CONSULTANT'S REPORT OF

BIODIVERSITY ANALYSIS

FOR USAID PID MISSION

NATURAL RESOURCES MANAGEMENT PROJECT

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1. Selection of Kalimantan for Project Area

In terms of species richness and levels of local endemism, two areas of Indonesia stand out as being of by far the greatest importance - Kalimantan and Irian Jaya, being respectively the largest and most diverse forest blocks of the Sundaic and Papuasian biological sub-regions. Of the two, Kalimantan appears to be in the greatest need of conservation efforts because the resource base is more seriously threatened. Kalimantan has a higher population density, is facing greater immediate threats from logging, transmigration, shifting cultivation and industrial plantations, and has less forest area remaining and less proportional area reserved for conservation purposes.

Kalimantan is the richest rainforest area in the Sundaic portion of Indonesia with 14% more plant species than the next richest island Sumatra and far greater levels of endemism. 34% of the flora including 59 genera are endemic to Borneo compared with 12% and 17 genera for Sumatra and only 10% and 7 genera for Java. Of particular significance, Borneo is the centre of the world distribution of the family Dipterocarpaceae, by far the most important tree family in SE Asia for timber and the dominant family in most forest types. 262 species of Dipterocarp occur in Borneo and most of these are present in Kalimantan. Dipterocarp forests show the greatest species diversity of all forest types on Borneo but are one of the least well-represented vegetation types in the Kalimantan nature reserve system and also the type facing the greatest pressure from the timber industry.

Borneo also has high levels of vertebrate endemism with 30 bird species and 44 mammals unique to the island.

2. Historical Problems facing Reserve Development and Protection.

There are a total of 25 existing natural reserves in Kalimantan, including two national parks (taman nasional) 14 nature reserves (cagar alam) 5 game reserves (suaka margasatwa) and 4 recreation parks (taman wisata/taman laut). In total these cover 2.8 million ha. or 5.2% of the region (see Appendix 1 and maps 1 to 4).

In addition another 6 reserves have been identified as important for conservation and have been reserved for conservation purposes on the Forest Land-use Concesus Maps (TGHK) but are as yet ungazetted.

Between them, these existing and proposed reserves contain the full range of recognised habitat types of Kalimantan (see map 5) and contain viable populations of all bird and mammal species known from the four Kalimantan provinces, except rhinoceros which may now be extinct here.

Despite this apparently good coverage by reserves, several factors give rise to serious concern about the future of Kalimantan's rich living resources.

Forest loss in Kalimantan is among the fastest in the whole region due largely to the relative ease of logging brought about by the rather gentle gradients and multitiude of convenient broad rivers for rafting out logs, combined with the very high prices commanded by Bornean timbers and the hunger of many sawmills constructed along the coasts of Kalimantan.

Very large areas of Kalimantan have also been destroyed as a result of slash and burn agriculture practiced by indigenous and transmigrant families in an effort to seek agricultural production on soils too weak to sustain permanent agriculture. The rate of such agriculture has increased with the fast expanding population and is greatly facilitated by the spreading network of timber roads that make new forest areas accessible to land-hungry farmers.

Another serious loss of natural habitat is caused by large-scale industrial plantations to plant rubber, cocoa, pepper, oil palm, coconuts and other crops. More land has been cleared for Indonesia's controversial transmigration policy, with already over 300 thousand new settlers having been dropped in Kalimantan so far from Java. In 1982/3 large fires destroyed 3.4 million ha. of forest.

The reserves themselves are not immune to these forms of forest destruction. There are many examples of illegal logging in reserves, timber concessions overlapping reserves, transmigration schemes falling inside reserve boundaries, large-scale fires destroying reserves, villages living in and clearing fields in reserves, mining activities in reserves, and uncontrolled poaching and trapping of wildlife in reserves.

Failure to protect the reserve system is rooted in many causes - lack of interest and lack of funds for conservation, staff shortages, lack of training and motivation, lack of supervision of field staff, field staff being absent from duty posts, poor controls of regional land-use planning, inaccuracies of maps, reserves having unrealistic and often invisible boundaries, etc.

The present project recognises the great need to conserve the valuable biodiversity of Kalimantan and is designed to solve many of the present problems.

3. Policy Relating to Natural Resource Management.

In general, Indonesian policy regarding the use of natural resources is very good. The problems lie mainly in implementation and law enforcement.

National policy provides adequate provisions for the establishment of nature reserves and relatively large areas are already gazetted as such.

In theory, forestry operations are regulated by many excellent principles - selective cutting at two levels of intensity, also protection forests on steep slopes or erosion prone surfaces, clearcutting only if areas are scheduled for conversion to agriculture, replanting prescribed after cutting if natural regeneration is inadequate, annual cutting plans for concessions must be made and approved, etc.

Under national policy, Environmental Impact Assessments (EIAs) must be made for all major development projects.

Many rare, endangered and precious species are listed as protected under national legislation, others are protected internationally under CITES (Convention for the International Trade in Endangered Species) with both a

management and scientific authority established to determine suitable export quotas of scheduled species and supervise the checking of identification and export documentation for such trade.

In practice these and other existing regulations are weakly enforced, and abused by the public, private and governmental sectors.

Indonesia would face few problems in sustaining the utilisation of its natural renewable resource bases if the existing policies and regulations were properly adhered to. There are nevertheless a few weaknesses inherent in current policy that could be improved.

1. There still exists no passed legislation to designate and regulate the establishments of national parks (taman nasional) or marine reserves (taman laut) in Indonesia although a number of these exist in fact and are run in a different way from other reserves (cagar alam, suaka margasatwa, taman wisata and taman buru). Such legislation has been in draft for many years but has still not been passed.

2. There are weaknesses in the regulations regarding the carrying out of EIAs in that there is still no mechanism by which provincial government can make or order independent assessments. It is currently the developer who undertakes his own EIA and the relevant executing ministry that approves it. Cross sectoral issues are neglected and the system can be seriously abused.

3. The current forestry land use concensus maps (TGHK) are a powerful tool in guiding development and decison-making but they have a number of inherent inadequacies. They are made on a macro scale that is often difficult to apply on a project planning scale, they are on inaccurate or somewhat distorted basemaps, they apply a simplistic formula which addresses erodibility although it neglects one important factor (namely the length of slope) and completely ignores differing human dependence on water supplies from different catchments and the water protection needs of seasonal rainfall areas. Several provinces, and notably Central Kalimantan, within the project area have already produced revised maps but probably all provinces could now make greatly improved integrated land-use planning maps on a more detailed scale and using better basemaps, better climatic, land use and landform data that are now available.

There is currently a lack of macro-environmental monitoring. Some agency should be given the responsibility of inventorying the living resources base of Indonesia by combining remote sensing interpretation of the extent and condition of different types of wildlife habitat combined with ground truth survey data of habitat condition and species status. This work is beyond the capability of the Directorate General of Forest Protection and Nature Reserves (PHPA) and should be undertaken by an independent academic agency such as LBN (the National Biological Institute) or the PSLs (environmental studies centers at universities).

There is an inherent weakness in the short duration of timber concessions (20 year cycles) as this forces rapid exploitation of forest blocks followed by minimal investments for the future. Forestry production would be less prone to quick short-term rape and have greater long-term sustainability if the

concession areas were smaller and exploitation periods much longer. At present no one is putting much effort into securing a second tree crop or protecting forest estates from invasion by agricultural speculators after logging. New techniques for propogating dipterocarp trees from cuttings have been developed in INHUTANI and TROPENBOS, which could help solve this problem.

It is recommended that this project try to address these policy weaknesses, advise the relevant government bodies on suitable revisions and press for the adoption of such improvements. Where policy improvements are made, the project should try to improve the capability of the relevant departments to implement those changes.

4. Preserving Biodiversity.

Biodiversity is a concept used to describe the richness of living forms, both in absolute numerical terms and in diversity of forms. Thus, three species have more biodiversity than two species but two species of different genera constitute more biodiversity than two species of the same genus.

The biodiversity found in a given area is determined by several factors: size of the area, richness of its habitats, heterogeneity of habitat and distinctiveness of those habitats communities.

a. Size

Size is a major component of biodiversity. The larger the island, reserve or habitat patch, the more species it will be able to retain at species equilibrium.

All other things being equal, species number will be determined by habitat area. A tenfold increase in size will generally result in a doubling of species number at equilibrium. As reserves are isolated from other forest areas by land conversion, they will behave rather like small islands and lose species until a new species equilibrium is reached.

Calculations based on the number of plants and animal species found on forested Indonesian islands of different sizes show that both plant and animal richness is proportional to area to the power of 0.37 (MacKinnon, 1981 reproduced as Fig. 1).

b. Richness of Habitat

Certain habitat types are more species rich than others. Everwet lowland rainforest is the richest type on all islands. Richness decreases with altitude and soil type (e.g., montane forests, heath forests, swamp forests and mangroves are less species rich at plot level and in total).

Similarity, certain large islands such as Irian and Kalimantan are richer than corresponding forest types on smaller islands like Java and Sulawesi.

A matrix of habitat type by island as scored for plant richness (represented by the total spp. of field recognisable taxa 15 cm. diameter found in half

hectare plots) was made from over 250 botanical plots scattered all over Indonesia (MacKinnon, 1981 reproduced as Table 2) to score habitat richness. Richness scores for different habitats of Kalimantan are taken from this table with minor adjustments for parts of Kalimantan known to be locally rich in species or poor in species (see map 6).

c. Heterogeneity of Habitat

Each different habitat included in a given reserve will add its own characteristic species to the overall list depending upon its own size, richness and degree of distinctiveness. An area with 2 or 3 distinct habitat types will tend to have more species in total than the same total area of just one homogeneous habitat type. This heterogeneity effect is scored by adding the component habitat scores for each reserve.

d. Distinctiveness

Each island of Indonesia is given an overall distinctiveness score based on its insular levels of endemism in major groups scored as (plant endemism +((mammal endemism + bird endemism)/2)/2. For Borneo this score is 23%. This score is applied across the board in Kalimantan (plant endemism is mostly lowland, vertebrate endemism mostly montane) but adjusted on the basis of areas of known high and low local endemism (see map 6). Endemism is also boosted for unique examples of a habitat type such as limestone forest.

These factors are combined to give an overall estimate of the distinct species that can be saved in a given locality by the following formula:

$$SN = K((A_1.37xR^1xe^1)+(A_2.37xR^2xe^2)+ .....(A_n.37xR^2xe^2))$$

where SN = Total number of species
K = A constant
An = Area of habitat type n
Rn = Richness score of habitat n
En = Regional distinctiveness score of habitat n.

These scorings are given in Table 3 and an overall index of biodiversity is taken as SN/K. The respective scores are carried over to Table 4.

5. Criteria for the Selection of Reserves for External Assistance.

It is decided that the project should include a component for the ugrading and improved management of 3 or 4 of the most important nature reserves in Kalimantan. The following criteria have been used in selecting suitable reserves for inclusion.

Preference has been given to large, relatively undisturbed gazetted blocks of natural habitat, rather than repairing damaged or degraded reserves or selecting areas whose gazettment as reserves is not yet definite.

Preference has been given to habitat types that have high biodiversity value i.e., score highly for species richness, levels of species endemism or

distinctiveness (see section 4 above) and habitat types facing the fastest depletion. For all those reasons dipterocarp forests are a prime choice.

Preference has been given to areas that combine complete mosaics of several different habitat types such as complete altitudinal zonation.

Preference has also been given to areas of medium threat and damage, i.e., areas that are clearly threatened and would be severely damaged in the next few years unless protective action is taken, but not areas already so damaged and threatened as to leave little chance of success.

An attempt has been made to include in the selected reserves as wide a total range as possible of the full habitat variation shown on Kalimantan.

Efforts have been made to avoid duplication with the assistance efforts of other agencies by omitting reserves where technical assistance from other sources, e.g., Japan, World Bank, Asia Development Bank and WWF, is anticipated.

An evaluation of the respective values and threats to the various reserves in Kalimantan has been completed by the Biodiversity Specialist, scoring areas for species richness, levels of endemism, threat to habitats and level of human pressure and damage (see Table 4, which condenses these data for major reserves only).

From this analysis, it is decided that the reserves Pararawen, Pleihari Martapura, Muara Uya, Muara Sebuka, Sungai Berambai and Sungai Mahakam, whilst being rated as priority 1 on the national scale (FAO 1982) are not rated as priority A at the continental level (IUCN 1984) or do not score high for biodiversity (e.g., Muara Sebuka). In addition, Gn. Niut, Kutai and Sungai Mahakam are now too destroyed to be priority choices under the current criteria for selection. Of the remaining reserves, Tanjung Puting is also not rated as highest priority, being of only moderate biodiversity (due to lack of dipterocarp forest), being quite badly damaged and also having quite extensive investment and interest shown by other external agencies. It could be given a general assistance grant. For quite different reasons, Gn. Bentuang Karimun is not rated as a priority choice because of its extreme remoteness and status as a military security zone, together with current low threat.

The remaining three gazetted reserves are all very important reserves with high biodiversity and little damage to date. Together they make a good selection for upgrading and development assistance under this USAID project, covering the whole spectrum of vegetation types from coastal to high montane and from the southwest of Kalimantan to the northeast. The three reserves Gn. Palung, Bukit Raya/Baka and Sungai Kayan/Mentaranag are at different stages of reserve development and all have somewhat different problems and potential. Their development will give a wide range of training and development experience to the counterpart staff who work on the project. Two other areas which are not yet gazetted score highly for biodiversity and are rather azonal in nature, namely, the unique peaty lakes of Sentarum and the unique (for Kalimantan) limestone forests of Sangkulirang. It is proposed that whilst development of these reserves is not yet possible, they should also be

surveyed during the planned project and documentation prepared (feasibility reports) to press for their gazettment. Descriptions and an outline of the interests and needs of each of these five selected areas are given below.

6. Reserve Descriptions, Values, Threats and Needs.

a. Gunung Palung Reserve

Description: The reserve is situated on the west coast of Kalimantan to the east of the coastal town of Sukadana. It shows a complete series of different vegetation types from a mangrove fringe, through peat swamps and freshwater swamps to lowland dipterocarp and lowland alluvial forests, hill forests and a small area of montane forest on the top of Gn. Palung at 1160 m.

The reserve has a total area of 100,000 ha.

Significance: Gn. Palung is the most biologically diverse area of its size in Kalimantan. It is the only reserve in Borneo to show a complete vegetation spectrum from coastal to montane forest. The reserve remains largely undisturbed by man, being protected as a result of long-standing beliefs among the local Malay peoples that it is a haunted mountain. The reserve lies in a region of Kalimantan known for its relatively high local endemism of flora and contains high densities of such rare animals as orang-utans, proboscis monkeys and parakeets.

Threats: The reserve is largely undamaged apart from some former removal of ramin logs from the swamp forests of the newly added reserve extension and a very small area along the northern and eastern fringes of the reserve which has been cleared and used for past agriculture.

Former threats from timber companies overlapping the reserve area have now been resolved, but a transmigration scheme with an accompanying road to the north of the reserve will add pressure on forest resources from that side. Clearing of some coastal areas for planting coconuts threatens to break the vegetation continuum near the sealine, but this area could be reestablished when boundaries have been marked in the field. The region is not a tradionally intense hunting area so that wildlife populations are in rather good condition.

Needs: The reserve needs a solution to landrights in those border areas where it is preceded by previous human occupants. When agreement has been reached, these boundaries should be clearly marked in the field. A normal guard infrastructure should be established in line with the existing management plan consisting of 8 resort posts and 2 rayon posts. Reserve staff need to be increased from 8 persons to a total of 39. The management plan needs checking and updating and revising as necessary. A long-term research and monitoring station should be established to cooperate with and ultimately take over from the current research camp begin run by staff of Harvard University. Some basic equipment such as boats and radios should be provided to the reserve and the staff need a substantial amount of training in both theory and practice of reserve manangement and monitoring techniques. A patrolling and reporting system must also be developed to monitor both biological and human factors.

The reserve should be raised in status to a national park as long recommended (FAO, 1981) and in the Management Plan (MacKinnon, 1980).

Priority for Action:

1. Revison of plan
2. Build up of guardforce
3. Training and establishment of patrols
4. Development of tourist facilities
5. Development of long-term monitoring of resource base
6. Special studies e.g., orang-utan, proboscis monkeys, parakeets, etc.

Local Involvement: Needs and opportunities for local involvement in reserve affairs are rather limited. Local people will benefit from growing needs for lodgings, food, transport and souvenirs, if limited tourism or educational uses of the reserve are developed. The opportunity for local development of coral diving around Karimata island exists in a similar way to that already developed for Pulau Bunaken in Menado Bay, Sulawesi.

University students and school groups from Pontianak could use the reserve for educational fieldwork purposes, but the reserve is rather far away and it is probable that interest of this sort will be rather limited until better communications are developed.

b. Sungai Kayan/Mentarang

Description: This is a very large reserve of 1.6 million ha. established in 1980 along the Sarawak border of East Kalimantan. The reserve contains extensive undisturbed valleys, hills and mountain forests with a high species richness and some pockets of high local endemism in plants. The area has not been fully surveyed faunally but should have high endemism of birds and mammals, particularly in montane areas. The area contains several local human settlements of Kenyah Dayaks, Punans and also Kelabit highlanders. These people still maintain a relatively traditional hunter/cultivator lifestyle and are of great cultural and anthropological interest. They occupy only a small total area of the reserve (less than 0.5% of the proposed southern block).

Significance: The reserve is the largest protected continuous block of Bornean rainforests. As such, it is a very important genepool resource with a very large diversity of species and the best chance that many of the rare species can survive. About 70% of the reserve is below 1000 m., thus being lowland forest in the strict sense, with about 20% being below 500 m, containing the richest types of dipterocarp forest.

The presence of several of the aboriginal Dayak tribes living in and around the reserve adds to its interest and value in several ways, particularly in the ethnobotanical knowledge that these people have preserved, which can now be put to use for scientific study.

Threats: Timber concessions have destroyed much of the lowland forests outside the reserve and there will be pressures for logging to move inside the reserve boundaries, though at present, work in adjacent timber concessions is

at very low intensity due to the expense of extraction. The large size of the reserve will lead many people to think that a bit more logging is excusable. This will seriously threaten the lowest altitute parts of the reserve which are of course the richest in species and most valuable parts for conservation. In fact, the reserve should be extended in the lowlands and reduced in some upland sectors as recommended by WWF 1982.

Modernisation and population increase of the Dayak communities living in and around the reserve will also put increased demands for timber, firewood and hunting areas on the reserve. Careful zoning and buffering will be needed to control these pressures.

Needs: The reserve is very large and does overlap with several human communities, especially in the central Long Bawan sector. It needs a revision of boundaries to completely exclude peripheral communities and the establishment of enclaves for those villages too far inside the reserve. It is probably best to divide the reserve into at least three smaller reserves for more sensible boundaries and for easier management.

A good system of zoning and buffering will be needed. Studies should be made of local land-rights and customs to resolve conflicting land-use claims. Studies should also be conducted on the impacts upon the natural resource base by the various activities of these indigenous peoples. This sort of study could be established under the Man and Biosphere Programme (MAB) of UNESCO by declaring the reserve an MAB reserve.

A management plan should be prepared for the reserve, clearly outlining a programme for establishing secure boundaries, enforcing protection regulations, monitoring the biological resources and human impacts, and developing any other aspects that are required, e.g., research facilities, tourism, social assistance to local communities, etc.

Priority for Action:

1. Complete remote sense mapping of the habitat types of the reserve, followed by ground inventory of the flora and fauna of selected types.
2. Discuss land-use conflicts and claims and devise acceptible, biologically adequate boundaries for the reserve. Prepare documentation necessary for making such boundary revisions.
3. Prepare management plan or plans.
4. Recruit initial staff and train them for routine duties.
5. Establish long-term monitoring and patrolling system.
6. Develop MAB-type studies among indigenous communities.

Local Involvement: Local people should be involved in several ways:

1. They should be taken on as reserve staff for guarding and patrolling the reserve. The local people are familiar with the area, its fauna and flora and will do this job far better than would better educated officers brought in from coastal towns and cities.
2. Local people will also make the best field assistants for reserch purposes in scientific studies or surveys of the reserve.

3. Local people will make the most interesting guides in the event of tourism development as they know far more about the region, its history, biology, and the traditions beliefs and habits of the local people. Such guides would need some training in language and ways of presentation.
4. Local people should be deeply involved in studies of land-use impacts, etc.
5. Local communties should also be involved in discussions of boundary revisons, zoning development of buffer zones, and in settlement of land-use conflicts.

The reserve will always have problems of abuse unless these conflicts can be solved early. The reserve is far too large to be physically protected from poachers, wood cutters, etc. Its security will depend on the respect and acceptance shown towards it by local people. Studies should be undertaken to demonstrate the clear advantages to these local people from the maintenance of such a reserve against the logging of the area. Establishment of a buffered tradional use zone may go a long way to winning this type of local cooperation.

Extension work will be needed for this.

c. Bukit Raya/Bukit Baka

Description: The proposed project area consists of two adjacent nature reserves, which straddle the boundary between Central and Western Kalimantan, with a total area of approximately 210,000 ha and the possibility to extend the Bukit Raya reserve southwards and eastwards to include more low-elevation forests.

The area contains an excellent range of undisturbed forest types, from lowland dipterocarp to montane forests on rather rich soils and volcanic rocks. Bukit Raya is one of the highest mountains in Kalimantan and has the best developed montane forests, which have attracted a good deal of attention from foreign botanists.

Significance: The area is a beautiful example of rich undisturbed rainforests and is probably the most valuable montane forest for conservation in Kalimantan. It scores highly on all criteria for selection for protection and has a high chance of success, being still undisturbed, rather remote and not facing high human density.

Threats: The lowland forests up to and even marginally inside the boundaries of the reserve are currently being logged and when they are finished there will be some pressure to degazette more forests for logging from the reserve.

The human population to the south of the reserve spreads steadily further up the valley bottoms, clearing forest for farmland. Some land in the extreme southwest of the reserve has already been destroyed by cultivation.

Plans to take a major road across the provincial border as part of the trans-Kalimantan highway would open access to forest immediately to the west of the reserve and would therefore be a ptoential threat.

Needs: The flora of the reserve have already been fairly well studied but there are no good faunal inventories. A faunal survey is urgently needed to confirm the presence of orang-utans and other expected species of interest and value. Montane areas should contain some of Borneo's endemic bird and mammal species, and as it is isolated from other montane areas of Borneo may contain some new species or forms.

The reserve needs a management plan as soon as possible.

The lowland forests to the south of the reserve remain the richest and most valuable parts of the area for conservation. They have been proposed for several years as a further extension of the reserve. These areas should be resurveyed and if still in good condition, they should be excised from timber concessions and added to the reserve.

The reserve is of high value for research. It would be useful to develop a research station in the reserve to house visiting groups of scientists and also permit more research and monitoring to be carried out by reserve staff.

The reserve has almost no staff (5 persons), so a programme of recruitment and training would be a high priority of the management plan.

Bukit Raya and Bukit Baka should be managed as a single unit. At present they fall into different provinces and different Balais (a watershed-level office in a region). This would be solved if they were made a national park with their own Balai level of management.

Priority for Action:

1. Completion of faunal survey.
2. Make a forest cover map based on aerial photographs and propose final reserve boundaries for gazettment.
3. Completion of management plan.
4. Establishment of permanent research facility.
5. Implementation of management plan including recruitment, training and establishment of monitoring and patrolling system.

Local Involvement: There are very few people living in or even close to the reserve. Local people should be given preference in recruitment as junior staff and the people in the river area along the southwest corner of Bukit Raya Reserve should be involved in buffer zone activities. A survey of this corner should be made but probably the land already destroyed by the villagers should, if suitable for sustained agriculture, be cut out of the reserve or, if not suitable for sustained agriculture, be retained as part of the reserve and reforested as a buffer zone to provide wood and timber for local communities.

d. Sangkulirang

Description: The Sangkulirang peninsula contains several large blocks of karst limestone covered in distinctive limestone forest and riddled with caves.

Significance: The caves are of very high archaeological, speleological and touristic importance. The limestone flora and fauna have a high level of biological endemism. Such formations are rare in Kalimantan and currently completely unprotected, despite several recommendations that they should be. Since the land surface of these areas is very steep they are virtually useless for either agriculture or forestry so their establishment as reserves should cause little land-use conflict with other departments.

Threats: The forests are cut by villagers wherever they are accessible: the forests are also quite small and thence vulnerable to hunting pressure. Also, the caves and limestone will be destroyed by vandalism, extraction of lime, cement and marl, and other activities unless given proper protection status.

Needs: The area still needs more surveys to determine where reserve boundaries could be established. A feasibility document should be prepared to press for the establishment of the area and the relevant departments should continue to push this request through to gazettment. Kanwil Kehutanan (area forestry offices) have already expressed their support for this idea.

Prority for Action:

1. Complete surveys.
2. Submit feasibility study.
3. Press for gazettment.

Local Involvement: The activities will require little involvement of local communities except in making field surveys and discussing village needs of these forests.

The survey work and preparation of reports should involve local reseach staff such as the Forestry Research Institute at Samarinda or PSL at the University of Unmul.

e. Danau Sentarum

Description: The proposed reserve consists of a unique biological feature in Kalimantan, namely, a system of inland peaty freshwater lakes. The lakes are surrounded by swamp forests and on firmer ground dipterocarp rainforests. There are no permanent settlements inside the area but there are numerous temporary houses used by fisherman seasonally.

Significance: The lake contains several endemic species of fish and is an important fishery nursery area for the surrounding lakes and rivers. The lakes serve an important hydrological function, holding back large amounts of water in the peaty swamps during heavy rains and thus reducing flooding of the Kapuas River. The fishery and water control function is analagous to the Great Tonle Sap lake of Kampuchea. The lakes are probably an important stopover for some migratory waterfowls, although the resident bird fauna seem rather reduced as a result of hunting and nest raiding.

The area has been studied in great detail by Geissen (1987) and proposed several times as a nature reserve (e.g. FAO 1981). The area has been approved as a reserve, but has not been established in the field.

Needs: The area does not need resurveying but a feasibility paper based on the study and draft management plan of Geissen should be submitted and PHPA should press for the gazettement of this area.

Priority for Action:

1. Complete feasibility plan.
2. Press for gazettment.
3. Revise management plan.
4. Mark boundaries.
5. Recruit staff and implement plan.

7. Summary of Action Priorities for Selected Reserves.

	Palung	Raya/Baka	Kayan/Ment.	Sentarum	Sangkul.
Faunal Survey	*	***	***	*	**
Floral Survey	*	**	***	*	**
Vegetation Mapping	*	**	***	*	*
Feasibility Study		**	**	***	***
Push Gazettment		*	*	***	***
Survey for Man. Plan		***	***		*
Prepare Man. Plan		***	***		*
Revise Man. Plan	**			**	
Revise Boundaries		**	**		
Demarcate Boundaries	***	***	***		
Develop Tourist Facility	**		*		
Develop Research Station	*	***	**		
Intitiate Studies	*	*	***		*
Recruit Guards	**	***	***		
Train Guards	***	***	***		
Patrol/Monitor	***	***	***		
Train Managers	**	**	***		
Extension Work	*	*	***		
Develop Buffer Zones	*	*	***		

8. Priority Equipment Needs of Reserves.

	Palung	Raya/Baka	Kayan/Men.	T.Puting	unit cost
4-wheel vehicle	2	3	2	1	$15,000
motor bike	2	4	6	2	5,000
kelotok boat	4	2	6	4	10,000
camera set	2	4	4	2	1,000
binoculars	10	12	20	8	250
altimeter	2	6	6	1	100
computer	1	1	1	2	5,000
typewriter	2	4	3	2	500
compass	12	20	20	10	50
camping kit	4	6	10	2	500
Radio network	1	2	3		2,000
library books	few	many	many	many	15,000
binocular microscope	1	2	2	2	1,000

preserving equipment	1 set	1 set	1 set	1 set	400
office equipment	1 set	2 sets	2 sets	1 set	2,000
drawing board	1	2	2	1	500
agricultural tools	4 sets		40 sets		100
parangs	12	20	20	10	20

9. Technical Assistance Needs.

Judging from the past experience of other programmes providing technical assistance for reserve development in Indonesia under FAO and WWF/IUCN projects, it is quite clear that the stationing of a foreign advisor at the reserve level over the medium- to long-term has had a significant positive effect on the development of those reserves. However, such assistance must be carefully planned if the benefits to be achieved are not to be lost at the end of the project when such assistance is withdrawn. Great attention must be paid to building up local self-sufficiency and independence. Part of the trouble has been that the Government attaches importance and therefore counterpart inputs of staff and funds into assistance projects, while foreign technical staff are present, but loses interest in projects once they are "over". Guarantees of continued Governmental input should be built into the project design and agreements should be made to ensure that achievements made during the life of the project can be maintained and built on afterwards.

It is recommended that each of the three reserves have a technical adviser for at least three years during the project followed by a period of intermitant visits by foreign technical assistance staff.

Such TA staff should work closely with reserve directors and government planning teams in planning for management, planning operations, giving in-service training to guards and managers, preparing extension materials and tourist information materials, providing computer training, and setting up monitoring plots, patrol and reporting schedules, analysis and tabulation procedures, statistical analysis of monitoring results, and helping generate domestic and international publicity.

In-country technical assistance in the form of biologists, foresters and land-use planners should be involved as needed and in preference to foreign technical assistants if available. There are many well- trained technicians and scientists in the Forest Research Institutes, PSLs, universities and National Biological Institute (LBN) to undertake inventories, surveys, special studies, buffer zone and land-use trials and other research topics. Foreign technical assistants can have a role in planning such research needs and initiating such studies, but should not be required to undertake major research projects of their own.

Short-term foreign consultants would be useful in holding more specialised workshops and training courses in the use of computers, wildlife management, dipterocarp regeneration, ex situ conservation techniques and other subjects that may arise during the project.

It is therefore proposed that there should be a senior technical advisor to manage and coordinate the reserve component of the project for its entire duration. This person should be a senior parks planner/manager of wide international experience. He would be based in Jakarta but would liase regularly with USAID, with the PHPA offices in Jakarta and Bogor, the LBN office in Bogor, the PHPA Balais in Bogor and Bandjar Baru, the provincial Bappedas and Kanwil Kehuatanan in each province, and make regular field visits to the various project areas. He would prepare a mid-term report and final report for the project, which would be examined by visiting review teams.

In addition, it is proposed to station three middle-level parks managers at each of the three main reserves for assistance. These persons would be staggered in time to allow for easier implementation and are required for varying periods of time depending on the complications of the different project areas. These advisors will live in the reserves but liase regularly with their relevant provincial offices and would also be available for additional surveys or fieldwork in other reserves of the province as needed.

Five short-term consultants would join the project at different times to run specialised training courses in different aspects of reserve management.

An agronomist would be assigned to the MAB studies for 2 years to set up a number of land-use trials and monitoring plots in lands inside and adjacent to the Sungai Kayan Sungai Mentarang reserve in East Kalimantan in conjunction with the MAB committee and Forest Research Institute office in Samarinda.

10. Schedule of Technical Assistance for Reserves Component.

Position	year1	year2	year3	year4	year5	year6	year7	total mm
Senior TA (Jkt./B.Baru)	**********	**********	**********	**********	**********	**********	**********	84
TA W. Kal. (Gn.Palung)		**********	**********	**********				36
TA C. Kal. (Bukit Raya)			**********	**********	**********			48
TA E. Kal. (Kayan/Ment)				**********	**********	**********		60
Review Team				***			***	12
Consultants (training)		**	**	**	**	**		15
Agronomist (land-use trials)				**********	**********			24
Total TA needs	18	45	51	63	51	27	24	279

10. Training Needs.

Staff training of guards, managers and research workers should be a major part of the project to strengthen the domestic capability of protecting nature reserves. The following table summarises what types of training are currently available through governmental in-country programmes and where additional training is required through this project.

Summary of Training Needs

Subject	Currently Available	Additional Needs
Reserve Management	Gn. Batu Training School	Overseas study tours. Overseas fellowships.
Reserve Protection	Bogor policing course	Field courses on practical aspects of fieldcraft and inventory/monitoring.
Extension Work	Almost none (but c.f. Perum Perhutani and Ag. Extension service)	Special local courses in preparation and presentation methods. Overseas course of WWF available in UK.
Env. Monitoring	Almost none	Training developed in PSLs.
EIA	Overseas courses	Develop local training courses in PSLs
Land-use Trials	Much theoretical training available	More practical experience.

For overseas training in wildlife management, there are excellent courses available in Lincoln College in New Zealand, Wildlife Institute of India, University of Michigan, University of Idaho, University of London and many others. Care should be taken to provide the right type of training. There have been numerous examples of people receiving over-technical training returning to a less high-tech society. We do not want managers to return thinking that you need lots of high-tech solutions that are unavailable in Indonesia.

Short-term study tours are a very useful way to quickly open the eyes of rather senior mangers who cannot be spared for long-term training courses. It is useful to show such managers what a good job is being done with very simple methods and low budget developments in other Asian counties such as India, Nepal, Sri Lanka, Malaysia and Thailand. Such experience is rather more relevant than taking Indonesian managers to look at reserve management in the United States or other developed countries where both problems and solutions are very different from those found in Indonesia.

It is therefore proposed to send 2 staff from each of the 3 reserves selected for development on overseas fellowships to get masters degrees in wildlife management. It is recommneded to send 2 to the USA (Michigan or Idaho), 2 to New Zealand (Lincoln College), and 2 to Britain (London or Southhampton) for such training. In addition one staff from each provincial Bappeda in Kalimantan (4) should be sent to the USA for a three-year degree course in integrated land-use planning.

Three overseas study tours should be organised for 2 months each for up to ten staff of PHPA to visit nature reserves in other Asian countries to gain a better perspective of what types of developments and methods are suitable for use in Kalimantan.

12. Schedule for overseas training.

	year1	year2	year3	year4	year5	year6	year7	total mm
Wildlife Management (US)			**********	**********				72
Nature Management (UK)				**********	**********			72
Reserve Management (NZ)					**********	**********		72
Study Tour (Asian Countries)		**		**		**		60
Land-use Planning				**********	**********	**********		144
Total	0	26	42	122	114	98	18	420 mm

13. Types of Research Needed.

Several different types of research activities are needed in and around reserves to enable managers to apply more appropriate measures to ensure that reserve objectives are realised.

The manager must be able to justify his reserve. For this he needs to know what resources he is protecting and why they are important. This involves basic inventory and a knowledge of species status and values.

The manager must be able to evaluate the effectiveness of his own management policies and actions. For this he must compare various biological measurements in the managed areas with baseline data of the state of affairs before management was applied or under alternative forms of management including no active management.

The manager may need specific studies to be undertaken to solve particular management problems such as why is the population of banteng going down? Why are the trees along the river edge dying without regeneration? etc. He needs access to competent ecologists to undertake such studies when needed but must also constantly monitor the condition of his reserve to even notice that such problems are occurring.

The establishment of long-term monitoring plots to watch forest growth or succession studies, undertaking of ecological and energetic studies, or regularly censusing important species should be done by suitably trained scientists or technicians. However, there is a lot of basic monitoring that can and should be done on a routine basis by the relatively untrained guards during normal patrol activities.

Patrol reporting forms should be designed so that guards on patrol note down various key measurements of biological or human factors. The accumulated records will allow the manager to watch trends in the sightings of important or indicator species, the incidence of meaningful events, the frequency of human activities or abuses, and other important things. Such patrolling and reporting can form the basis of monitoring the condition of the ecosystem in the same way that checking the human pulse or temperature is a way of monitoring the health of the whole body.

Socio-economic studies should be undertaken to document and evaluate the benefits from reserve protection. Such studies can prove valuable weapons for propoganda purposes, in extension work, in justifying the management of reserves, and winning greater popular support.

Land-use impact and intercropping land-use trials should be undertaken to help develop more productive, more sustainable and less ecologically damaging forms of land-use around reserves and in enclaves and buffer zones. Many of the reserves in Kalimantan are threatened by shifting agricultural techniques which were ecologically acceptible and effective at low population density with small field size and long periods of fallow, but are quite unsustainable at today's increased population densities. Such studies should consider the economics of land use; the sustainability of land- use through its effects on soil condition; other environmental impacts such as erosion, waterflow, microclimate etc.; and reduced dependence on artifical fertilizers and insecticides.

14. Institutional Relationships.

The principal counterpart agency for the reserve assistance aspects of the project is PHPA, who are responsible for the establishment and management of all reserves. However, there are good reasons to also involve other agencies in the process of reserve management, monitoring and research.

All research programmes should be approved by the Indonesian Institute for Sciences (LIPI) who will ascribe suitable counterpart institutes to each project such as the National Biological Institute (LBN), Soil Research Institute (LPT) or MAB committee. LBN is officially the scientific authority identified in the administration of CITES (Convention for the International Trade in Endangered Species) and as such should be authoritative on the individual conservation status of the relevant species in Indonesia. They should be involved at the reserve level in monitoring wildlife populations. The Soil Research Institute is probably the only agency with sufficiently broad terms of reference to undertake studies in long-term viability of differing types of land-use in and around reserves such as in buffer zones and enclaves.

The universities and PSLs (environmental study centres) should be encouraged to improve their own capabilites in monitoring environmental impacts and to develop a greater interest in the future of the nature reserves. Such nature reserves constitute important baseline data studies against which changes in areas given more intensive utilisation and development can be compared. The computerised species and habitat monitoring database already established at the PSL of UNLAM at Banjar Baru is a good example of the type of monitoring that the PSLs could undertake.

Assistance could be given to the PSLs both in the form of grants and in the provision of UN volunteers or CUSO volunteers to work in each of the four Kalimantan PSLs to help upgrade their capacity to undertake such field surveys and monitoring. An AT computer would be needed for each database together with digitizer, plotter and printer.

Several NGOs should also be encouraged to participate in projects in reserves.

Involvement of mutliple agencies in reserves has other advantages. It means that mismanagement or even abuse of a reserve by a single management agency is less likely. Additional agencies can bring more resources to bear upon management problems. For instance, PHPA really has no capability at present to establish scientific research, monitoring or analysis. These aspects can be far better carried out by independent specialised institutions. Moreover, one of the weaknesses has been the isolation of the nature conservation sector in Indonesia. Conservation is not a different form of land use which needs different ground rules. Nature reserves are merely one end of a whole spectrum of land-use types varying from total protection to total development. They must be fully integrated into the land-use planning process.

Protected areas are not an unproductive sector. Apart from preserving long-term genetic resources of only hypothetical or futuristic benefits, they serve many vital functions here and now in protecting water catchments, preserving sources of seed for reafforestation, serve as dispersion sources of beneficial species such as pollinating insects and bats, pest-controlling birds, edible fish and game animals, exportable wildlife species, etc. In the buffer zones they also produce quite a lot of valuable harvest in the form of timber, firewood, medicinal plants, fruits, honey, grazing land, hunting areas, rattans and other fibres and many other minor forest products.

The reserves also have a high value in their roles as sites of heritage, national pride, recreation, tourism, research and education.

Studies should be undertaken to evaluate these benefitial functions and demonstrate the real benefits of individual reserves and the whole policy of reserve management to local communities and national interests. PHPA is not the prime agency to conduct such studies. They should be undertaken by independent academic institutions.

15. Involvement of Local people.

Stricter application of land-use planning and development principles should ensure that nature reserves are not further destroyed by major developments such as logging or transmigration. In cases where valuable minerals such as gold, copper, coal, oil or gas are found beneath reserves, there are mechanisms by which reserves can be degazetted if the exploitation of these resources is decided at the interministerial level to be greater than their importance as nature reserves. The greatest continuing threat to the reserves is the uncontrolled cutting, burning, farming and hunting activities of local people.

The nature reserves are too large to permit efficient policing to the point that illicit entry is impossible. However, patrolling and policing of reserves should be at a level where no one can regularly engage in illegal activities within a reserve without eventually being caught.

The survival of reserves and their natural resources is made much greater if the reserves can attain the respect of and appreciation from local people.

Such respect will be enhanced if local people see an effective guardforce that is proud of its reserve and keen to protect its values. If reserve staff themselves show no interest in reserve protection and are among the first to abuse the regulations for personal benefit, this invites a free for all among local people. The best approach is a clear policy of "Keep out, this is not your property and you are not getting it, but if you behave you can have a share of the benefits".

The share of the benfits can come in many forms. Local people benefit from employment as staff or in peripheral industries (catering, guiding, souvenirs, suppliers to the reserve, etc.). Local people certainly benefit from the proximity of quality forests in having greater supply of forest products, improved water supply, reduced risk of floods and landslides, enhanced hunting and fishing, and cooler more equible climate. It should be clearly pointed out to local communities that they are much better off living near a reserve than if the reserve was not protected, for in that case it would be logged by a timber company and they would lose their own access to forest products and possibly face severe evnironmental problems of erosion, floods, water shortages, raised ground temperatures and lowered water tables.

The more local people can be involved in the work of reserves or organised in supportive activities such as school nature lover groups, volunteer work units etc., the more secure will be the reserves themselves.

16. Conservation Buffer Zones.

To reduce the inevitable two-way frictions that occur when human settlements directly abut nature reserves, it is policy to establish buffer zones to reduce direct contact of these mutually conflicting land uses.

Conservation buffer zones can be defined as areas peripheral to (but usually outside) national parks or reserves which have restrictions placed upon their use to give an added layer of protection to the reserve itself and to compensate villagers for loss of access to the strict protection zones of the reserve.

Such buffer zones are generally managed primarily for the benefit of local people to meet their needs for forest products which they could formerly gather inside the protected area or as compensation for loss of such former priviledges. As such, buffer zones should not be regarded as being protected areas, although for ease of administration, they should, where possible, be on state land managed by PHPA (Kawasan hutan cadangan suaka alam).

The following regulations should apply to buffer zones:

1. No permanent dwellings may be built within buffer zones.
2. No open agriculture should be practiced in buffer zones, which should be covered with forest, tree plantations or plantations of bushy perennial crops such as coffee and tea.
3. Introduction of exotic plants or animals liable to invade the reserve is prohibited.

4. Burning of natural vegetation is prohibited.
5. Hunting of protected animals or animals for which the reserve is established is prohibited.

Normally permitted activities include: subsistence hunting, fishing, collecting honey and minor forest products, collecting medicinal plants, rearing of medicinal plants, grazing of domestic animals, collection of firewood, rattan and timber for personal use, planting of firewood plantations, planting of industrial plantations and bushcrops, and development of agroforestry.

A traditional use zone is an unusually large buffer zone in which natural vegetation cover must be maintained but where indigenous people may continue to live or hunt and gather forest products in their traditional manner.

Further guidelines for the development and mangement of conservation buffer zones are given in the National Conservation Plan (Vol. VIII) (FAO. 1981).

17. Physical Construction Needs.

Management plans have been made for Gn. Palung reserve and Tanjung Puting Reserve. Preliminary plans exist for Danau Senatarum and Sungai Kayan/Mentarang. No plan exists for Bukit Raya. Existing plans are now several years old but have not yet been implemented. The following table lists the stuctures recommended to be built on the basis of existing plans or where no plans occur on the basis of likely initial requirements. Additional construction needs may arise when all management plans have been completed or revised.

	Palung	Baka	Raya	(Tj.Puting)	Kayan/Ment.	Sentarum	Sangkuli.
N.P.Office 200m^2	1		1	1	1		
Rayon Office 120 ^{2}	1	1	2	4	3	1	1
Guard Resort 70 m^2	3	2	4	10	6	2	1
Garage 30m^2	1		1		1		
Roads (kms.)	10		2		20		
Marking Boundaries	200	60	400	300	500		
Housing 70 m^2 Units	1		2	2	2		
Information Centre 50m^2	1			1	1		

Construction costs vary from location to location, with transport of materials a highly variable component. However, an estimate of overall construction costs can be obtained by using an average figure of Rp. 150,000 per m^2 for permanent and Rp. 100,000 per m^2 for semi-permanent buildings. Road costs are estimated at Rp. 5 million per km., garages at Rp. 2 million per unit, boundary demaraction at Rp. 1 million per km., and establishment of buffer zones at Rp. 2 million per ha.

18. Anticipated Project Budget.

Technical Assistance (279 mm)	$ 3,348,000
International Travel	90,000
Local Travel (incl. MAF & heli)	800,000
Per Diems	400,000
Counterpart Honoraria	500,000
Equipment	5,000,000
Overseas Fellowships (420 mm)	840,000
Overseas Study Tours	240,000
Local Training	100,000
Maintenance of Equipment/Buildings	300,000
Construction	500,000
PSL Support	1,000,000
Buffer Zone Development	1,000,000
Reporting	100,000
Contingencies	700,000
Total	$10,418,000

19. Need to Build a Strong Incentive System for GOI Personnel.

One of the major weaknesses in reserve protection in Indonesia is the fact that in most cases, the park headquarters or reserve offices are in towns far from the reserves themselves. This means that at ground level in the reserves there are only few and very junior personnel, rarely supervised and poorly supported by their superiors.

This project will try to ensure that more staff are on-site in the project areas.

The reason why offices tend to be far from reserves is partly logistic but is far more a matter of the difficulties of getting officials to live and work in remote posts. The dislike of remote postings is partly caused by fear or dislike of remoteness itself but also from financial considerations. Government salaries are very low. Most officials need to supplement their incomes by becoming involved in other businesses or bonus carrying projects. Such possibilities are greater the nearer you are to HQ.

Two ways are proposed to retain enough incentive to get motivated officers to work in the reserves:

1) improved living conditions - provision of good housing, schools, clinics, social centres, sports facilities and gardens; provision of adequate transport, etc.

2) incentive schemes - accelerated promotion credits, field and project allowances, preference in selection for overseas training, and other perks.

20. Considerations of Recruitment.

The project proposed upgrading three reserves which currently have very few staff. Many more people will have to be recruited during the project and most of these people should be locally recruited.

Local recruitment has many advantages:

1) Local people are already familiar with the geography, language, fauna and flora of the project area and have good local contacts and information sources.

2) People brought in from outside will often be resented and distrusted or even hated by local communities who will not cooperate.

3) Town people will often not enjoy forest life and will be afraid or unenthusiastic about many aspects of fieldwork.

4) Local recruitment brings financial benefits to the families and villages of staff which helps to create better relations between the park and local communities.

5) Local recruitment is much cheaper than paying for the transport and extra allowances for distantly recruited staff.

The main drawback with recruiting local people is that they often have low educational levels which makes it difficult to take them on full-time as government employees. It should be possible to arrange special training courses such that certificates or diplomas of training accomplishments can be used in lieu of formal school education levels as criteria for acceptance.

PHPA is severely limited in its ability to recruit new staff. The area of reserves has increased dramatically over the last ten years but the number of government employees in PHPA remains the same, with high understaffing, especially in the field. Conversely, the area of production forest shrinks every year and overall production of logs also shrinks, yet Ministry of Forestry staff levels continue to go up with considerable areas of overstaffing. Preferably some process should be agreed whereby production forestry staff can be converted to PHPA staff when their areas have been logged out and local priorities swing from production to protection. Total dependence on daily staff is not a satisfactory answer to PHPA's problems as these staff have no long-term security and drift away. Many have worked for several years without any pay, get discouraged and leave; thus wasting all training and other inputs invested in them and leaving PHPA with an unreliable and not so loyal workforce.

21. Recommendations for the Contracting of TA Components.

It is recommended to offer the reserve protection TA component of the project to a consultancy firm - preferably one with experience in working in Indonesia or with access to consultants with Indonesian experience. Indonesia is a difficult country to work in and many pitfalls can be avoided by using people who already know the ways of things there.

WWF-US would certainly be a serious contender for such a consultancy and would have a number of important advantages:

1) Long-term experience of working in Indonesia with access to many consultants with Indonesian language proficiency and local experience, including national experts.

2) WWF has its own Representative's office in Indonesia (in Jakarta) and an Administrative Office in Bogor, so it can provide a higher level of local backup and support for the project than could most other US consultancy firms.

3) WWF is also trying to affect policy in Indonesia and conduct conservation projects in Kalimantan. It has independent funds for this and would be in a position to bolster the project in useful areas such as providing extra volunteers or meeting unforseen needs during the course of the project. It would in any case be necessary to establish good relations with WWF to avoid overlap of conflicts of interest.

4) WWF is a non-profit organization and thus able to provide project management services at cost without seeking a profit on its overheads. Contracts currently used to maintain consultants in the field in Indonesia cost about one quarter of those budgetted for under standard USAID guidelines. This could be a considerable saving to the US Treasury.

22. Terms of Reference of TA Experts Needed for Nature Reserve Component.

a. Expert Stationed in Gunung Palung.

Duty Station: Teluk Melanau

Duration: 3 years

Qualifications Required: PhD plus several years experience in park development, preferably with some experience in tourism development and control, and also experience in educational or awareness publications. Knowledge of Indonesian language essential but could be acquired in 3-month intensive language course at start of contract.

Personal Qualities Needed: Ability to live and work in remote places, good physical fitness.

Duties to Include:

Survey the entire reserve to prepare a revised management plan in first year.

Supervise design and construction of park offices at Teluk Melanau, and other guard posts and visitor facilities as prescribed in management plan.

Assist PHPA in selection and recruitment of day guards for reserve; run appropriate training courses for these guards, design patrol routes and reporting forms, and initiate routine patrolling and monitoring system.

Coordinate activities with ongoing research programmes of Harvard University.

Hold discussions with local agencies adjacent to or overlapping with reserve boundaries e.g., HPHs, plantations, villages, etc.

Design a buffer zone plan and initiate trial plots and studies.

Design a tourism plan. Meet with tourist agencies and private sponsors and set up trial tourism in Gn. Palung. Such tourism could include development of lodges at Teluk Melanau and Kampong Baru; sea-based recreation such as game fishing and scuba diving to as far as Karimata islands; river trips up the Matan river to watch proboscis monkeys; and forest walks from Kampong Baru up Gn. Panti and Gn. Palung to see forest formations, birds and orang-utans.

Make short survey trips to other reserves in Kalimantan Barat to prepare a revised provincial conservation plan with Bappeda. Coordination with other project aspects centered on Bappeda.

Coordination with PSLs or other agencies collecting base-line data in reserves for provincial planning and EIA purposes.

Make recommendations for counterpart training needs. Coordination with Central Kalimantan TA on condition of Bukit Baka reserve.

Liaison with TA coordinator in Bogor, including 6-monthly progress reports and all matters of HQ relevance.

Assist PHPA counterparts in routine management tasks, boundary demarcation, extension work, training, operational planning, preparation of information and promotional materials - brochures, maps, posters, guidebooks etc. - analysis and evaluation of reports, monitoring and inventory data.

Prepare final report at end of contract.

b. Expert Stationed in Bukit Raya.

Duty Station: Tum Tabulus

Duration: 4 years

Qualifications Required: PhD plus several years experience in conservation related fieldwork. Extensive scientific publications and specialized interests in ornithology and/or small mammals, but with at least some experience in reserve design and management. Knowledge of Indonesian language essential but could be acquired in 3-month intensive language course at start of contract.

Personal Qualities Needed: Ability to live and work in remote places, good physical fitness.

Duties to Include:

Survey the entire reserve and adjacent Bukit Baka reserve in neighbouring Kalimantan Barat to prepare a management plan in first year.

Supervise design and construction of park offices at Tum Tabulus or whatever site is preferred in management plan, and other guard posts and research facilities as prescribed in management plan.

Assist PHPA in selection and recruitment of day guards for reserve; run appropriate training courses for these guards, design patrol routes and reporting forms, and initiate routine patrolling and monitoring system.

Hold discussions with local agencies adjacent to or overlapping with reserve boundaries, e.g., HPHs, plantations, villages, etc.

Design a buffer zone plan and initiate trial plots and studies.

Design a research plan including the establishment of a semi-permanent montane forest field station. Supervise design and construction of such a station. Encourage Indonesian institutes, universities and PSLs to develop an interest and set up research projects in the reserve. Also promote the facilities offered by the reserve for research to foreign research agencies who may wish to participate in studies at the field station.

Initiate inventory work on the reserve's mammalian and avian fauna with particular reference to bats, small mammals and montane birds.

Make short survey trips to other reserves in Kalimantan Tengah to prepare a revised provincial conservation plan with Bappeda. Coordination with other projects aspects centered on Bappenas.

Coordination with PSLs or other agencies collecting base-line data in reserves for provincial planning and EIA purposes.

Make recommendations for counterpart training needs. Coordination with West Kalimantan TA on condition of Bukit Baka reserve.

Liaison with TA coordinator in Bogor, including 6-monthly progress reports and all matters of HQ relevance.

Assist PHPA counterparts in routine management tasks, boundary demarcation, extension work, training, operational planning, preparation of information and promotional materials - brochures, maps, posters, guidebooks, etc. - analysis and evaluation of reports, monitoring and inventory data.

Prepare final report at end of contract.

c. Expert Stationed in Sungai Kayan/S. Mentarang.

Duty Station: Long Bawan

Duration: 5 years (could be 2 different persons)

Qualifications Required: PhD plus several years experience in conservation work overseas. Preferably with strong social anthropological or ethnobotanical background, but with at least some experience in park design and management and some experience of tourism and adventure trekking management. If job is split between two persons, one should be tourism oriented the other anthropological. Knowledge of Indonesian language essential but could be provided through 3-month intensive language study at start of contract/s.

Personal Qualities Needed: Ability to live and work in remote places, good physical fitness.

Duties to Include:

Survey the full extent of the reserve plus adjacent Kayan Mutlak and Ulu Sembakung areas to prepare a management plan in first 2 years.

Supervise design and construction of park offices at whatever site is preferred in management plan, and other guard posts and research facilities as prescribed in management plan.

Assist PHPA in selection and recruitment of day guards for reserve; run appropriate training courses for these guards, design patrol routes and reporting forms, and initiate routine patrolling and monitoring system.

Hold discussions with local agencies adjacent to or overlapping with reserve boundaries, e.g., HPHs, plantations, villages, etc.

Design a buffer zone plan and initiate trial plots and studies. This plan should include extensive "traditional use zones" where indigenous people can continue their traditional forms of harvesting forest products and hunting. Such a plan should be based on assessed needs of the local people (Kelabits, Punan and Kenyah) around the reserve and take into account their traditional rights and harvesting methods. Considerable research will be required in this plan.

Design a tourism plan including the possibility of adventure trekking from the upland Kelabit Highlands through the lands of the other Dyaks by forest walks, river rafting and dugouts, staying in traditional longhouses, etc., to the lowlands.

Initiate inventory work on the reserve's vertebrate fauna and also flora.

Make short survey trips to other reserves in Kalimantan Timur to prepare a revised provincial conservation plan with Bappeda. Coordination with other project aspects centered on Bappeda.

Coordination with PSLs or other agencies collecting base-line data in reserves for provincial planning and EIA purposes.

Make recommendations for counterpart training needs.

Liaison with TA coordinator in Bogor, including 6-monthly progress reports and all matters of HQ relevance.

Assist PHPA counterparts in routine management tasks, boundary demarcation, extension work, training, operational planning, preparation of information and promotional materials - brochures, maps, posters, guidebooks, etc. - analysis and evaluation of reports, monitoring and inventory data.

Prepare final report at end of contract.

d. Coordinator Stationed in Bogor/Jakarta

Duty Station: Bogor

Duration : 6 years

Qualifications Required: Senior conservationist with PhD and many years relevant overseas experience, preferably within the region and familiar with the Indonesian situation. Should have senior project management experience and proven skill in communications. The DG of PHPA requests that he should be not too old (i.e., experienced but still dynamic). Knowledge of Indonesian language essential but could be provided through 3-month intensive language study at start of contract.

Duties to Include:

Coordination of all HQ aspects of the conservation component of the project. Close liaison with DG and directors of PHPA. Regular meetings with other relevant agencies such as LBN, Forest Research Institute, IPB, Soil Research Institute, BAKOSURTANAL and KLH.

The coordinator is expected to become a close advisor the DG PHPA and may be asked to give more general advice about conservation priorities in areas beyond Kalimantan. In this way lessons learned from Kalimantan can affect polity in other islands of Indonesia.

The coordinator must establish good working relations with the WWF Representative in Jakarta and also with the leaders of other TA programmes in the conservation sector so as to avoid project overlaps and secure complimentary support from other projects and programmes.

Arrange international training for PHPA staff under the project. Organize workshops and training courses within country as needed by the project. Organize recruitment of short-term consultants as needed.

The coordinator should act as spokesman on all project matters relating to the nature reserves component. He should edit and arrange suitable translation and publication of all technical documents and reports and provide literature and other support for the field staff.

Make regular field visits to provincial field projects to give advice and support whenever needed.

Prepare annual workplans and reports, mid-project report and final report on the nature reserve component.

Try to influence and improve PHPA policy and practices through regular meetings and discussions with PHPA leaders.

Prepare news items, publicity and awareness materials resulting from the project.

Represent the project internationally by participating in regional and international conservation programmes and meetings of WWF, IUCN, etc.

Hold training sessions and seminars for HQ staff of PHPA. Serve on mid-term and final review missions.

23. Follow-up Activities Required Prior to the Start of the Project.

The DG PHPA has requested a senior advisor to work closely with himself, based in Bogor, as soon as possible to help coordinate this and other international TA projects. It would be useful if USAID could separately increase its project through WWF-US to provide this assistance. The presence of such a person could help achieve the other prerequisites listed below.

It would be useful to identify suitable counterparts for the project well in advance of the project starting date so that they could be given suitable training before the project starts rather than suffer losses of important project staff for training during the life of the project.

Assurances must be sought from the GOI that legislation regarding the establishment of national parks is going to be passed in the not too distant future.

Assurances must be sought from the GOI that the selected reserves are going to be upgraded to national park status during the next Repelita or can be brought forward as priority cases for upgrading.

Assurances must be sought from the GOI that it will be able to continue routine costs of maintaining national park facilities and standards in the project sites after the end of the project. Among other things, this will require funds for continuing the engagement of harian (daily) guards.

Assurances should be sought from PHPA so that they can provide adequate counterpart staff for 3 new national parks in the project. Harian workers can

be recruited under the project but there should also be a certain number of pegawai negeri (civil servants). For this, PHPA may have to get special permission to accept new pegawai negeri in excess of their annual quotas or move pegawai negeri from other divisions of the Ministry of Forestry.

Agreement should be sought from PHPA to establish park offices inside or at least at the entrance to new national parks, rather than in main towns, as has been the custom in Indonesia but has proved far from effective. To enable PHPA to post staff to such offices, it may be necessary to develop better living facilities such as access roads, housing, gardens, schools, clinics, social centres and other incentives. These needs must be taken into account when designing park developments.

Efforts should be made to locate suitable national experts who would be available and willing to work on the projects.

Encouragement should be given to PHPA, WWF and to PSLs to make further field surveys to the S. Kayan/S. Mentarang reserve complex prior to the start of the project and preferably prior to the project preparation mission, to prepare more background information on the conditions of different parts of this large area and narrow down the current broad range of development options to a few concrete proposals for redesigning the reserve.

Efforts should already be taken to prevent further damage to the selected reserves prior to the start of the project. Action is already needed to halt logging in both Bukit Raya and Bukit Baka. Action is needed to cancel or review HPH boundaries that overlap the Gn. Palung reserve.

PHPA should fight to achieve the most westerly possible alignment of the proposed highway from West Kalimantan to Central Kalimantan. This road could considerably threaten the Bukit Baka/Bukit Raya reserves if it passes too close to their boundaries.

Encouragement may be needed to allow for the continuation of important field studies currently in progress by the Harvard University Team under the leadership of Dr. Mark Leighton in the Gn. Palung area. A small grant may be considered, and also to Dr. Galdikas' studies in Tanjung Puting National Park.

Coordination is needed to avoid overlap with activities of other TA projects such as the ADB project for land-use mapping in Kalimantan, TAD (German assistance) to develop Bappeda land-use planning in East Kalimantan, WB NAtional Parks project, MAB studies in Apo Kayan, WWF ethnobotanical studies in Kalimanta, BP's EIA studies in Kutai National Park, DESC assistance to Bappedas in land-use planning, AWB wetlands project, and Japanese forest conservaton projects in Kalimantan should be planned to dovetail and support activities of this project.

Annex 1. Alternative Approach to Biodiversity Project.

The sections above have been based on the terms of reference given: namely, that the project would include the development of three or four select nature reserves, that these reserves should be terrestrial, and that the project should be on Kalimantan. Released from these limitations, I would have suggested a somewhat different structure.

Firstly I would include at least some reserves in Irian Jaya into the project. Irian is the largest and richest biological reserve in Indonesia and has enormous potential for saving biodiversity. Secondly I would include some marine reserves in the project. Two thirds of Indonesia is sea and these are the richest seas in the world with the most extensive coral reef system in the world, the most extensive areas of mangroves in the world, and the widest range of marine habitats from shallow continental shelves such as the Java and Arafura seas, to some of the deepest ocean trenches in the world. Indonesia has a number of proposed marine reserves, but almost none of them have been developed. Meanwhile, the seas are being overfished, polluted and the beautiful reefs destroyed for lime, molluscs and ornamental fishes. Assistance in this neglected field is urgently needed and this is one area in which the USA undoubtedly has much useful experience.

The scale of the project is large enough to take on more than three reserves, particularly if these are "biodiversity" reserves which are essentially still intact and not in need of heavy development. In this case, I would propose adding three Irian reserves for development: a) the Gn. Lorenz National Park - a spectacular reserve dropping from the snowy glaciers at nearly 5000m. through the entire horizontal spectrum of foresty types to the mangroves and coastal waters, the only reserve in the world with such a wide spectrum; b) The Foja-Mamberamo reserve on the north side of the island with another wide range of habitats from montane to marine, including the unique "Inland Sea" wetlands of the Mamberamo river and the largely unexplored and endemic-filled Foja mountains where "Man the Hunter" has still not penetrated and the Cassowaries and Tree Kangeroos are as tame as in the "Garden of Eden"; and c) The Cendrawasih Marine Reserve - the largest, richest and least distrubed system of coral reefs and islets in the entire archipelago.

In addition I would add the adoption of more reserves on Kalimantan to widen the coverage of habitats to include more coastal and marine areas such as Kutai (extensive coastal forest types, mangrove, Nipa, and freshwater swamps), Pulau Karimata (the best coral reefs in Kalimantan) and Gn. Niut (another terrestrial reserve of high local endemism and richness).

For these changes in project scope, I would keep to the same number of technical experts, backed up, if possible, by linkage to some volunteer organization such as CUSO, VSO or UN volunteers. The experts would have to cover more ground and should spend quite some of their time in working closely with provincial governments in revising and refining the provincial conservation plans, surveying, and making feasibility studies in an even wider network of reserves, even if all cannot be fully developed at present.

By having a wider scope of habitat and geography, and especially by also including marine reserves, the project would be in a much stronger position to affect overall policy on conservation issues countrywide.

Broadening the project would obviously create more coordination work for the TA coordinator in Bogor, whose job would also become one of liaising with other TA projects in Indonesia. This liaising role cannot be underestimated - in East Kalimantan, for instance, there are already many projects concerned with improving forest management, studying different types of swidden agriculture, mapping, remote sensing and GOI use in land-use planning. There is little need for USAID to introduce anything very new in the province, but a big need to help pull it all together and render the various types of information in a form that can be readily understood and used by BAPPEDA in provincial planning.

This approach would also greatly strengthen the links between the nature conservation elements of the project with the policy and land-use planning components. At it stands at present, the connection between these two components with different counterpart lead agencies and different structures (one centrally coordinated the other provincially organized) is very weak and you might as well have two different projects.

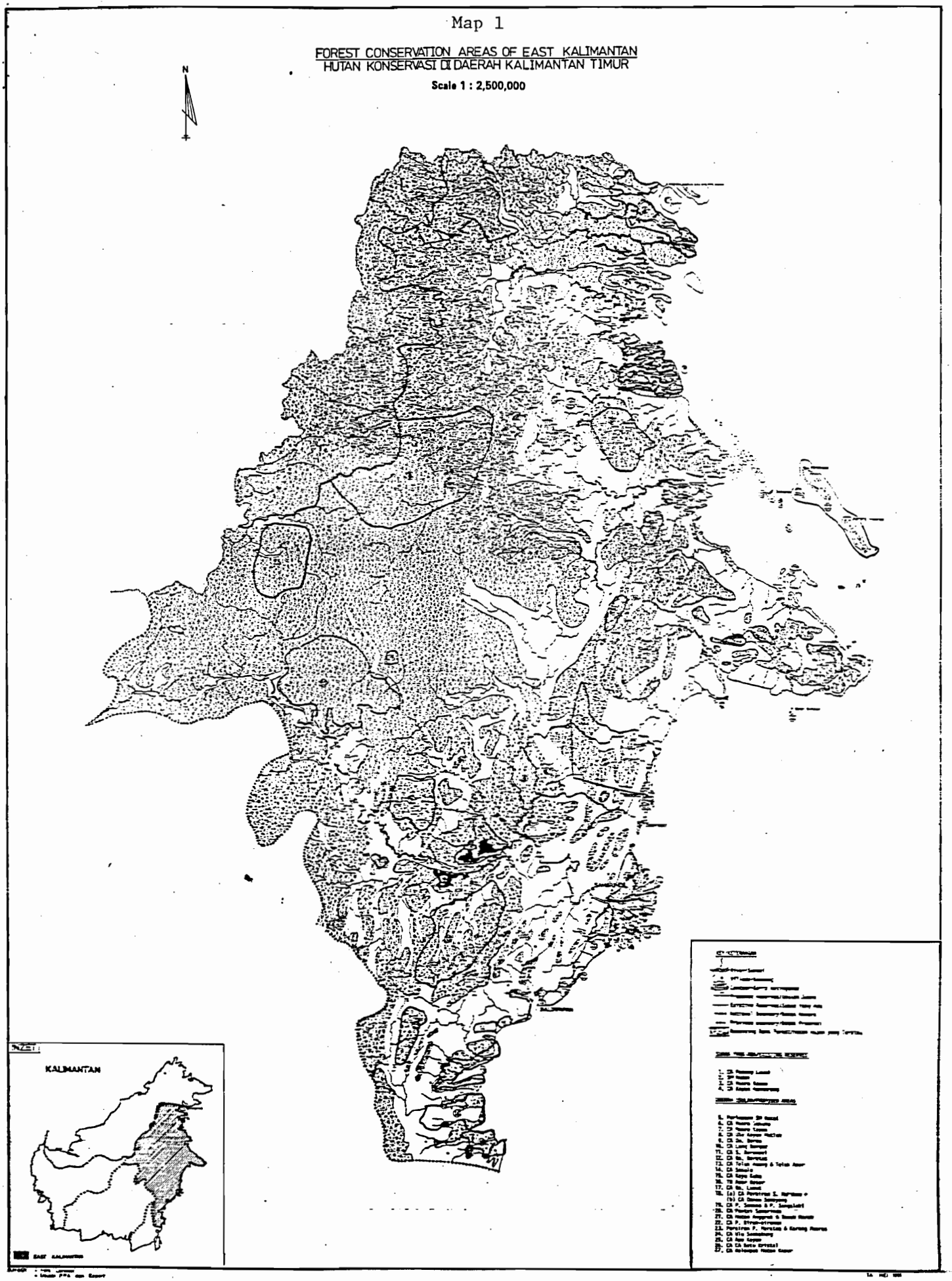
Nevertheless, the need to start things at ground level in the provinces is very important. The reason why conservation is so ineffective in Indonesia is precisely because of the top-down approach that has been adopted. A DG has been created that has formed directorate, balais, sub-balais and seksis. There are literally thousands of staff sitting at desks doing clerical and administrative work and only a few dozen guards actually posted around the forests to protect them. For example, the sub-balai in East Kalimantan (the second-largest province in Indonesia), who has the largest areas of nature reserves directly under his control (almost 2 million hectares), has not a single forest-based guard and has himself never visited any of the reserves under his supervision in his several years there. It is a total waste of time putting more effort into central "policy" issues when nowhere does conservation reach the ground level. The only useful new approach is to start by putting activities down on the ground in and around the forest by dollar power and building upwards until the project meets up with the Government system somewhere in the middle. At that point, we can start talking policy.

To guarantee that there is more attention at the ground level, I would also recommend a slightly different channelling of project funds. I would link the provincial nature conservation work and the provincial land-use planning aspects by programming both through the Governor's office. The Governor's office is superior to both the Bappeda and Sekwilda and can therefore direct funds as appropriate to each. Most of the planning and information synthesis would still take place in Bappeda, but any executive actions such as reserve development would have to be done at the Dinas level, i.e., through Sekwilda. Such as structure would ensure greater cohesion of the whole project and ensure greater attention and local support from the Governor himself who is in fact by far the most powerful and useful sponsor in the province. Only those sums needed directly for central coordination would have to be channelled through the central government, i.e., Home Affairs and executing ministries, e.g., Forestry.

Map 1

FOREST CONSERVATION AREAS OF EAST KALIMANTAN
HUTAN KONSERVASI DI DAERAH KALIMANTAN TIMUR

Scale 1 : 2,500,000



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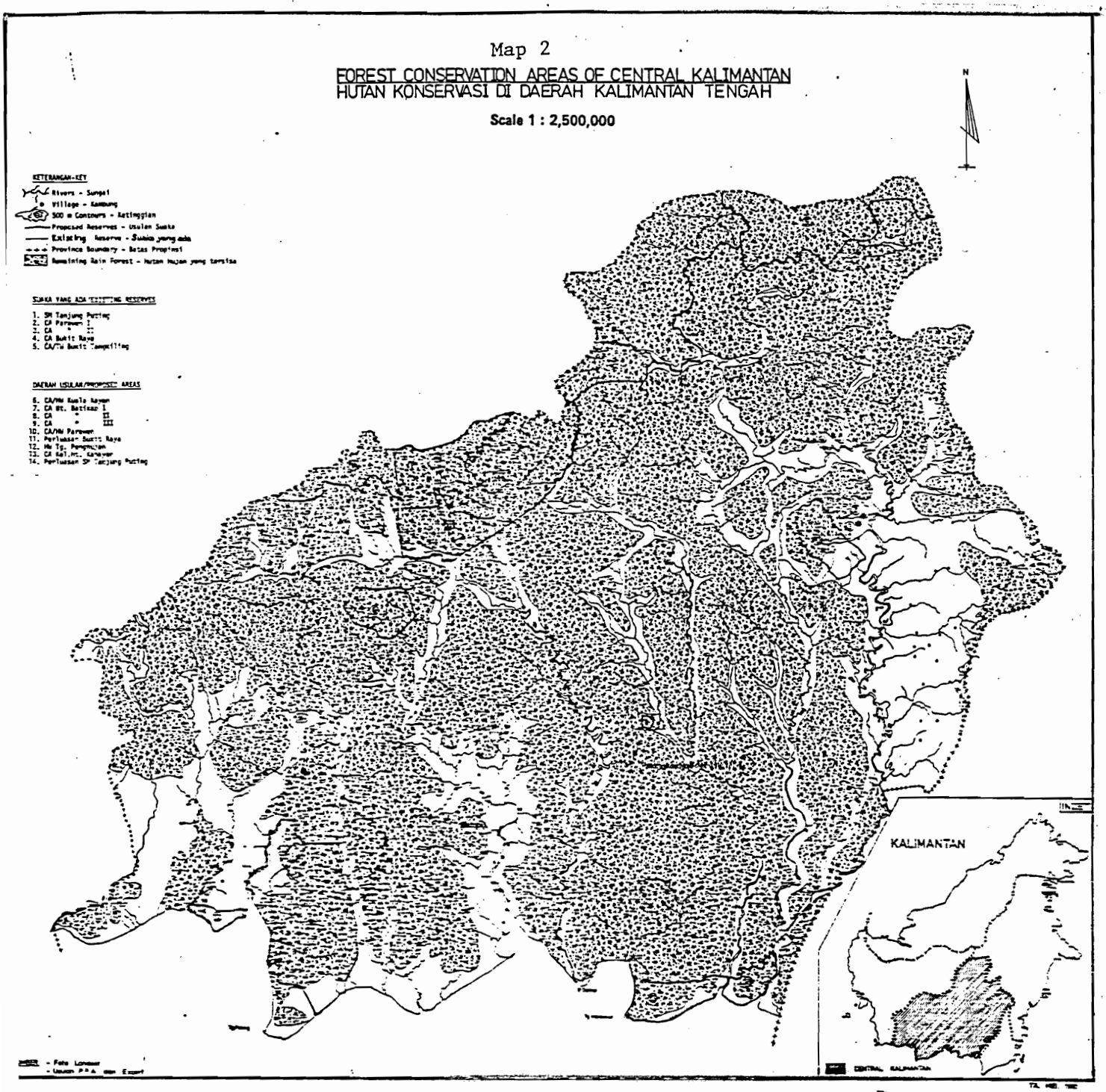
Map 2

FOREST CONSERVATION AREAS OF CENTRAL KALIMANTAN
HUTAN KONSERVASI DI DAERAH KALIMANTAN TENGAH

Scale 1 : 2,500,000



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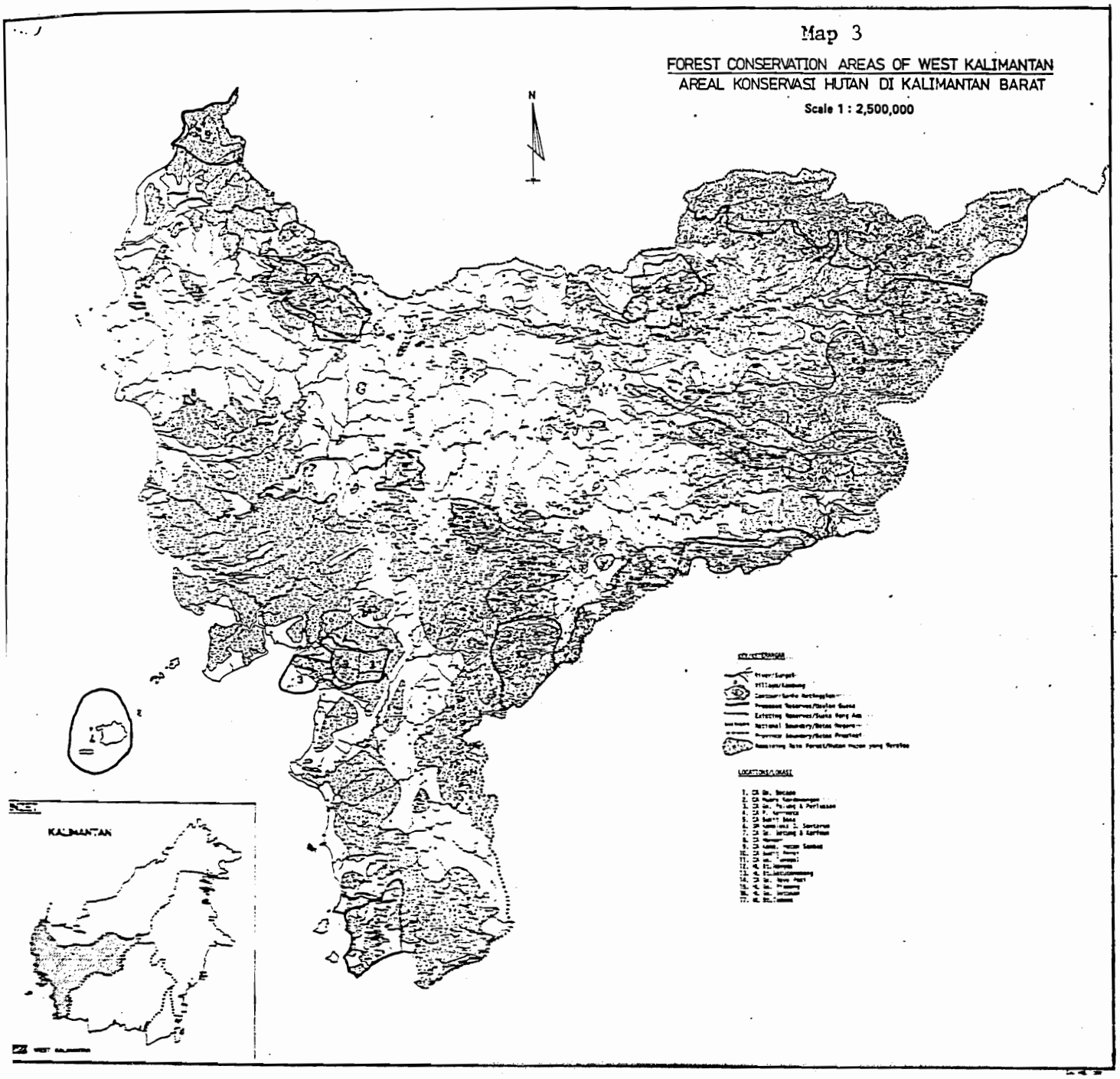
Map 3

FOREST CONSERVATION AREAS OF WEST KALIMANTAN

AREAL KONSERVASI HUTAN DI KALIMANTAN BARAT

Scale 1 : 2,500,000



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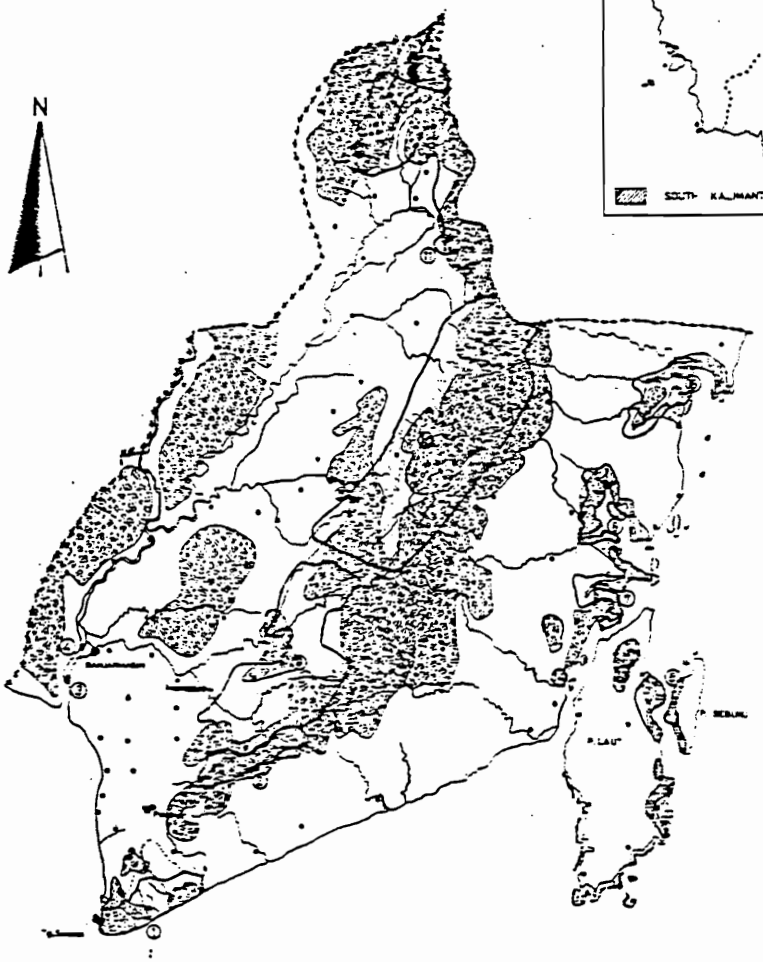
Map 4

FOREST CONSERVATION AREA OF SOUTH KALIMANTAN

HUTAN KONSERVASI DI DAERAH KALIMANTAN SELATAN

Scale 1 : 2,500,000



KETERANGAN

Rivers - Sungai

Village - Kampung

Proposed Reserves - Usulan Suaka

Existing Reserve - Suaka yang ada

Province Boundary - Batas Propinsi

Remaining Rain Forest - hutan hujan yang tersisa

SUMBER - Peta Lanscape

- Laporan PPA 30h Expert

SUAKA YANG ADA (EXISTING RESERVE)

1. SM Pleihari Tanah Laut
2. SM Pleihari Martapura
3. SM P. Kapet
4. SM P. Kemenang
5. SM Gunung Lumut

DAERAH USULAN (PROPOSED AREAS)

6. SM Pamukan
7. SM Kelumpang Barat
8. SM P. Sebuku Barat
9. SM Pleihari Martapura
10. SM Pegunungan Meratus
11. SM Pegunungan Meratus
12. SM Sungai Kintap
13. SM Kintap
14. SM P. Laut
15. SM P. Sebuku
16. SM P. Kalimantan

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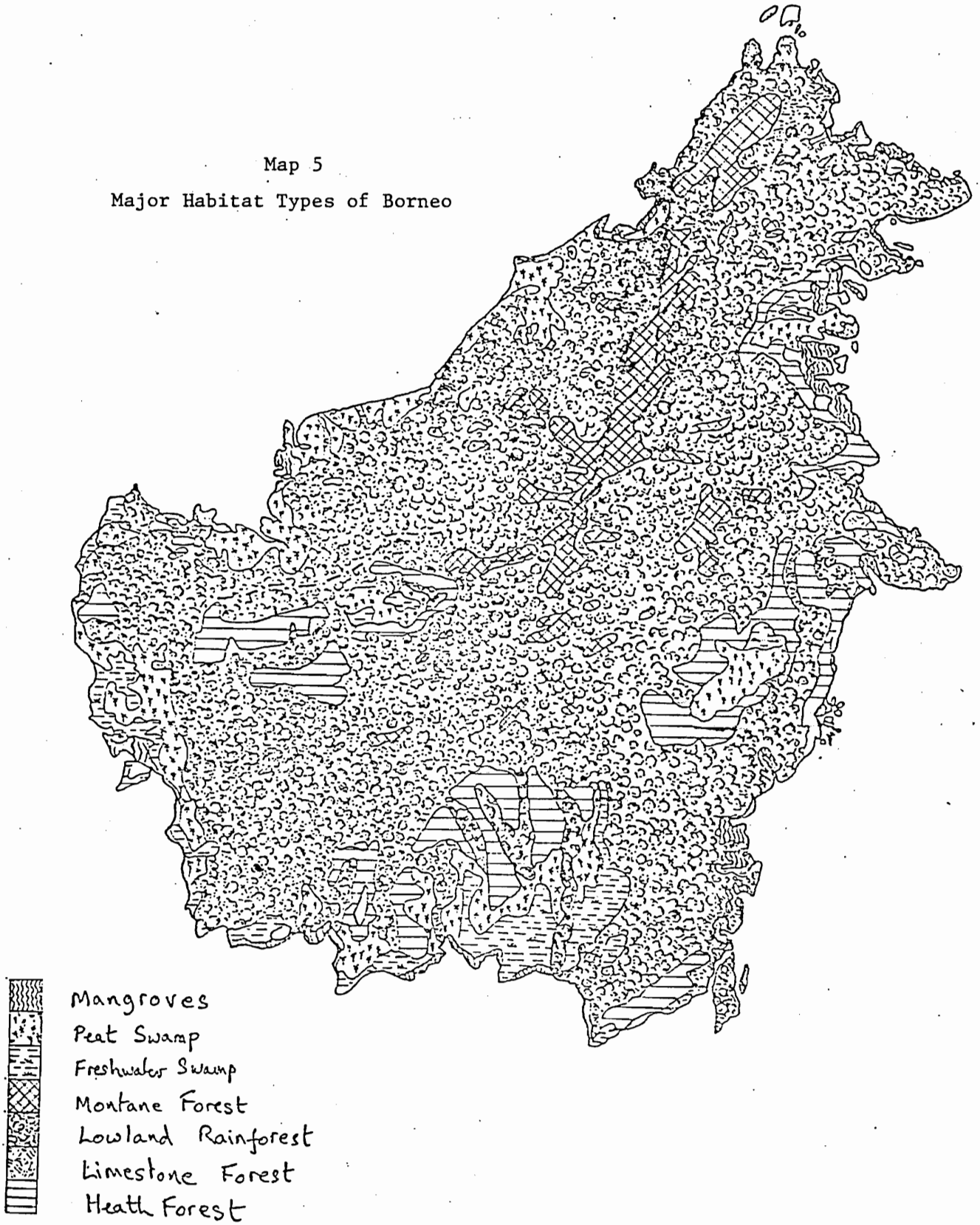
Map 5

Major Habitat Types of Borneo



Map 6

Generalised Plant Richness of Borneo
(after Ashton)

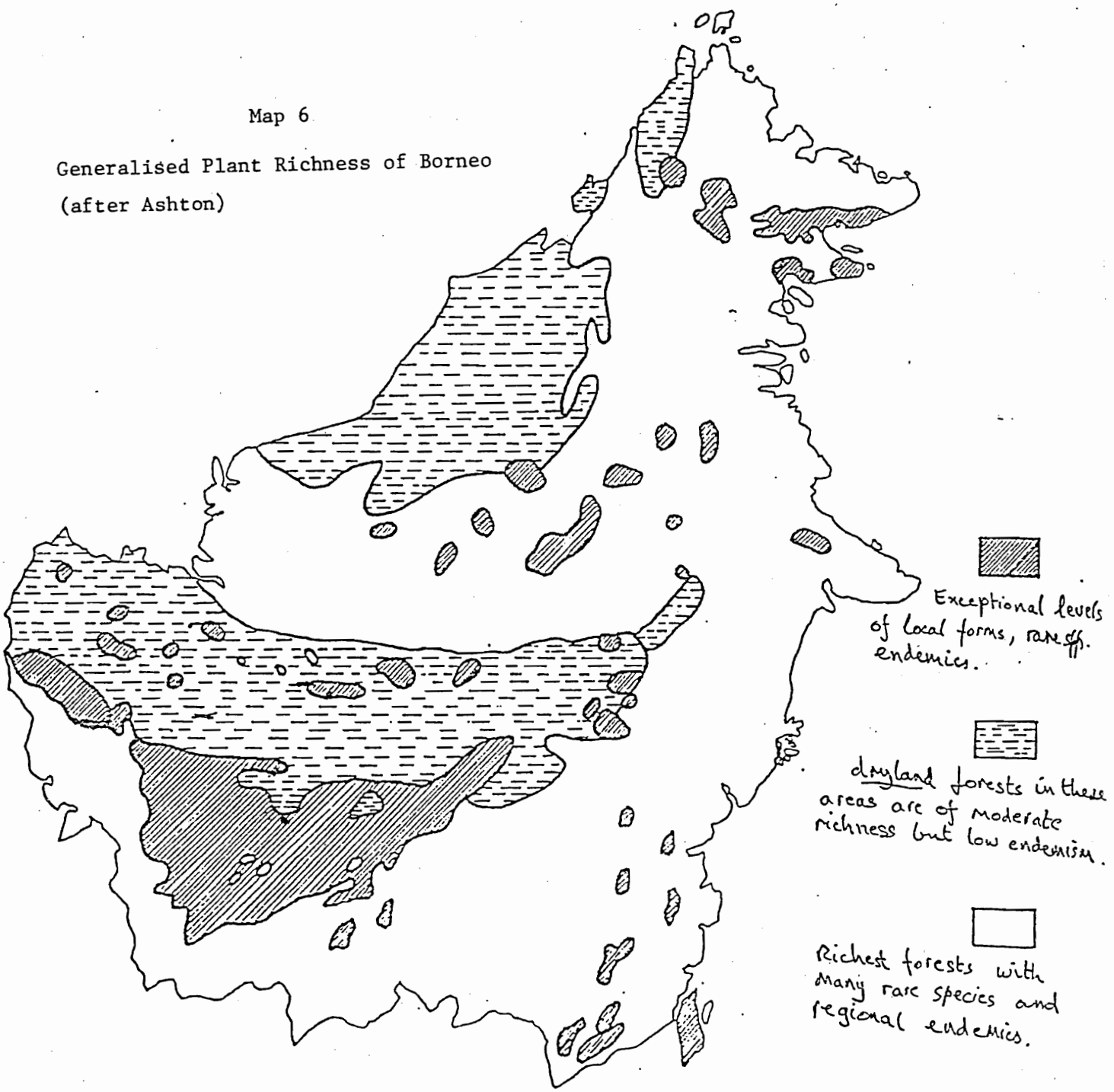


FIGURE 1. Relationship between species number and island size for different groups of wildlife.

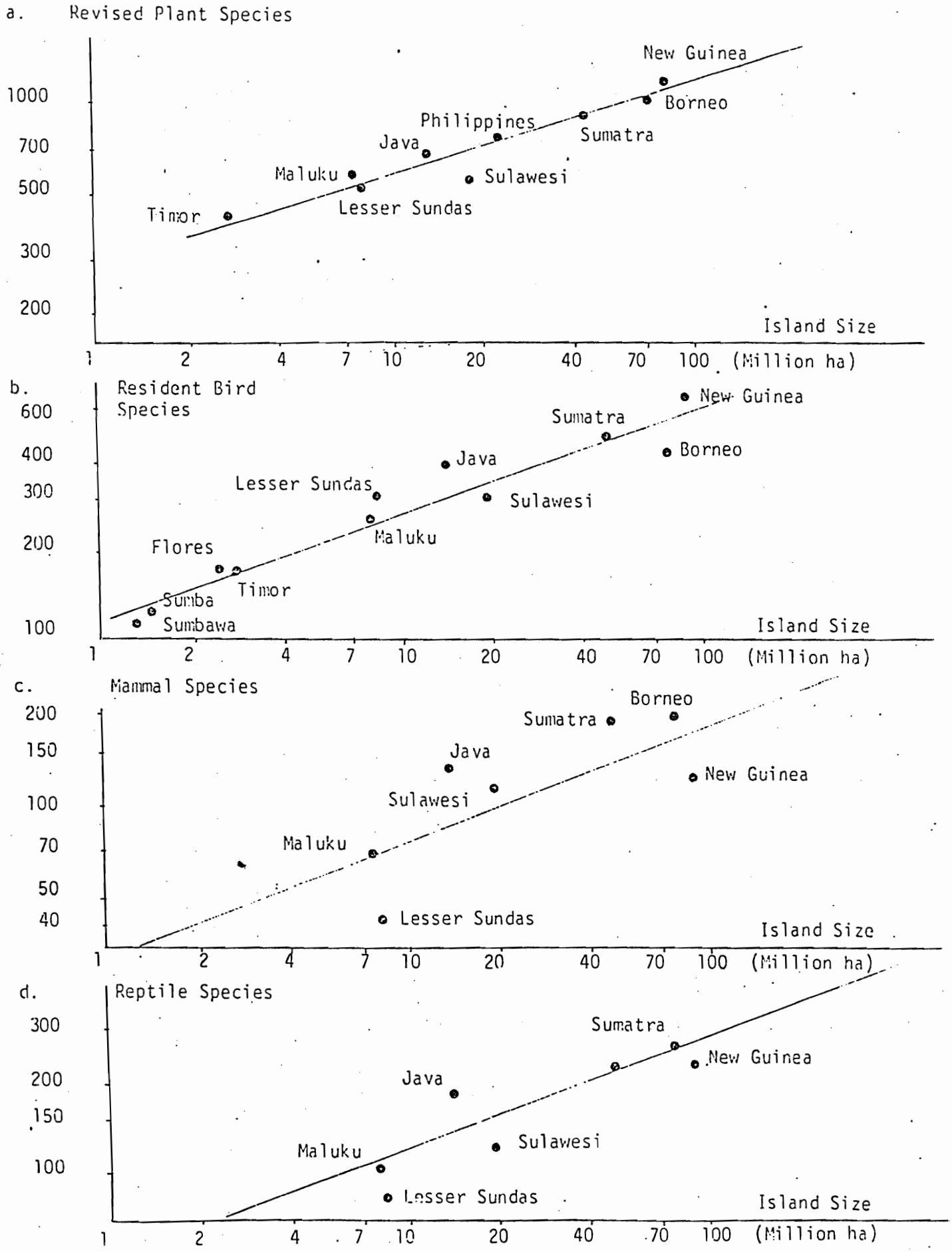


Table 1. A Comparison of Biotic Richness and Endemism Throughout Indonesia

Island	Plants Species	Plants % Endemism	Mammals Species	Mammals % Endemism	Birds Species	Birds % Endemism	Reptiles Species	Reptiles % Endemism	Overall Richness Score	Overall Endemism
Sumatra	820	11	221	12	465	2	217	11	1.30	9
Java + Bali	630	5	133	12	362	7	173	8	0.99	7
Borneo	900	34	221	19	420	6	254	24	1.36 ‡	23
Sulawesi	520	7	114	60	289	32	117	26	0.80	26
Lesser Sundas	510	3	41	12	242	30	77	22	0.47	12
Moluccas	380	6	69	17	210	33	98	18	0.58	16
Irian Jaya	1030	55	125	58	602	52	223	35	1.51 ‡	55

‡ Overall richness is taken as the mean of the plant richness score and animal richness score where these in turn are the island totals divided by the overall mean island scores.

Activities Permitted + Prohibited x in Different Categories of Protected area

	Taman Nasional (according to zones)	Cagar Alam	Suaka Marga-Satwa	Taman Wisata	Taman Buru	Extra-Limital Buffer Zones	Protectio Forests
Growing Food Crops	x	x	x	x	x	x	x
Growing Tree Crops	x	x	x	+	+	+	+
Human Settlement	x	x	x	x	x	x	x
Commercial Logging	x	x	x	x	x	x	x
Collecting Herbs and Firewood	x	x	+	x	x	+	+
Hunting	x	x	x	x	+	x	+
Fishing	x	x	x	x	+	+	+
Camping	+	x	+	+	+	+	+
Scientific Collecting with permit	+	x	+	+	+	+	+
Active Habitat Management	+	x	+	+	+	+	+
Non-exotic Introduction	+	x	+	+	+	+	+
Collecting rattan + poles with permit	+	x	x	x	+	+	+
Mineral exploraion	x	x	+	x	+	+	+
Wildlife Control	+	x	+	+	+	+	+
Visitor Use	+	x	+	+	+	+	+
Exotic Introductions	x	x	x	+	x	+	+

Table 2. Matrix of Floral Plot Richness in Different Habitat Types on Different Indonesian Islands

Habitat Type	New Guinea	Borneo	Sumatra	Java	Sulavesi	Maluku	Lesser Sundas	Habitat Mean
Upper Montane	15 (1)	22 (2)	18	10 (1)	10 (3)	11	7	14.3
Fertile Lower Montane	62	61 (2)	66 (3)	49 (2)	49 (4)	32 (1)	25	51.4
Infertile Lower Montane	41 (1)	43	35 (1)	30	23 (2)	25	16	33.0
Fertile Hill Forests	63	64 (6)	75 (1)	45 (2)	45 (3)	35 (1)	0	52.8
Infertile Hill Forests	40 (2)	44 (1)	38 (2)	37 (1)	34 (3)	19 (1)	17	34.5
Fertile Lowland Rainforest	75 (4)	39 (6)	80 (5)	51 (3)	58 (3)	37 (1)	0	65.0
Infertile Lowland Rainforest	44	50 (3)	51 (4)	35 (3)	34 (3)	28 (2)	21 (2)	36.5
Monsoon Forest	32 (1)	0	0	15 (1)	19	30 (2)	14 (2)	22.7
Heath Forest	0	40 (3)	50	0	0	0	0	40.0
Beach Forest	20	25 (1)	21	20 (1)	18 (2)	13	4 (1)	16.8
Volcanic Scrub	17	0	20 (1)	12 (1)	10 (2)	11	7	14.0
Complex Mangrove	13	15 (1)	14	12	7 (1)	8	5	11.0
Simple Mangrove	6	6 (1)	6	5 (1)	4 (1)	4 (1)	2	4.8
Peat or Fresh Water Swamp Fore	46	45 (2)	46 (4)	35	25 (1)	29	19	38.6
Island Mean Richness Index	1.20	1.30	1.26	0.91	0.82	0.76	0.48	

Data from 250 forest samples in 102 different localities.
Bold figures represent mean number of tree species greater than 15 cm diameter found in 0.5 hectare plots; figures in brackets indicate number of localities. Weak figures are estimates made by multiplying habitat means by island mean richness index.

Table 3. Biodiversity Scores of Major Kalimantan Reserves.

Name	Habitat Type	Area (A) ha.	$A^{0.37}$	Richness	Distinctiveness	Sub-Total	Total
Already gazetted:							
Gn. Niut/Becapa	HF	7,000	26	40	0.33	343	
	LWdip	54,000	56	80	0.33	1478	
	HWo	22,000	40	50	0.33	660	
	Mo	7,000	26	50	0.33	429	
	MF	1,000	13	18	0.33	77	
	LWpl	2,000	17	80	0.33	449	3436
Gn. Palung	HWo	5,000	23	50	0.28	258	
	LWdip	58,000	58	80	0.28	1299	
	PS	20,000	39	44	0.28	480	
	FS	10,000	30	44	0.28	370	
	Mnv	4,000	22	14	0.28	86	
	Mo	1,000	13	50	0.28	182	
	LWa	5,000	23	80	0.28	515	3190
Bukit Raya/Baka	MF	6,000	25	18	0.28	126	
	Mo	73,000	63	60	0.28	1058	
	LWdip	66,000	59	80	0.28	1322	
	HWo	95,000	70	60	0.28	1176	3682
Gn. Bentuang Karimun	LWdip	204,000	92	80	0.23	1693	
	HWo	330,000	110	60	0.23	1518	
	Mo	58,000	58	50	0.23	667	
	MF	8,000	28	18	0.23	116	3994
Tanjung Puting	HF	135,000	79	40	0.18	560	
	FS	78,000	65	45	0.18	526	
	PS	98,000	70	44	0.18	554	
	Mnv	11,000	31	14	0.18	78	
	FSa	35,000	48	45	0.18	389	2116
Pararawen	LWpl	62000	25	90	0.18	316	316
Pleihari Martapura	Mo	4,000	22	40	0.28	266	
	LWdip	15,000	35	80	0.28	784	
	HMo	7,000	26	50	0.28	364	1414
Kutai	FS	20,000	39	45	0.18	316	
	LWdip	30,000	45	70	0.18	567	
	HF	20,000	39	40	0.18	281	
	Idf	20,000	39	60	0.18	421	1585
S. Kayan/S. Mentarang	MS	20,000	39	18	0.23	161	
	Mo	770,000	151	50	0.23	1736	
	HWo	635,000	140	60	0.23	1932	
	LWdip	175,000	87	80	0.23	1601	5430

Name	Habitat Type	Area (A) ha.	$A^{0.37}$	Richness	Distinctiveness	Sub-Total	Total
S. Mahakam	FL	30,000	45	20	0.23	297	
	PS	10,000	30	44	0.23	304	
	FS	30,000	45	45	0.23	528	1400
Not yet established:							
Danau Sentarum*	PS	30,000	45	50	0.28	630	
	DS	25,000	42	50	0.28	588	
	FL	25,000	42	20	0.33	277	1495
Muara Uya	LWdip	15,000	35	80	0.23	644	
	LWpl	6,000	25	90	0.23	517	
	HWo	4,000	22	60	0.23	304	1465
Muara Sebuka	Mnv	60,000	59	14	0.18	144	
	HF	25,000	42	40	0.18	302	
	FS	10,000	30	44	0.18	238	684
Ulu Kayan/Mutlak	MF	5,000	23	18	0.18	75	
	Mo	125,000	77	50	0.18	693	
	HWo	500,000	128	60	0.18	1382	
	LWdip	350,000	113	80	0.18	1627	3777
Sungai Berambai	HF	65,000	60	40	0.18	432	
	PS	15,000	35	44	0.18	277	
	LWdip	35,000	48	80	0.18	691	1400
Ulu Sembakung	Mo	100,000	71	50	0.23	816	
	HWo	250,000	99	60	0.23	1366	
	LWdip	150,000	82	80	0.23	1509	3691
Sangkulirang	DL	87,000	67	40	0.33	844	
	ML	41,000	51	40	0.33	673	
	HF	3,000	20	40	0.28	224	
	LWdip	30,000	45	40	0.33	1040	2781

* Surat Keputusan now released but reserve still not established.

Table 4. Summary of Relevant Details in Selecting Important Reserves for Assistance.

Name	Mam. End.	Av. End.	Uniq-ue	NCP	IMR	Biodiv-ersity	Remote-ness	Threat Degree	Damage Degree	Other Support
Already gazetted:										
Gn. Niut/Becapa	10	6	C	1	A	3436	low	high	high	low
Gn. Palung	8	5	B	1	A	3190	low	med.	low	med.
Bukit Raya/Baka	8	7	B	1	A	3682	med.	med.	low	low
Gn. Bentuang/ Karimun	13	13	C	2	A	3994	high	low	low	low
Tanjung Puting	8	4	C	1	A	2116	low	med.	high	high
Pararawen	8	4	C	1	B	316	med.	med.	med.	low
Pleihari Martapura	5	3	C	1	B	1414	low	high	high	med.
Kutai	9	4	C	1	A	1585	low	high	high	high
S. Kayan/ S.Mentarang	13	16	C	1	A	5430	med.	med.	low	low
Sungai Mahakam	1	0	A	1	B	1400	low	high	high	low
Not yet established:										
Danau Sentarum	3	0	A	1	A	1495**	med.	med.	med.	low
Muara Uya	5	4	C	1	B	1465	low	high	med.	low
Muara Sebuka	8	6	C	1	A	684	med.	high	med.	low
Ulu Kayan/Mutlak	14	16	C	1	A	3777*	med.	med.	med.	low
Sungai Berambai	7	4	C	1	B	1400	med.	med.	med.	low
Ulu Sembakung	14	15	C	1	A	3691*	med.	high	med.	low
Sangkulirang	9	5	A	1	A	2781	med.	med.	med.	low

* = two high scoring areas adjacent to S. Kayan/Mentarang that would be partially incorporated in the redesigned reserves.
**= important values of aquatic habitats not included in this score.

Mammalian endemics = expected number of endemic mammals;
Avian endemics = expected number of endemic birds;
Unique = C (low), B (med), or A (high);
NCP = refers to priority given in National Conservation Plan;
IMR = refers to priority given in Indomalayan Review of IUNC;
Biodiversity = refers to combined score weighted for area size, habitat richness and level of local endemism;
Remoteness = refers to distance from major population centres-low = less than 1 day travel, med. = 1-2 days travel, 3 = more than 2 days travel;
Threat degree = refers to relative pressure for conversion;
Damage degree = refers to proportion of reserve already damaged or degraded with high = 20% damage, med.= 5-20% damage and low= 5% damage;
Other support = refers to likelihood of other agencies assisting area.
Scores that render reserves unsuitable for selection are underlined.
Names of reserves found unsuitable are underlined.