlement at Colonia in east occupied from October to May. Santa Clara - uninhabited.

ZONING In accordance with the management plan, the most important zone is the primitive one, followed by the intangible zone, the extensive use zone, the natural recuperation zone, the special use zone and the intensive use zone.

CONSERVATION MANAGEMENT In 1976, a management plan for the national park was published, setting out goals for the conservation of native biotic communities, scientific research, protection of landscapes, education, recreation and economic development through tourism. Successive local authorities have attempted to control erosion on the slopes near San Juan Bautista by reforestation mainly with eucalyptus and conifers. Recently CONAF prepared a project outline incorporating both the control and eventual elimination of feral animals, and the cultivation and propagation of endangered plants ex situ, with a view to re-stocking suitable pilot areas. So far, this programme has had success with the propagation of the palm Juania austalis and species in the genera Berberis, Chenopodium, Sophora, Fagana, Dendroseris (sensu stricto) and Rea. The Juan Fernandez are the focus for a project under IUCN/WWF's Plants Campaign Programme which would involve the assessment of wild populations of each native species, propagation of endangered species ex situ in nurseries and greenhouses, training in horticultural techniques, and livestock control. A public awareness programme will be initiated. CONAF has had a certain amount of success with the recovery of the Juan Fernandez fur seal from near extinction in the 1950s to a thriving population now in excess of 3,000.

VISITOR FACILITIES Tourism has been encouraged both as a function of the National Park and to ease economic dependence on the Juan Fernandez lobster. A road was to have linked the settlement with a small landing-strip in the south-west of Robinson Crusoe island (see below) but visitors now continue to be transport by boat.

DISTURBANCES OR DEFICIENCIES Serious threat from 3 sources (1) Herbivorous mammals - goats, cattle, horses, donkeys, pigs, sheep, rats and rabbits - have all been introduced (in some cases as early as 1574) causing irreparable grazing damage. Most urgent needs are to reduce the numbers of feral cattle and sheep on Robinson Crusoe island and goats on Alexander Selkirk island. Other introduced animals include the coatimundi Nasua narica, the four-eyed sapito Pleuroderma thaul and the vineyard snail Helix pomatia. (2) Erosion caused by livestock grazing. This is the most serious threat and most difficult to control on the steep volcanic terrain. Some 46% of Robinson Crusoe island is considered affected especially in the east and round Cumberland Bay. Native forest survives in high ridges and steep ravines. In many other places bedrock is exposed. Regeneration is unlikely to occur because of the presence of weedy alien species. The decline of Luma forest on Robinson Crusoe island has led to widespread repercussions proving detrimental to many species including the Juan Fernandez Tit-tyrant, endemic to the island. In the late 1970s there was an attempt to construct a road across Robinson Crusoe, which was abandoned because of the environmental hazards involved. Similar erosion problems exist on Alexander Selkirk. (3) Alien flora. Introduced plants such as the Chilean Maqui Aristotelia chilensis and a bramble Rubus ulmifoliosus have become dominant and have extensively over-run plant communities. The native myrtle Ugni selkirkii is being rapidly replaced by the introduced U. molinas. On the dry treeless 'prados' of west Robinson Crusoe Island, several species of European grass and thistles are widespread. In addition to these 3 threats, there has been selective felling of native trees, especially of the chonta palm J. australis and the sandalwood tree S. fernandezianum, now thought to be extinct.

SCIENTIFIC RESEARCH Annual returns of fauna are produced. According to the management plan, research priority is given to the study of the eradication or control of introductions, methods of erosion control and soil reclamation, plant succession, inventory of flora and fauna, and habitat requirements of endangered species. IUCN/WWF Project 1410, begun in 1981, aims to continue studies on the seal population and to establish a conservation plan for the

seal. The project will include censusing, tagging, land exploration to detect breeding areas, mapping, behavior and reproductive studies, and an education campaign. So far research is scarce, and has been in relation to the importance of the resources.

SPECIAL SCIENTIFIC FACILITIES None.

PRINCIPAL REFERENCE MATERIAL

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- Biosphere Reserve nomination submitted to UNESCO.

STAFF 1 administrator, 2 rangers, 10 permanent workmen and 10 temporary workmen.

BUDGET US\$ 20,000 for the control of rabbits, and also for personnel and control procedures. IUCN/WWF Plants Campaign project 1984-86 US\$ 100,000.

LOCAL PARK OR RESERVE ADMINISTRATION Ricardo Meza, Corporacion Nacional Forestal(CONAF), V Region, 3 Norte 541, Vina del Mar, Chile.

DATE October 1984

NAME Durmitor National Park (Tara Canyon Biosphere Reserve)

MANAGEMENT CATEGORY II & IX (National Park & Biosphere Reserve)

World Heritage Site (Criteria: ii, iii, iv)

BIOGEOGRAPHICAL PROVINCE 2.33.12 (Balkan Highlands)

LEGAL PROTECTION

DATE ESTABLISHED 1952 as a National Park (Sluzbeni list Nar. Rep. Crne Gore (No. 14/1952). Accepted as a World Heritage Site in 1980

GEOGRAPHICAL LOCATION In Republic of Montenegro, Yugoslavia. 42°58'-43°17'N, 18°16'-19°27'E

ALTITUDE 450-2,522m

AREA 32,000ha

LAND TENURE State ownership

PHYSICAL FEATURES The Durmitor National Park comprises Mount Durmitor plateau and the valley formed by the canyon of the River Tara, incorporating three major geomorphological features: canyons, mountains and plateaux, ranging in elevation from about 450m to 2,522m. Because of its geographical location and range in altitude, the Park is under the influence of both Mediterranean and alpine micro climates which has resulted in an exceptional range of species. Geologically the Durmitor and Tara canyons are made up of rocky massifs of the secondary era (from the lower Triassic to the upper Cretaceous), tertiary and quaternary eras. The dominant features are the limestone formations of the middle and upper Triassic, the upper Jurassic and the upper Cretaceous, especially the so-called Durmitorean flysch. The River Tara, one of the last wild rivers in Europe, has pure, clear waters, a gorge of 1,300m depth and notable floristic and faunistic diversity. The 16 glacial lakes of the Durmitor and the canyons of the Tara, Susica and Draga rivers were formed during the quaternary period, following the sudden thaw of the snow and the formation of glaciers on the Durmitor and neighbouring mountains. The waters of the largest lake, Black Lake (Crno jezero) feed two separate river basins: the River Tara, and underground through the Durmitor Massif to the River Komarnica or Piva. There are numerous examples of weathering processes, rock shapes and land features characteristic of karstic erosion, fluvial erosion and glacial erosion.

VEGETATION Vegetation zones include deciduous forest, coniferous forest, sub-alpine zones of Fagetum subalpinum and Pinetum mughi and Alpine meadows. The park supports a rich karstic flora with many rare and endemic species including Verbascum durmitoreum (R), Gentiana levicealix, Edraianthus glisicii, E. sutjeskae, Valeriana braunii-blanquetii, Daphne malyiana (V), Carum velenovskyi, Saxifraga prenja, Trifolium durmitoreum, Oxytropis jacquinii, Silene graminea and Viola zoysii. There are 37 taxa endemic to the area and 6 specific to Durmitor. The Park contains one of the last of the virgin black pine Pinus nigra forests in Europe, on soils that would usually develop beech woodland.

NOTEWORTHY FAUNA The Tara and its tributaries, as well as the lakes, contain a large number of salmonidae including Salmo trutem fario, Hucho hucho and Thimalus thimalus. Forest fauna include brown bear Ursus arctos, wild boar

Sus scrofa, wild cat Felis silvestris, chamois Rupicapra rupicapra, various species of eagle, capercaillie Tetrao urogallus, black grouse Lyrurus tetrix and rock partridge Alectoris graeca.

ZONING The Park contains 7 reserves under special management, grouped in 3 zones: i) Mlinski potok and Black Lake Basin containing 270ha of mixed forest including Spruce, fir, beech, black pine and maple. The unusual hydrology of Black Lake and the virgin forest of Mlinski are the principle reasons for the areas special management status. There is also a 5ha peat bog (Barno lake) at 1,450m with an interesting lucustrine flora. ii) Tara Gorge Biosphere Reserve which includes the 3,000ha gorge, 40ha virgin black pine Pinus nigra forest which is unusually productive for growing in calcareous soil, and 70ha Zabojski Lake with its interesting hydrology which is currently being studied. iii) Skrc Lakes and Susica Valley of 2,500ha in the north-east of the Park, managed to protect and facilitate the study of chamois Rupicapra rupicapra and other rare animals.

POPULATION 4,000 people live within the park boundaries which enclose parts of five communes.

DISTURBANCES OR DEFICIENCIES There are two major threats. One arises from a lead processing factory, 32 km upstream from the canyon. The current holding tanks for storage of waste waters rich in heavy metals are due to fill in 1985. As it is not possible to provide new tanks and as 2,000 workers would lose jobs if the plant were closed down, the government has opted to discharge wastes into the Tara River. A conservation symposium held in Montenegro declared that if this happens, the river would become biologically dead. The second threat is from a hydro project planned for the gorge. An alternative scheme which would not affect the canyon has been presented by the Yugoslavia Institute for Nature Protection, but the government has not yet responded. In addition to these two threats, there has been reduction of the forested areas because of indiscriminate felling and indiscriminate building has resulted in the loss of arable land and pasture. Most of the high altitude pastures are grazed by sheep and cattle during the Summer. Some of the lakes are draining into subterranean swallow-holes.

SCIENTIFIC RESEARCH No information

SPECIAL SCIENTIFIC FACILITIES No information

PRINCIPAL REFERENCE MATERIAL Division of Ecological Sciences, Unesco has lists of endemic plants, the aquatic fauna and terrestrial fauna (reptiles, birds and mammals).

Birks, H.J.B. and Walters, S.M. (1973). The flora and vegetation of Barno jezero, Durmitor, Montenegro, Glasilo Republ. zavoda za zast. prirode - Prirodnjackog muzeja Titograd, No. 5, Titograd, 1972.

World Heritage nomination (1979). (Contains a list of references in Serbo-Croat.)

Wojterski, T. (1971). National Parks of Yugoslavia, Poznon.

STAFF 3 administrative staff. Surveillance provided by 6 skilled workers.

BUDGET 2,000,000 dinars in 1979

LOCAL PARK OR RESERVE ADMINISTRATION SlZ Nacionalnog parka Durmitor, Institute for the Protection of Nature, P.O. Box 2, Titograd 81001.

DATE February 1979

NAME Krkonôse National Park

MANAGEMENT CATEGORY II (National Park)

BIOGEOGRAPHICAL PROVINCE 2.32.12 (Central European Highlands)

LEGAL PROTECTION An Act to preserve and enhance the quality of the landscape and to preserve the rare species of plants and animals and geomorphological phenomena.

DATE ESTABLISHED 17 May 1963 by Act No 41/63

GEOGRAPHICAL LOCATION East Boheme. 50°45'N, 15°30'E

ALTITUDE 528-1603m

AREA 38,000ha

LAND TENURE National property

PHYSICAL FEATURES A mountain area mainly composed of crystalline schists. The area bears evidence of Pleistocene glaciation.

VEGETATION Mostly covered by forests of Picea excelsa, local remnants of natural mixed woods with Fagus silvatica, Acer sp.div., Sorbus aucuparia. Above the upper limit of forest there are growths of Pinus mugo subsp. montana and mountain meadows with Nardus stricta. In the upper part there are numerous peat bogs. There are many species of mountain flora, including many relic and endemic species: Sorbus sudetica, Campanula concortica, Salix[laponum], Hieracium alpinum s.l., Saxifraga nivalis, Rubus chamaemorus, Saxifraga oppositifolia, Cryptogramma crispa, Crocus albiflorus, Pulsatilla[vernalis], Anemone narcissiflora, Gentiana asclepiadea, Primula[minima], Daphne mezereum, Lilium martagon, L.bulbiferum, Mulgedium[alpinum], Aconitum napellus and Hieracium aurantiacum.

NOTEWORTHY FAUNA There are many species of mountain fauna, including many relic and endemic species: the alpine shrew Sorex lpinus and a white-toothed shrew, Crocidura suaveolens, the northern bat Eptesicus nilssonii, pond bat Myotis dasycneme and particoloured bat Vespertilio murinus, merlin Falco columbarius, rock thrush Monticola saxatilis, redpoll Acanthis flammea, ring ousel Turdus torquatus and dotterel Eudromias morinellus; the alpine newt Triturus alpestris, and the snail Vertigo artica.

ZONING There are 10 nature reserves under strict protection status and 2 large nature reserves under mild protection status.

DISTURBANCES OR DEFICIENCIES Acid rain. In a recent study on air pollution effects on national parks in Central Europe, this park was shown to be the most seriously threatened. Fully half of the park's forested area is heavily damaged and 1000 ha are already dead. In addition, forestry and agriculture are not restricted except within the territories of state nature reserves.

VISITOR FACILITIES The area is intensively used for both winter and summer recreation, and for winter sports. There are many hotels and, in particular, organization-owned hostels.

SCIENTIFIC RESEARCH Research has been undertaken by several universities and institutions and by the Czechoslovak Academy of Sciences, and covers the fields of geomorphology, botany, zoology, forest and climate.

SPECIAL SCIENTIFIC FACILITIES None.

PRINCIPAL REFERENCE MATERIAL

Sourek, J. (1969). Kvetena Krkonos, Academia, Praha.

STAFF 50 officers, 40 guards

BUDGET 5 mil. Kcs

LOCAL PARK OR RESERVE ADMINISTRATION Sprava Krkonosskeho narodniho parku, Vrchlabi.

DATE

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