Expanding the protected areas network in Vietnam for the 21st Century
An analysis of current system with recommendations for equitable expansion

by

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This is a technical report for the project entitled:
Expanding the Protected Areas Network in Vietnam for the 21st Century.

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Foreword

This report represents an important milestone for number of reasons. In itself it is a major contribution to the revision of the system of Special-use Forests it is also much more. It is testimony to the effect of cooperation between government and the NGO sector in the field of biodiversity conservation and demonstrates to government and funding agencies alike the value of such projects.

Vietnam has made great strides in the development of its protected areas system during past years and the government fully recognizes the shortcomings and gaps in the former system of Special-use Forests. That is precisely why the Ministry of Agriculture and Rural Development has embarked on a strategy to redress imbalances through evaluating and amending the system of Special-use Forests. What impresses us most about this report is that it uses a quantitative methodology utilizing scientific criteria to do so.

The results of this analysis reveal some starling findings, for example the extent to which the current system includes non-forest lands. This is placing an unrealistic burden on MARD which is committed to ensuring that the policy objectives of Special-use Forests are fully met. The report also reveals how critically threatened some of our endemic species of primates and birds now are. Swift and decisive governmentaction will be required if the global extinction of the most threatened species is to be prevented.

To my knowledge this may be the first time that a gap analysis of kind has been undertaken for a protected areas system within our region. Colleagues at FFI and BirdLife have synthesized a vast amount of data and can be justly proud of their achievement. This collaborative effort has drawn upon BirdLife's expertise in setting conservation priorities for which they are rightly renowned, and FIPI's professionalism in maintaining and managing a geographic information system on the status of the nation's forests. This report represents an important watershed in the implementation of this project and I wish FIPI and BirdLife every continued success.

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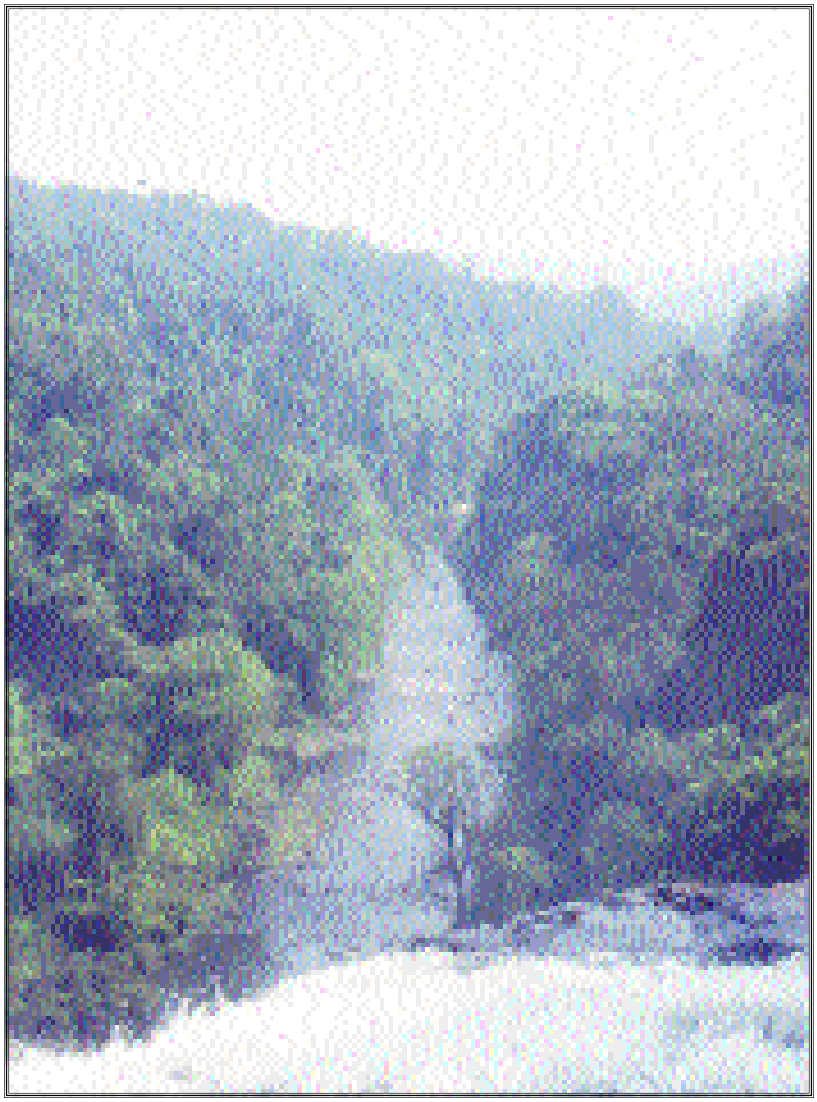


Photo: *J.C.Eames*

Riverine forest in evergreen forest, Kon Cha Rang Nature Reserve, Gia Lai province (Kon Tum Montane Forests Ecoregion).
The riverine forest ecotone remains seriously underrepresented in the protected areas network. A number of Globally Threatened species are dependent on riverine forest habitats. To ensure their conservation, it is important that entire watersheds are included within protected areas. Using rivers as boundaries for protected areas only results in the destruction of such habitats. This report proposes the extension of Kon Cha Rang to join Kon Ka Kinh Nature Reserve, increasing the long-term viability of this area for conservation.

Executive Summary

Recognising that the current protected areas network is inadequate to effectively preserve the full complement of Vietnamese biodiversity, MARD (the Ministry of Agriculture and Rural Development) have proposed to increase the area of Special-use Forest reserves from 1.3 million to 2 million hectares,

This exciting development allows a rare opportunity to choose, in an objective way, which areas should be added to the network. It also offers the chance to redress some of the imbalance in coverage of the present network.

This report is an analysis of information collated by BirdLife International and the Forest Inventory and Planning Institute, and highlights:

- **Natural Forest types, Ecoregions, Provinces, Elevation zones etc. that are poorly protected within the current protected areas network**

- **Globally Threatened species (of very large mammals, primates and birds) that are currently under represented within the existing network**

- **Areas, currently protected by decree, that now have little if any biological or conservation value**

The report concludes by recommending:

- **Areas for protection that would improve the equitable representation of the network and help prevent species extinctions**

The current protected areas network has a number of problems that need addressing - the proposed expansion of the network presents the ideally opportunity to do this. Points that need addressing are:

- **The unequal representation of biodiversity within the current protected areas network**

- **The vast area of degraded, non-forest lands within the current network**

- **Trans-Province reserves being managed as two (or more) separate areas**

- **The accuracy of information concerning protected areas, especially area, precise reserve boundaries, name and legal status**

Vietnam is 27% covered in Natural Forest, but this coverage is declining at a rate that will see the country devoid of forest within 90 years. Evergreen Forest, although the commonest forest type, is being lost the fastest.

Although 1.3 million ha of land is protected, only 770,000 ha comprise forested land. The distribution of this protected area is uneven: Evergreen Forest is poorly represented within the current network and certain ecologically distinct regions (Vietnam has 16 Ecoregions as defined by Wikramanayake et al. 1997) are under-protected. Protected areas tend to have been sited in higher elevation regions, and at the species level, certain Globally Threatened species currently enjoy no protection at all. At least three Provinces supporting areas of forest have no protected areas under their jurisdiction.

The solution to this disparity is to use the opportunity now presenting itself to target the additional protection in those areas, habitats etc. that are currently poorly represented.

The analysis presented in this report shows how much, and where the expansion of the protected areas network must be if all forest types, Ecoregions, and elevation zones are to be equally represented. It also shows which provinces should be targeted for the inclusion of a protected area, and ensures that all Globally Threatened species are to be at least partially safeguarded within the network.

Taking into account all of these factors, and by considering existing proposals, the potential for extending current protected areas, joining sites together and looking for the largest available forest area, this report has identified 25 areas that should be added to the current network. In combination, these areas would increase the protected area coverage to 2.1 million ha, and ensure a more equitable coverage of Vietnamese biodiversity.

Also identified are a number of protected areas that support little in terms of biodiversity value, and should therefore be degazetted to help increase the efficiency of the network as a whole.

Tóm tắt dự án

Hệ thống các khu rừng đặc dụng đã được thành lập chưa bảo vệ được hết các đối tượng đa dạng sinh học cần bảo vệ của Việt Nam, vì vậy Bộ Nông nghiệp và Phát triển Nông thôn đã đề xuất mở rộng diện tích rừng đặc dụng từ 1 triệu lên 2 triệu ha vào đầu thế kỷ XXI.

Chủ trương trên tạo điều kiện thuận lợi để rà xét lại các khu rừng hiện có và đề xuất một hệ thống khu rừng đặc dụng mới.

Bản báo cáo này nhằm phân tích thông tin do Viện Điều tra quy hoạch rừng và Tổ chức Bảo tồn chim quốc tế (BirdLife International) thu thập được về các khu rừng đặc dụng của Việt Nam.

Việc phân tích nhằm các đối tượng chính sau đây:

- **Các kiểu rừng tự nhiên, các vùng sinh thái, các tỉnh, các độ cao... còn ít được quan tâm bảo vệ trong hệ thống các khu rừng đặc dụng hiện nay.**
- **Các loài bị đe dọa có nguy cơ bị diệt chủng trên quy mô toàn cầu (bao gồm các loài thú lớn, linh trưởng, và các loài chim) đang nằm ngoài hệ thống các khu rừng đặc dụng.**
- **Các khu vực đặc dụng đã được quyết định nhưng có giá trị đa dạng sinh học thấp.**

Trên cơ sở phân tích trên, báo cáo đưa ra các khuyến nghị sau:

- **Mở rộng các khu rừng đặc dụng hiện có để tăng cường việc bảo tồn các loài có nguy cơ diệt chủng.**

Khi mở rộng hệ thống các khu rừng đặc dụng hiện nay cần chú ý các vấn đề sau:

- **Tính đa dạng sinh học trong hệ thống các khu rừng đặc dụng cũ chưa cân đối.**
- **Một số khu rừng đặc dụng có độ che phủ rừng thấp.**
- **Thiếu sự phối hợp trong công tác quy hoạch, quản lý và bảo vệ các khu rừng đặc dụng nằm trong ranh giới 2 hay nhiều tỉnh.**

- **Xem xét lại các thông tin có liên quan đến tên gọi, diện tích và ranh giới các khu rừng đặc dụng cũ.**

Tới nay Việt Nam còn khoảng 27% rừng tự nhiên, nhưng diện tích loại rừng này vẫn đang bị suy giảm. nếu với tốc độ mất rừng phổ biến và có diện tích lớn nhất cũng là loại rừng bị mất rừng hiện nay thì Việt nam sẽ không còn rừng trong vòng 90 năm tới. Rừng thường xanh một kiểu rừng phổ biến và có diện tích lớn nhất cũng là loại rừng bị mất đi với tốc độ nhanh nhất.

Mặc dù 1,3 triệu ha đã được bảo vệ trong các khu rừng đặc dụng nhưng trong đó chỉ có 770.000 ha là đất có rừng. Sự phân bố các đối tượng bảo vệ cũng chưa đồng đều: tỷ lệ rừng thường xanh và các hệ sinh thái khác nhau được bảo vệ trong các khu rừng chưa cân đối. (Theo bản đồ các vùng sinh thái của khu vực Đông Dương - Thái Bình Dương của ông Wikramanayake và các cộng sự (1996), Việt Nam có 16 vùng sinh thái). Các khu rừng đặc dụng thường được thành lập nhiều ở vùng có độ cao lớn. Một số loài có nguy cơ bị tiêu diệt trên quy mô toàn cầu (Thí dụ các loài được ghi trong sách đỏ của IUCN) còn chưa được thiết lập khu bảo tồn. Ít nhất 3 tỉnh có rừng nhưng chưa có khu rừng đặc dụng nào.

Vì vậy trong quá trình mở rộng hệ thống các khu rừng đặc dụng này cần phải bổ sung các đối tượng loài, các nơi sống có giá trị bảo tồn cao vào hệ thống mới.

Kết quả phân tích trong báo cáo đã chỉ ra các mức độ và khu vực cần được mở rộng và khi mở rộng cũng phải chú ý sự cân đối của các hệ sinh thái, tỷ lệ các rừng tự nhiên và các đai cao khác nhau. Báo cáo này cũng nêu ra những tỉnh nào cần xây dựng rừng đặc dụng và đảm bảo tất cả các loài đang có nguy cơ bị tiêu diệt trên quy mô toàn cầu sẽ được bảo vệ trong hệ thống rừng đặc dụng mới.

Tổng hợp các yếu tố trên và xem xét lại hệ thống các khu rừng đặc dụng hiện nay, các tác giả của báo cáo này đã xác định 25 khu vực cần được bổ sung vào hệ thống các rừng đặc dụng và tổng diện tích của hệ thống này là 2,1 triệu ha và hệ thống mới sẽ đảm bảo sự cân bằng đa dạng sinh học của Việt Nam.

Ngoài ra việc xác định các khu rừng đặc dụng cũ có tính đa dạng sinh học thấp cũng cần được công bố và đề nghị loại bỏ để đảm bảo tính khoa học và hợp lý của toàn bộ hệ thống rừng đặc dụng mới được đề xuất.

1 INTRODUCTION

The protected areas network of Vietnam was reviewed as part of the *Forestry Sector Review* (MacKinnon 1990, MOF 1991). Within these documents it was recognized that many of the protected areas were too small and/or too degraded to satisfy their conservation goals. Additionally, the review proposed a significant increase in the area set aside to more effectively preserve the nation's biodiversity. In recognition of these recommendations, the Ministry of Agriculture and Rural Development (MARD) adopted a target of 2 million hectares as "Special-use Forests", representing 6% of the national land area.

1.1 Objectives

This report is an analysis of information collated by BirdLife International and the Forest Inventory and Planning Institute (FIPI). It aims to:

The Imperial Pheasant is critically endangered and endemic to Vietnam. The conservation of this species is not guaranteed by the current protected areas network

- ***Highlight natural forest types, ecoregions, provinces, elevation zones etc. that are poorly protected within the current protected areas network***
- ***Highlight Globally Threatened species (of very large mammals, primates and birds) that are currently under represented within the existing network***
- ***Highlight areas, currently protected by decree, that now have little, if any biological or conservation value***
- ***Recommend areas for protection that would improve the equitable representation of the network and help prevent species extinctions.***

1.2 Structure of the report

In this report we first describe the current status of the protected areas network, highlighting problem areas which need to be addressed, but also detailing what the proposed expansion will mean in terms of conservation opportunity. Next we briefly describe the current protection afforded various biodiversity and geopolitical components that must be considered in any representative protected areas network. A detailed analysis of current biodiversity representation within the protected areas network is summarised in terms of a needs assessment - how much forest (under the constraints of the proposed extension) needs to be added, and where does it need to be to ensure equitable representation? Results are mapped, and justified in tabular form.

1.3 Data sources and protocols

This report has been based on information compiled over two years in collaboration with FIPI. The project has relied on relatively few data sources, and these are described below, along with an indication of how they have been used, and some of the problems inherent within them.

- **Protected areas**

The protected areas data used for this project has been compiled, and is managed by FIPI. Official documentation for which areas have decrees, what their size is, and even what their names are is seemingly not available, so much effort was devoted to clarifying some of these issues. The list presented in Appendix 1 is the best that we have managed to achieve, but there are inevitably flaws. A second issue relates to the mapped/digitized boundaries of reserves held by FIPI. We have used these mapped boundaries to do all the analyses presented herein. However, some boundaries appear to be in the wrong place, and others (without qualification) have incorporated proposed changes/extensions before these have been decreed. Throughout this report, the analyses have been based upon these mapped boundaries, and therefore the figures will habour inherent inaccuracies.

- **Land-use**

The land-use coverage for Vietnam is based upon a 1995 Landsat data set. This was classified into the land-use and forest types used throughout this report. There will be inaccuracies in this data due to the problems of interpolating landsat imagery without extensive ground-truthing. However, it was the best data available, and provided an excellent opportunity to analyse trends and distribution of protected area coverage in relation to land-use. Forest cover maps for 1943 and 1983 were also used (in digital format) to calculate trends in forest loss.

A survey team ground truthing the boundaries of the proposed Ea So Nature Reserve in Dak Lak Province

Photo: *J.C.Eames*

Photo: *J.C.Eames*

Evergreen forest interior in the Khe Net forest, Quang Binh province. Evergreen forest is a habitat type which occurs across all elevation zones and in all (bar one) of the ecore - gions considered by this report

- **Ecoregions**

Ecoregions represent unique assemblages of species and/or forest associations. We have followed, without modification, Wikramanayake *et al*. (1997) in their definition of 16 Ecoregions within Vietnam.

However, the Ecoregions described by these authors were done so at a regional (Indo-Pacific) level and we have noticed a number of areas where the boundaries require redefinition at a national scale. We have not attempted to do any such redefinition, and therefore the allocation of a particular protected area to one Ecoregion or another may change in the future.

- **Elevation**

The elevation zones used throughout the analysis are those that are readily available in digitized format. They range from 0-300 m, 300-700 m, 700-1,200 m, and 1,200 m and above.

Quite extensive areas of Vietnam remain unclassified due to the complexity of the karst limestone relief – we have attempted to take this into account in our calculations. We have referred to land below 700 m as lowland, and above as montane, but recognise that this is an arbitrary distinction (and one that is influenced by many factors such as latitude etc.).

- **Globally threatened species**

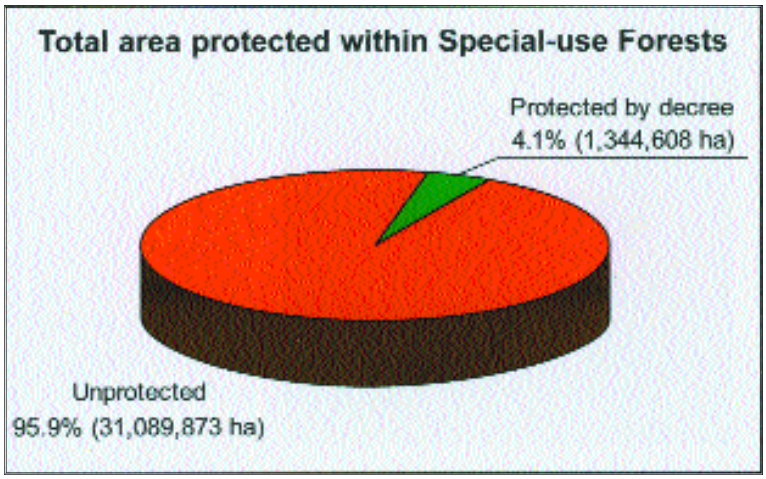
Data sets for Globally Threatened species were available for four very large mammals (from Duckworth and Hedges 1999); primates (from Fooden 1996); and birds (from BirdLife International's World Bird Database). Records of the very large mammals have only been used where they are confirmed records from the last 10 years.

Primate records are essentially based upon specimen data that include many historical records. Similarly, bird records are based on specimens and confirmed sightings, both historical and recent. For birds we have limited the analysis to resident forest species (i.e. excluding all wetland and coastal species, and migrants). We have followed IUCN (1996) and Collar *et al*. (1994) for categories of threat.

2 THE PROTECTED AREAS NETWORK IN VIETNAM

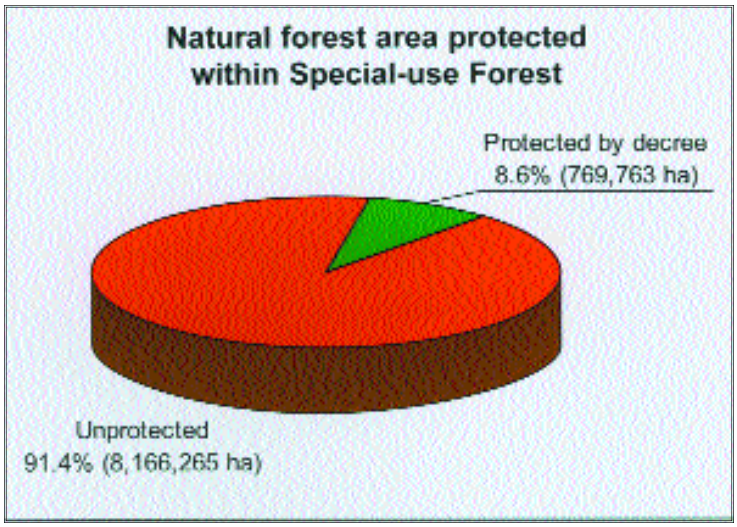
2.1 Background

The National Park of Cuc Phuong, the first protected area in Vietnam, was established in 1962. There are currently 86 decreed Special-use Forest reserves (National Parks, Nature Reserves, Cultural/ Historical sites): the majority of these (73, totaling 770,000 ha) were decreed in 1986 (MARD 1996). The reserves were selected to cover representative examples of all major ecosystems as well as about 30 sites of primarily historical or scenic interest. The 86 Special-use Forest reserves protect 1.3 million ha, or 4% of the land area. They are listed in Appendix 1.



2.2 The expansion of the protected areas network

MARD has adopted a target of 2 million ha under protection as Special-use Forests (see 1. Introduction), representing an expansion of the current network by 660,000 ha. Assuming that the additional 660,000 ha will be natural forested land, this represents 1,430,000 ha (or 16%, up from the current level of 8.6%) of natural forest protected.



The protected area network is constantly developing: there are reserves awaiting decree, reserves with extended boundaries, and many proposals for extensions, buffer zones or new protected areas. Possibly the most significant recent proposal for additions to the protected areas network is the Forest Protection Department (FPD) (1998) list submitted to government. This list is the first response to MARD's desire to expand the coverage of protected areas within the country. The purpose of this


Map 1:
Decreed protected areas
in Vietnam
PHONG QUANG
BAC BO
TRUNG KHANH
NUI PIA OAC
HOANG LIEN
BA BE
MUONG NHE
THAC BA
TAN TRAO
BAC SON
NAM DON
HUU LIEN
AI CHI LANG
TAM DAO
CAM SON
MUONG PHANG
DEN HUNG
YEN TU
CON SON
XUAN SON
BA VI
BA MUN
BA CO HANG RIA
BAI CHAY
SOI COP
CAC DAO VINH HA LONG
DAO HO SONG DA
CAT BA
XUAN NIM
DO SON
THUONG TIEN
PHUONG SON
VAC PHUONG
NGOC TRAO
XUAN THUY
LAM SON
TAM QUY
DEN BA TRIEU
BEN EN
PU HUONG
HOM ME
PU MAT
VU QUANG
KE GO
PHONG NHA
BACH MA
BAN DAO SON TRA
BANA-NUI CHUA
CU LAO CHAM
NUI THANH
NGOC LINH
BA TO
MOM RAY
KONG CHA RANG
KON KA KINH
KRONG TRAI
SEO CA HON NUA
YOK DON
HO LAC
NAM CA
CHU YANG SIN
BU GIA MAP
BI DUP - NUI BA
NAM LUNG
NUI BA RA
DEO NGOAN MUC
LO GO SA MAT
CAT TIEN
RUNG KHO PHAN RANG
NUI BA DEN
KALON SONG MAO
DUONG MINH CHAU
NUI DAI BINH
BOI LOI
BIEN LAC-NUI ONG
NUI CAM
TAM NONG (TRAM CHIM)
BINH CHAU PHUOC BUU
PHU QUOC
HON CHONG
U MINH THUONG
VO DOI
SAN CHIM BAC LIEU
SAN CHIM CA MAU
SAN CHIM CA MAU
DAT MUI
CON DAO
TRUONG SA
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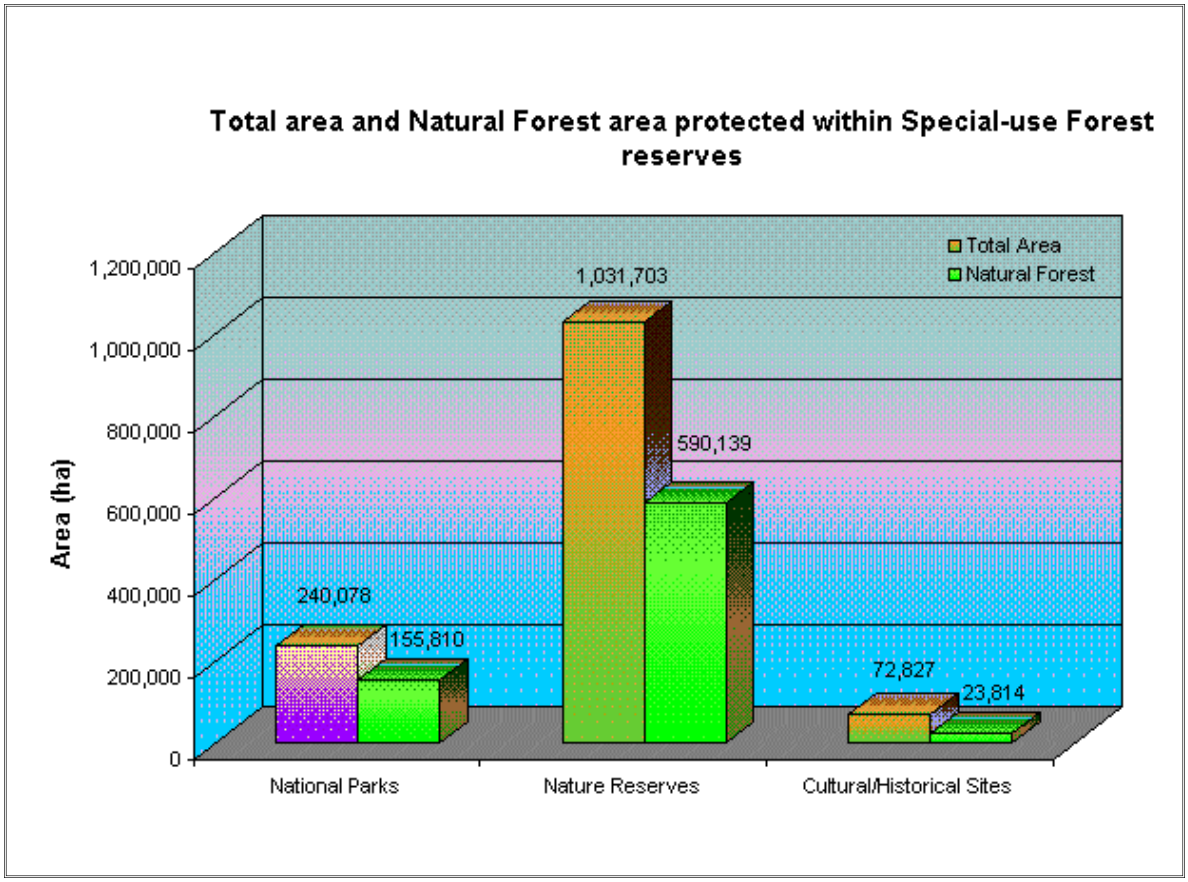
S
0
100
200
KILOMETRES

BirdLife/FIPI report is to complement the FPD (1998) list and other proposals, and present biological justifications for where the expansion of the protected areas network should be (see section 9. Expanding the protected areas network).



2.3 *The "protection" of non-forest lands*

Special-use Forest reserves currently include 575,000 ha of non-forest (scrub, grassland and agricultural) land, most of which is within Nature Reserves, some even within National Parks. This is clearly inefficient and a waste of the scarce resources available for reserve management. Suggestions for degazetting reserves or redefining the boundaries of reserves with large expanses of non-forest land are made in section 9.3 *Degazetting protected areas.*

2.4 *The importance of trans-province reserves*

Expansion of existing protected areas to include additional contiguous natural forest area is often better than creating a new but individually small protected area, as the larger the protected area, the betteris its long-term viability as a nature conservation unit. Special-use Forests are often located at province boundaries, and in some cases are contiguous with protected areas in adjoining provinces. However, while this creates larger areas of contiguous habitat, the

reserves are managed (potentially differently) as separate entities which is both inefficient and expensive, but most importantly, may have a negative impact on the wildlife resource. Such areas may best be managed as National Parks.

2.5 Data limitations

As the protected areas network evolves with new areas proposed and decreed, old areas having their boundaries revised, so the information concerning these areas (such as names, whether they are decreed or not) becomes out of date and inaccurate. One manifestation of this issue is uncertainty over the size of reserves. Table 1 compares the area of Special-use Forests at the time they were decreed with the areas calculated from reserve boundaries digitized by FIPI. Sites have only been included where the discrepancy between the two figures is greater than 1,000 ha (but excludes sites where proposed changes have already been incorporated into the reserve boundary by FIPI). While the concordance between the two is often excellent, the discrepancies as listed in the table suggests (in these cases) either that the boundaries of reserves are incorrect and need to be re-mapped, or that the area described for a particular reserve in the relevant decree needs revision. This is a significant issue as the variance amounts to 67,400 ha.

The discrepancies between the area provided by the Geographic Information System (GIS) and the area documented in the original government decree (MARD 1996) means that the figures presented in this report will have some inherent inaccuracies. In addition to area inaccuracies, the boundaries of some reserves have been mapped in the wrong places, also leading to some inaccuracies in this report (see section *1.3: Data Sources and Protocols*). Precise mapping of the boundaries of all Special-use Forests will be essential for long-term monitoring and future analyses.

The system of Special-use Forests includes 575,000 ha of non-forest which consists of srub, grassland and agricultural land.

Photo: *Gery Gomez*

Special-use Forest	Category	Area when first decreed (ha)	Current GIS area (ha)	Difference between areas (ha)
Ai Chi Lang	Cultural and Historical Site	1,000	2,126	1,126
Ba To	Cultural and Historical Site	500	2,365	1,865
Bai Chay	Cultural and Historical Site	562	3,018	2,456
Bana-Nui Chua	Nature Reserve	5,217	26,150	20,933
Binh Chau Phuoc Buu	Nature Reserve	5,474	14,257	8,783
Cam Son	Cultural and Historical Site	15,000	10,754	-4,246
Con Dao	National Park	6,000	7,598	1,598
Cu Lao Cham	Nature Reserve	1,535	338	-1,197
Cuc Phuong	National Park	25,000	29,853	4,853
Dao Ho Song Da	Cultural and Historical Site	3,000	11,573	8,573
Dat Mui	Nature Reserve	4,000	6,095	2,095
Ho Lac	Cultural and Historical Site	12,744	11,508	-1,236
Ke Go	Nature Reserve	24,801	26,271	1,470
Kalon Song Mao	Nature Reserve	20,000	11,819	-8,181
Kong Cha Rang	Nature Reserve	16,000	14,303	-1,697
Krong Trai	Nature Reserve	19,000	23,585	4,585
Lam Son	Cultural and Historical Site	300	3,239	2,939
Lo Go Sa Mat	Nature Reserve	10,000	13,582	3,582
Muong Phang	Cultural and Historical Site	1,000	2,670	1,670
Nam Ca	Nature Reserve	20,000	31,050	11,050
Nam Lung	Nature Reserve	20,000	11,265	-8,735
Ngoc Trao	Cultural and Historical Site	300	1,665	1,365
Nui Ba Den	Cultural and Historical Site	2,000	3,677	1,677
Nui Cam	Nature Reserve	1,500	7,781	6,281
Phu Quoc	Nature Reserve	5,000	13,036	8,036
Pu Huong	Nature Reserve	5,000	40,149	35,149
Rung Kho Phan Rang	Nature Reserve	1,000	18,838	17,838
Sop Cop	Nature Reserve	5,000	9,375	4,375
Tam Dao	National Park	19,000	27,980	8,980
Vo Doi	Nature Reserve	2,000	4,953	2,953
Yen Tu	Nature Reserve	5,000	9,306	4,306

Table 1. Selected Special-use Forest sizes: the discrepancy between sources

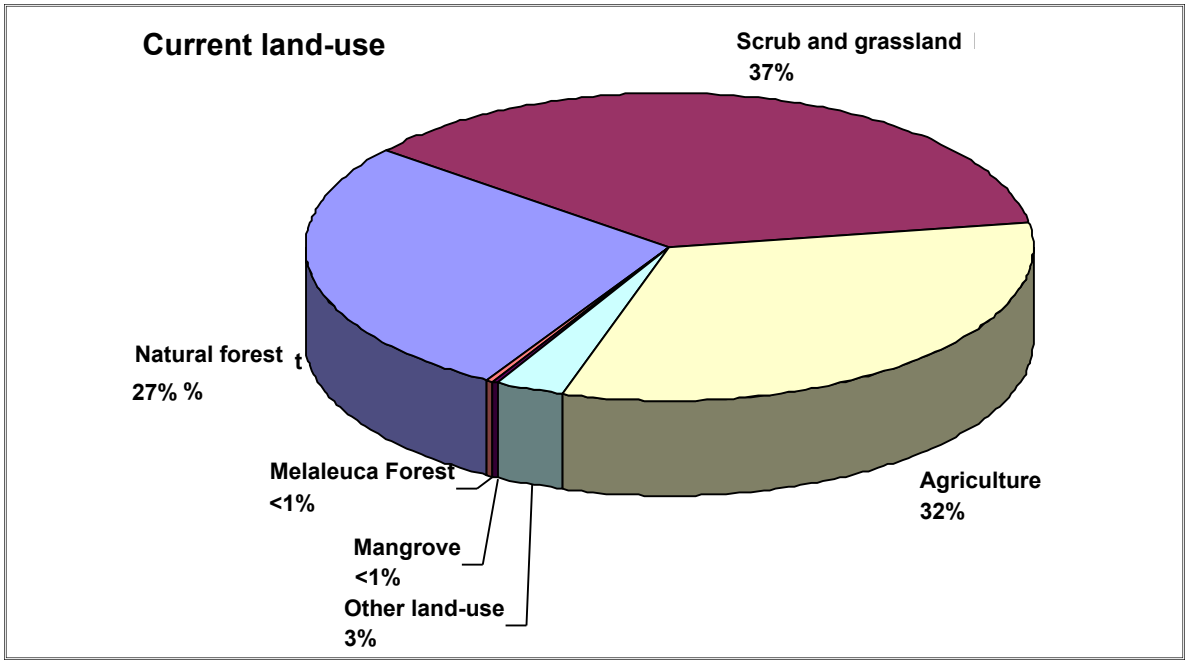
3 LAND-USE IN VIETNAM

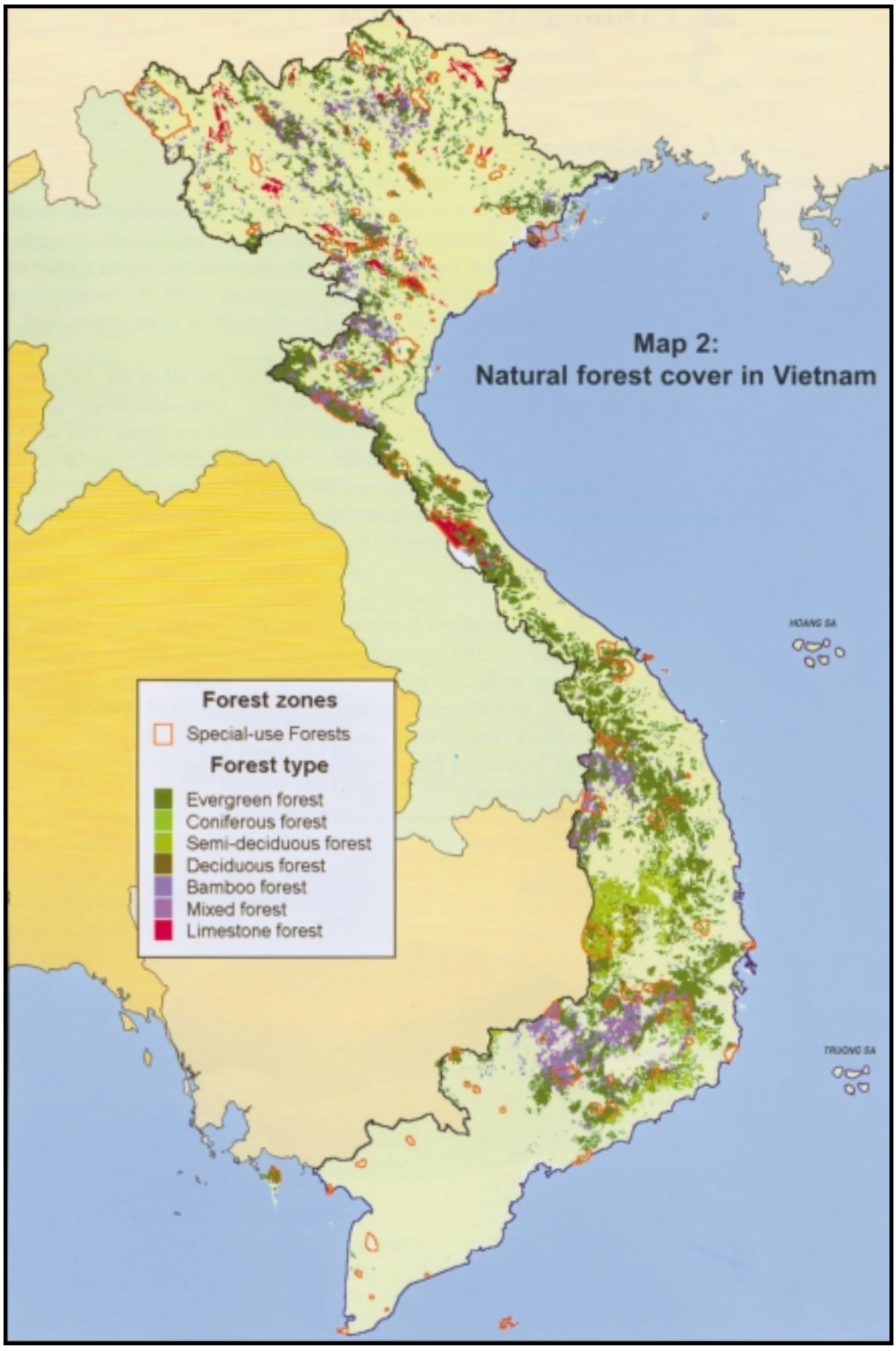
3.1 Background

The remit of this report is to consider the coverage of terrestrial natural forest ecosystems within the protected areas network. Therefore it excludes mangroves, Melaleuca forest, wetland and marine ecosystems. These should be considered elsewhere, as each is vitally important from a conservation standpoint if the full complement of national biodiversity is to be maintained.

Natural forest in this report is used as a generic term for all of the following forest types: evergreen forest; coniferous forest; semi-deciduous forest; deciduous forest; bamboo forest; mixed forest and limestone forest. The use of a more detailed classification was not possible, but consideration must be given to the full diversity of habitat types within each of these categories when reserve boundaries are drawn, and feasibility studies and management plans are written. For example, riverine forest is a particularly important habitat within all forest types.

While relevant information about bamboo forest is included as natural forest in the analyses below, no specific recommendations for the increase in protection of this forest-type are made, as it is not a climax vegetation type. Similarly, coniferous forest (i.e.monospecific stands of *Pinus kesiya* and *Pinus merkusi*) is essentially a secondary forest type, and occurs naturally only within two Ecoregions; Eastern Indochina Pine Forests and Da Lat Montane forests (see section *8.3: Coniferous Forest*).



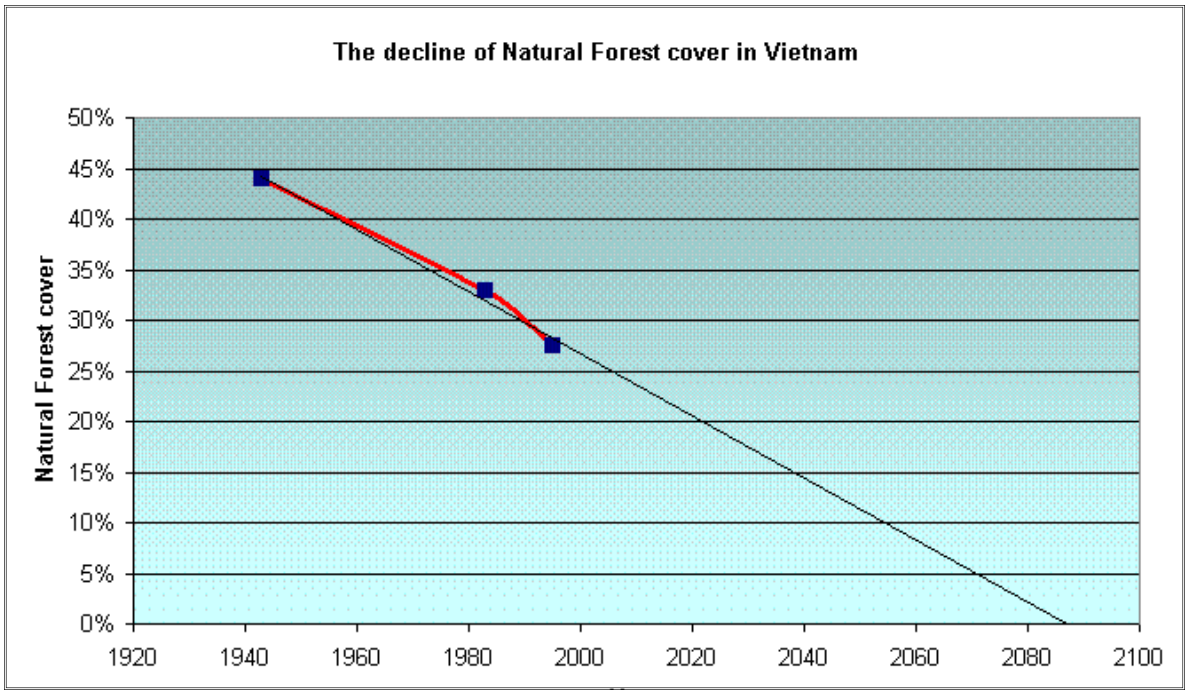

Map 2:
Natural forest cover in Vietnam
Forest zones
Special-use Forests
Forest type
Evergreen forest
Coniferous forest
Semi-deciduous forest
Deciduous forest
Bamboo forest
Mixed forest
Limestone forest
HOANG SA
TRUONG SA

3.2 Current land-use and natural forest cover

The natural vegetation of Vietnam has been extensively modified in recent times. Almost 70% of the country comprises agricultural land or scrub and grassland, and this percentage is increasing every year (see section *3.3*). Natural forest cover, is 27% and declining. The north of the country has lost most of its lowland forest, with montane forest now much reduced in extent and highly fragmented. The centre has lost most of its lowland forest, but retains significant blocks of forest along the Annamite Mountains, whereas the south retains extensive forest areas in the Western (or Central) Highlands, with lowland forests again much reduced.

3.3 The decline of natural forest cover

Natural forest cover was reduced from 44% in 1943 to 33% by 1983. The reduction is accelerating, with cover (in 1995) standing at 27.5% (a reduction of 1.6 million ha, or 15% of the remaining natural forest in 12 years). The highest rates of forest cover loss are in the most densely populated, lowland regions in the north and south. The central region is being cleared at a slower rate.

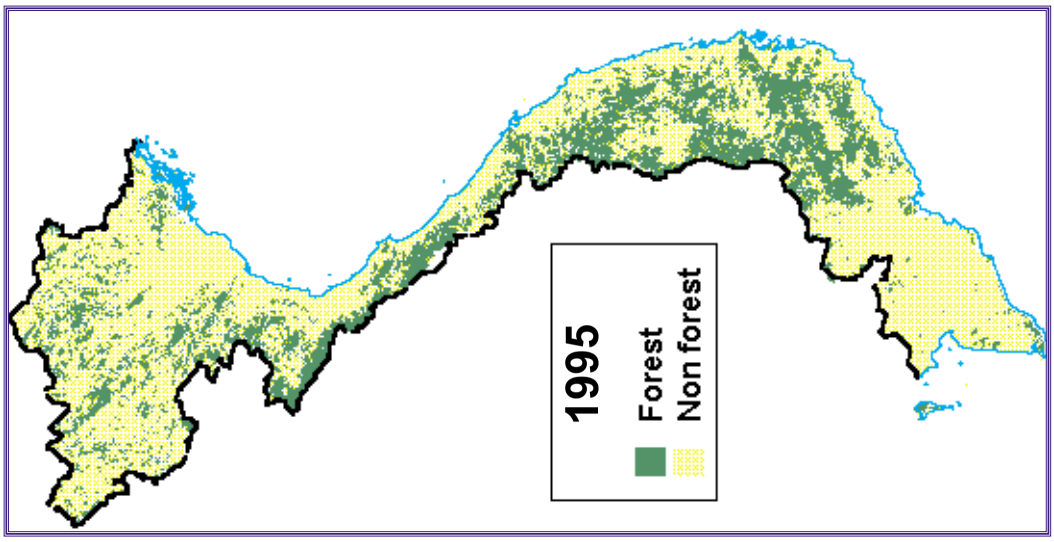


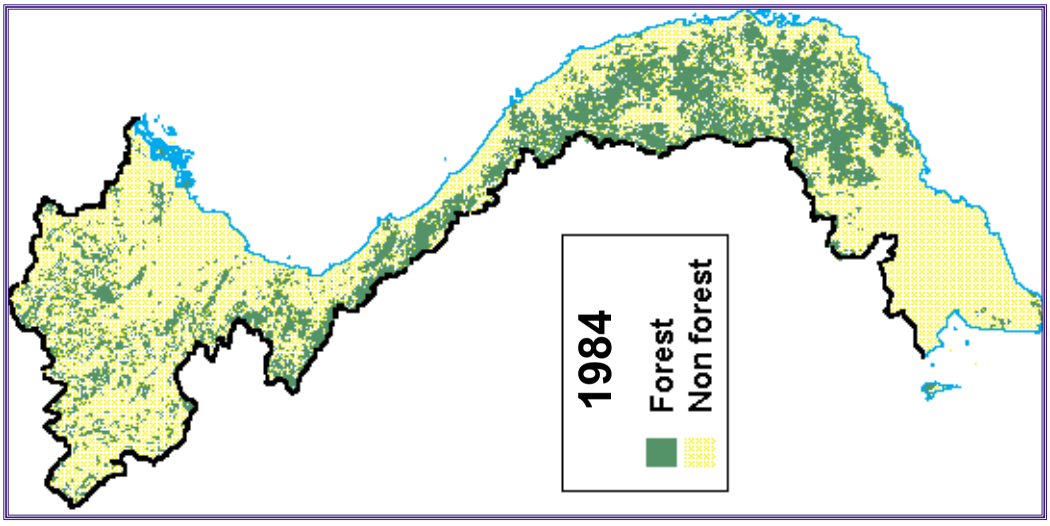
Due to different classification schemes used for the mapping of vegetation in 1983 and 1995, it is difficult to be precise about rates of loss for particular natural forest types. However, it appears that evergreen forest is being reduced the fastest, with a rate approaching 2% lost every year. In terms of area, this accounts for nearly all forest loss during the 12 years, although coniferous forest was reduced by 12% in this period.

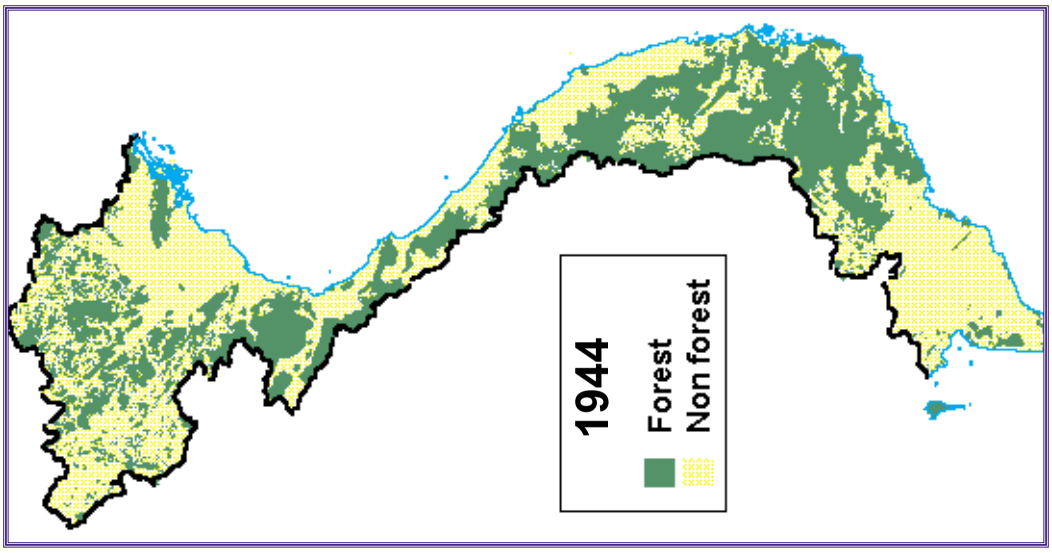
- **At current rates of forest loss, Vietnam will have just 20% Natural forest cover by the year 2020, and will have lost all forest by 2090.**
- **Evergreen forest is being reduced in area the fastest and is currently (relatively) poorly represented in the protected areas network.**

Map 3

The decline of natural forest cover in Vietnam

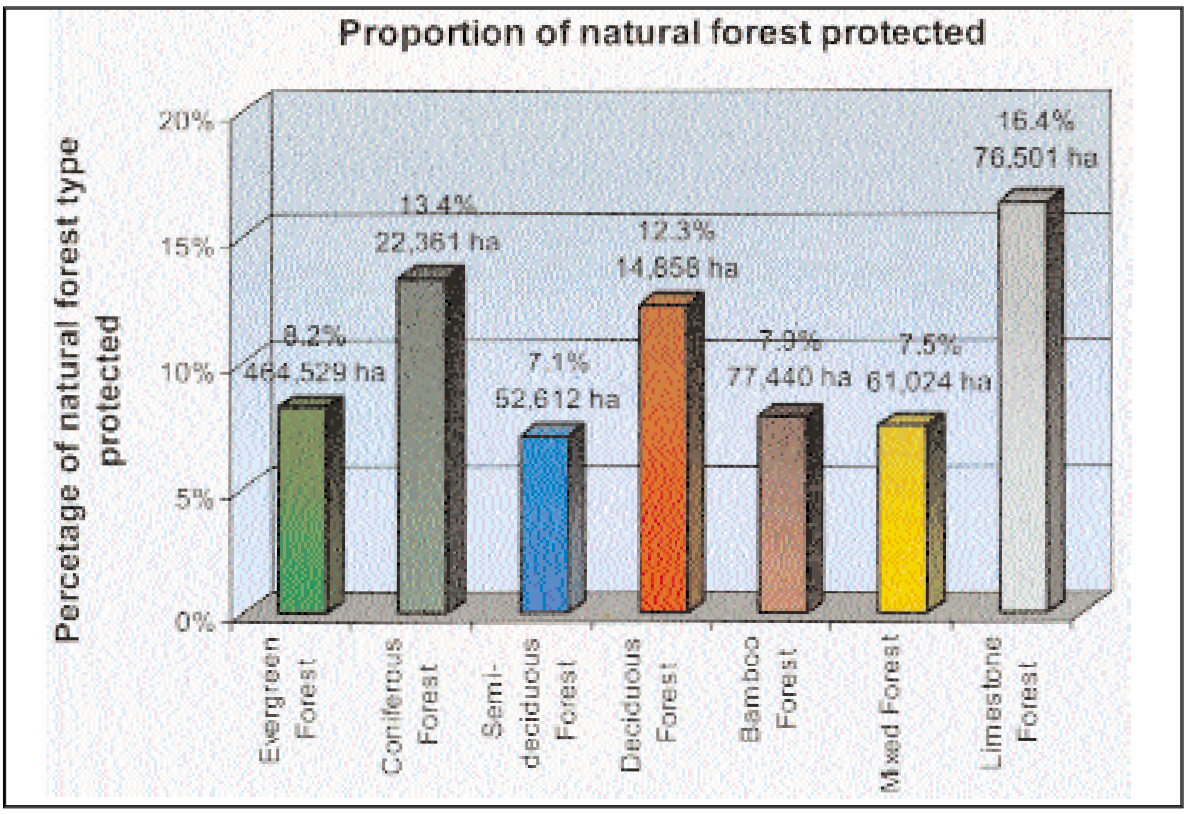






4 ECOREGIONS

Ecological regions are increasingly being used as a focus for conservation planning. They help divide regions and countries into more manageable units, but most importantly they are biologically distinct, so represent conservation priorities in their own right. For this analysis we have used Ecoregions as documented in Wikramanayake *et al*. (1997).



3.4 The protection of natural forest cover

The coverage of natural forest types within the protected areas network is not equitable. evergreen, semi-deciduous and mixed forest are all poorly represented, and therefore require a proportionately larger increase in protection. Limestone forest is reasonably well represented at the national level. However, this rather simplistic national view of protection disguises the fact that certain forest types may be better (or more poorly) protected within certain ecologically distinct regions, provinces, elevation zones. The consequences of this are important for biodiversity conservation.


Map 4:
Ecoregions of Vietnam
Forest zones
Special-use Forests
Ecoregions
Annamite Range Moist Forests
Cardomom Mountains Moist Forests
Central Indochina Dry Forests
Da Lat Montane Forests
Eastern Indochina Moist Forests
Eastern Indochina Pine Forests
Gulf of Thailand Mangroves
Gulf of Tonkin Mangroves
Kon Tum Montane Forests
North-east Indochina Montane Forests
Northern Indochina Subtropical Forests
Northern Vietnam Coastal Moist Forests
Red River Fresh-water Swamp Forests
Southern Vietnam Coastal Forests
Tonle Sap Fresh-water Swamp Forests
Tonle Sap-Mekong Peatswamp Forests
HOANG SA
TRUONG SA

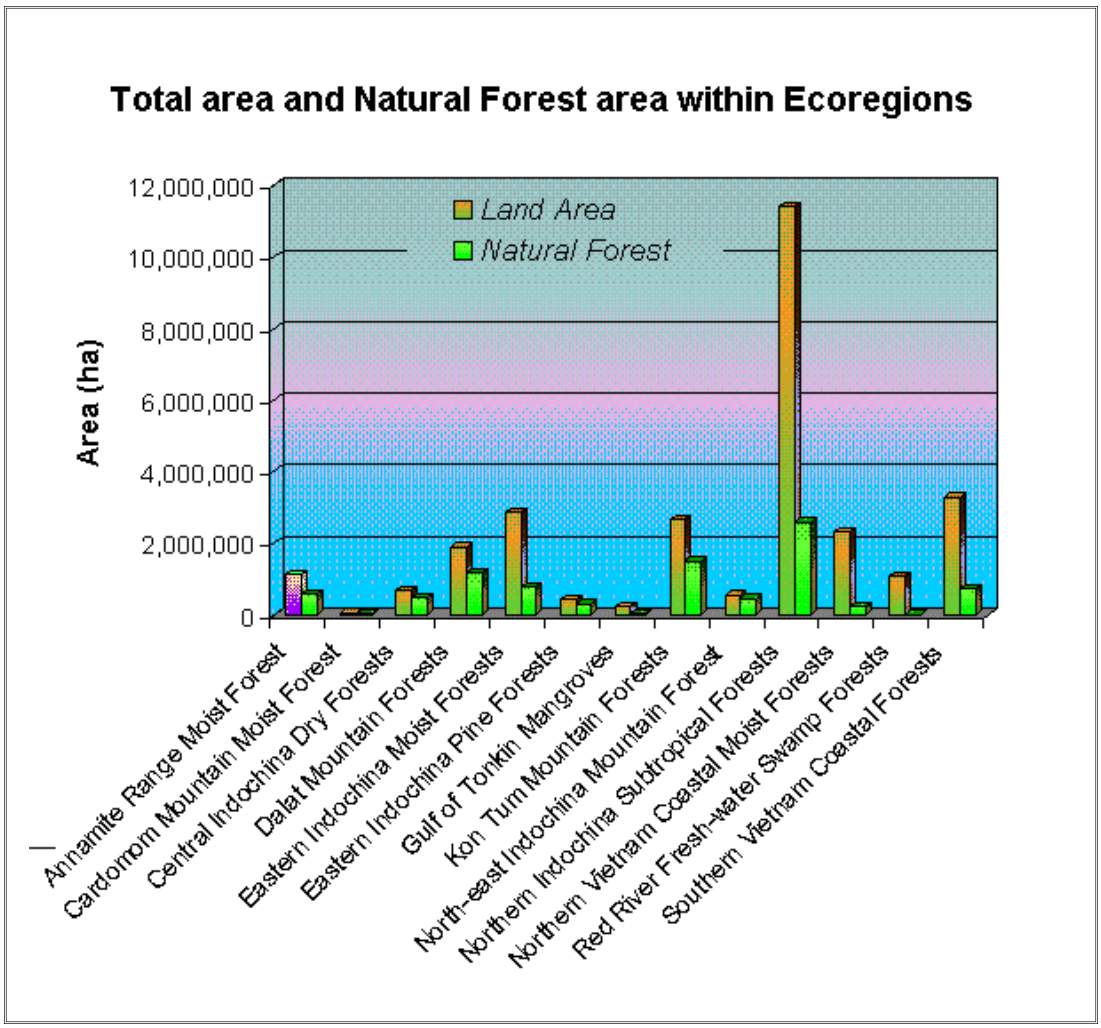
- **Vietnam can be divided into 16 distinct ecological regions, or Ecoregions.**
- **Ecoregions represent unique assemblages of species and/or forest associations.**
- **Equal representation of Ecoregions and the natural forest types within them is essential if the protected areas network is to maintain the full complement of national biodiversity.**
- **There should ideally be at least one National Park representative of each Ecoregion (see *9.2: New protected areas for the 21st Century*).**

Ecoregion	Total area (ha)	Natural Forest (ha)	Protected area (ha)
Annamite Range Moist Forest	1,123,768	589,676	185,936
Cardomom Mountain Moist Forest	54,697	30,839	12,639
Central Indochina Dry Forests	676,994	492,570	98,358
Da Lat Montane Forests	1,902,517	1,165,439	98,646
Eastern Indochina Moist Forests	2,874,009	789,213	65,756
Eastern Indochina Pine Forests	444,197	311,837	90,431
Gulf of Thailand Mangroves	1,523,190	2,062	7,146
Gulf of Tonkin Mangroves	221,108	29,051	14,295
Kon Tum Mountain Forests	2,683,772	1,495,318	169,488
North-east Indochina Mountain Forest	557,750.89	452,749	134,984
Northern Indochina Subtropical Forests	11,427,170	2,599,543	719,818
Northern Vietnam Coastal Moist Forests	2,324,576	233,624	87,037
Red River Fresh-water Swamp Forests	1,080,826	9,219	5,067
Southern Vietnam Coastal Forests	3,287,860	732,075	135,006
Tonle Sap Fresh-water Swamp Forests	964,719	0	0
Tonle Sap---Mekong Peat Swamp Forests	1,287,320	2,805	43,221

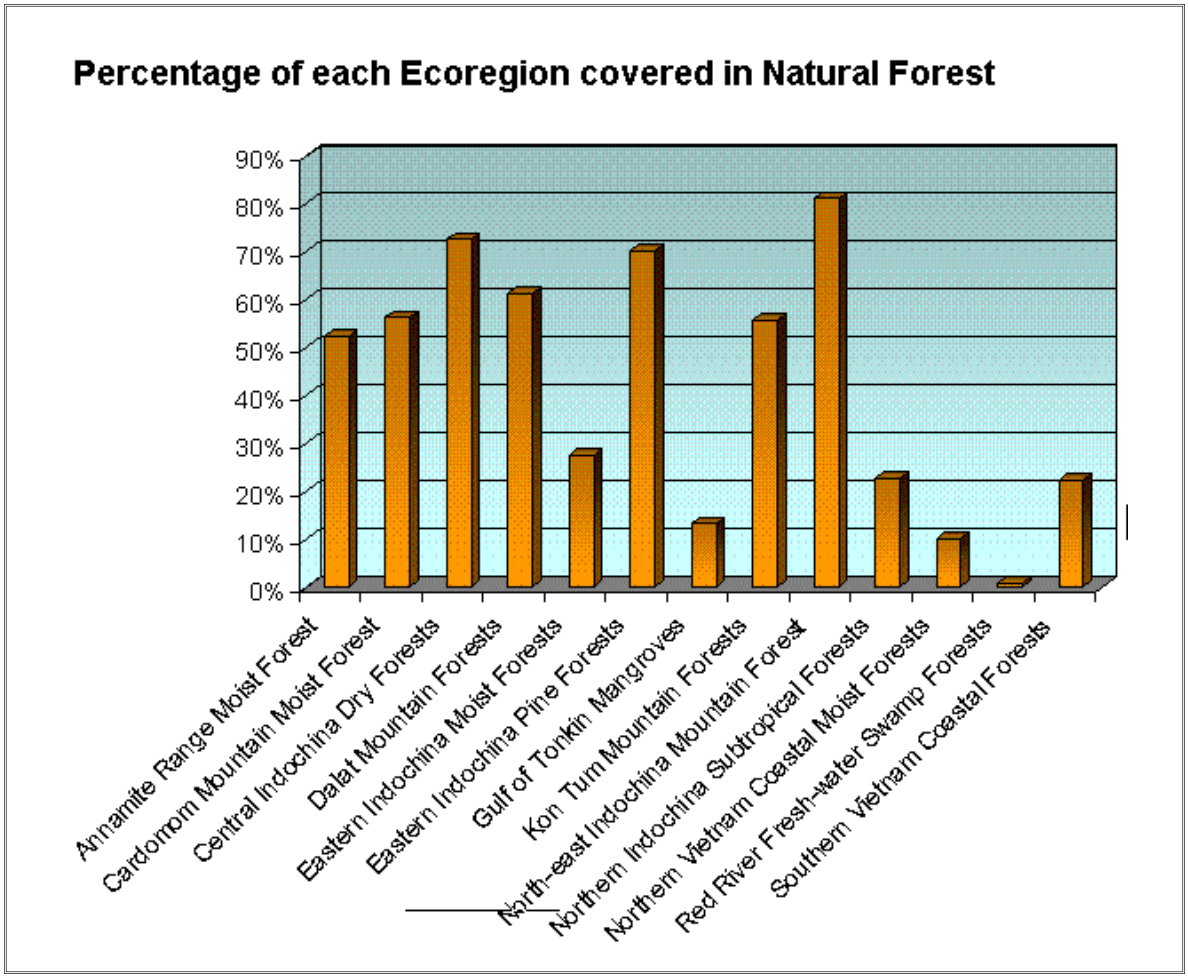
Table 2. The area of Natural Forest and Special-use Forest reserves within Ecoregions

- **The three Ecoregions highlighted in red, all within the Mekong delta area, have almost no remaining terrestrial natural forest cover, and have been excluded from further analysis in this report.**
- **Redefinition of some Ecoregion boundaries should be considered a conservation planning priority.**

- **Ecoregion boundaries within Vietnam support some inaccuracies, allowance for which has been made in the final recommendations, but not within the analyses below (see *1.3 Data sources and protocols*).**
- **The Red River Fresh-water Swamp Forests Ecoregion still retains approximately 8,000 ha of evergreen forest (although none of this is believed to be swamp forest), so it is included within the analyses.**
- **Ecoregions vary greatly in size, and also the area of natural forest that they support.**



- **The proportion of each Ecoregion currently protected varies greatly, and highlights some which need to be targeted for further protection, and some which are more than adequately protected already.**
- **The Northern Indochina Subtropical Forest Ecoregion is especially poorly represented within the current network and should be considered a high priority.**



- **The North-east Indochina Montane Forest Ecoregion enjoys almost 25% coverage by the current network, and should be considered a low priority for further protection.**

Forest fragments in Lang Son Province (Northern Indochina Subtropical Forest Ecoregion).

Photo: *J.C.Eames*

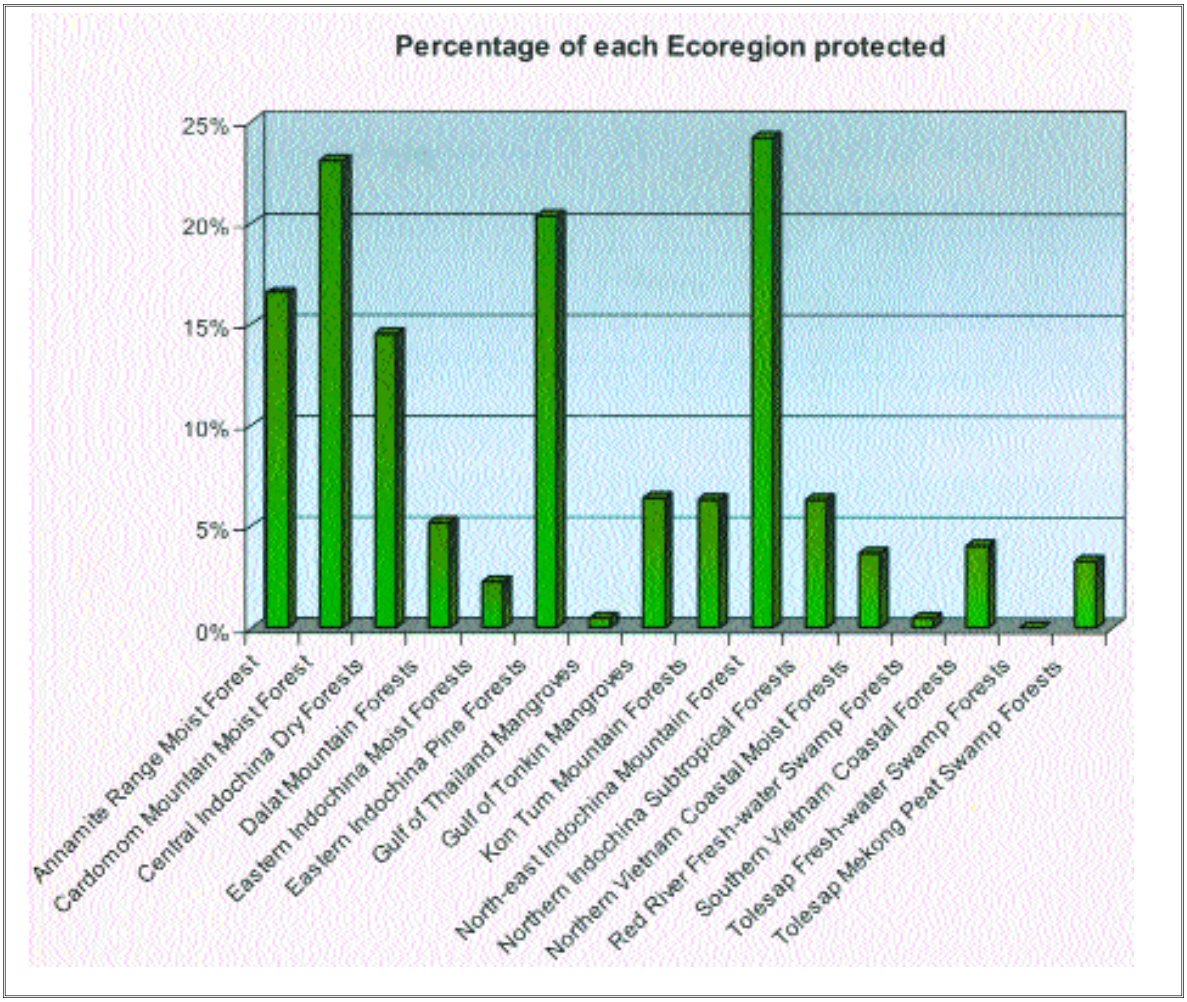
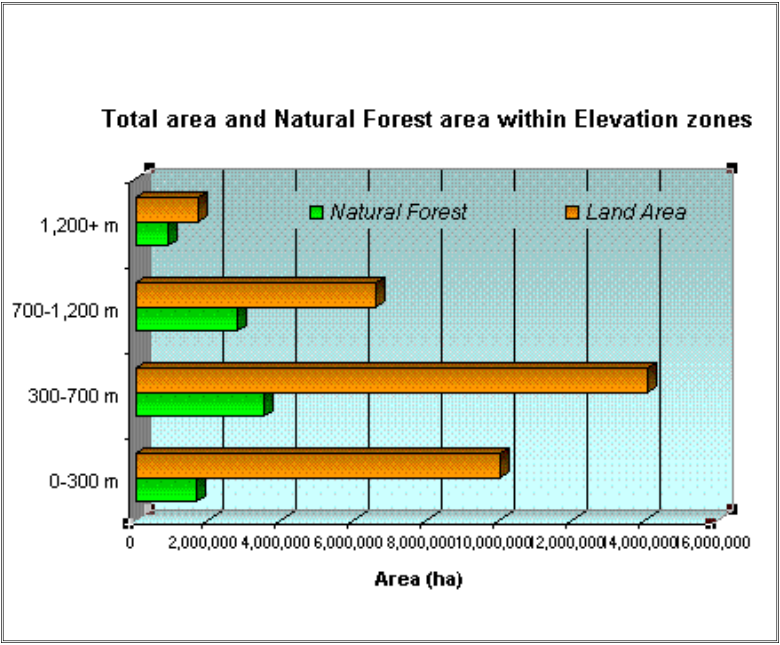


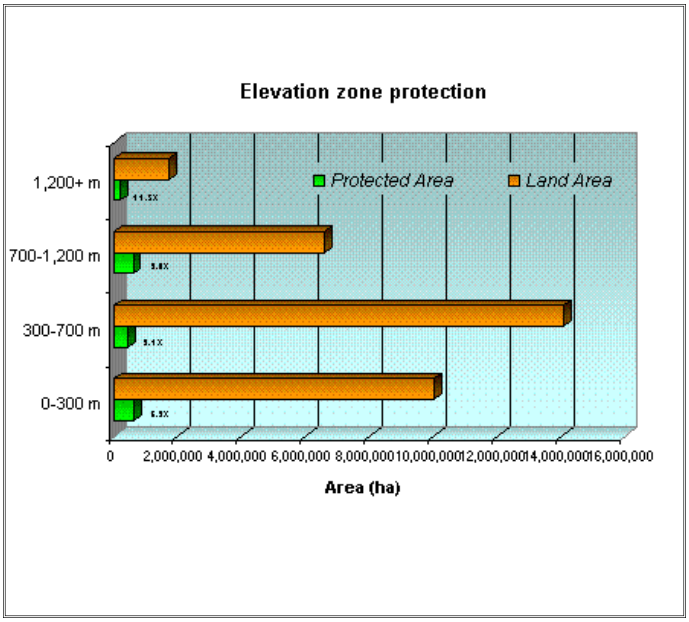
Photo: *J.C.Eames*

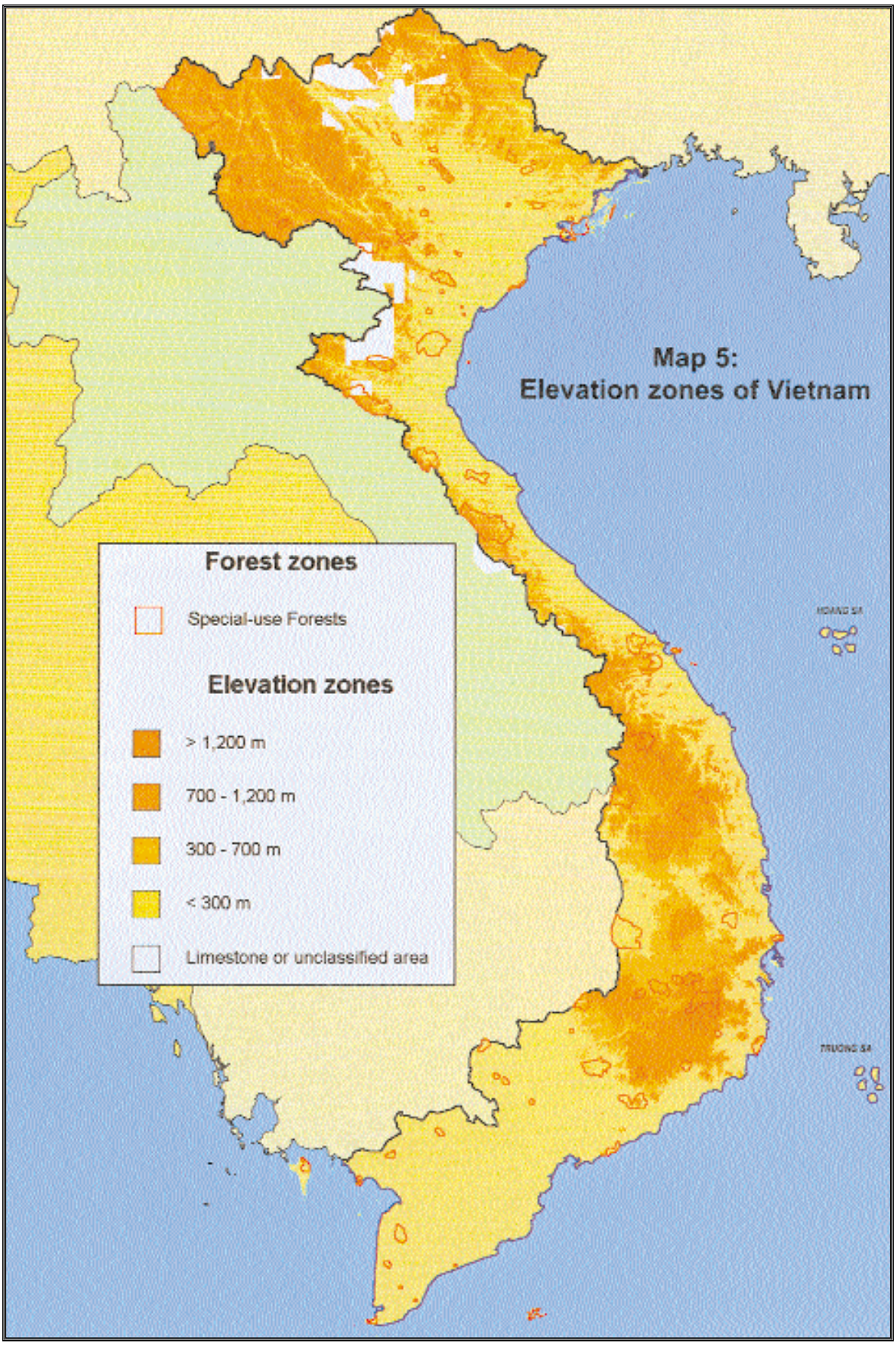
Swamp forest in Cat Tien National Park. Although no swamp for - est is known to remain in the Mekong Delta, a small but important area of this habitat type is found in Cat Tien National Park (Southern Vietnam Coastal Forests Ecoregion).

5 ELEVATION

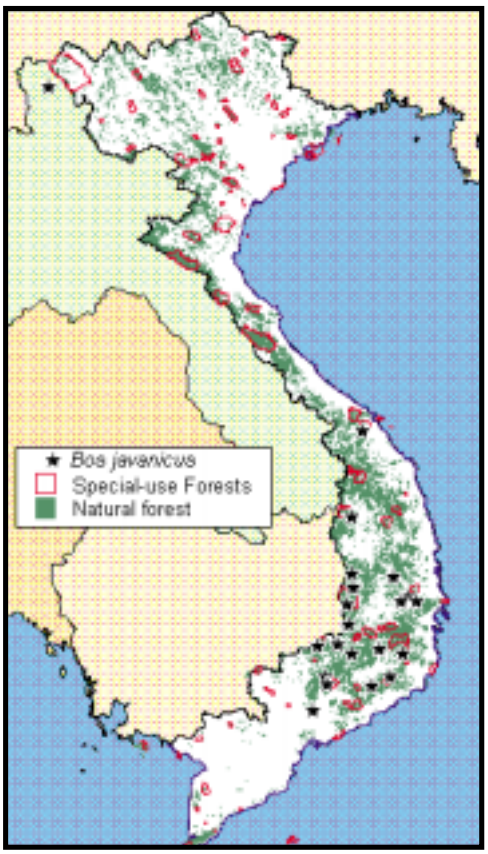


- **Elevation is often an influence in the distribution of ecosystems, species and species assemblages.**
- **Lowland areas (i.e. the densely populated areas in the north and south) have been the most extensively deforested.**
- **Approximately 70% of the country is above 300 m in elevation, 25% being montane (i.e. above 700 m).**
- **Equal representation of natural forest and Ecoregions within the various elevation zones is essential if the protected areas network is to maintain a high proportion of the nation's biodiversity.**
- **The protection of land at different elevations varies, with montane areas (above 700 m) being the best protected, but like all zones, still in need of further protection.**

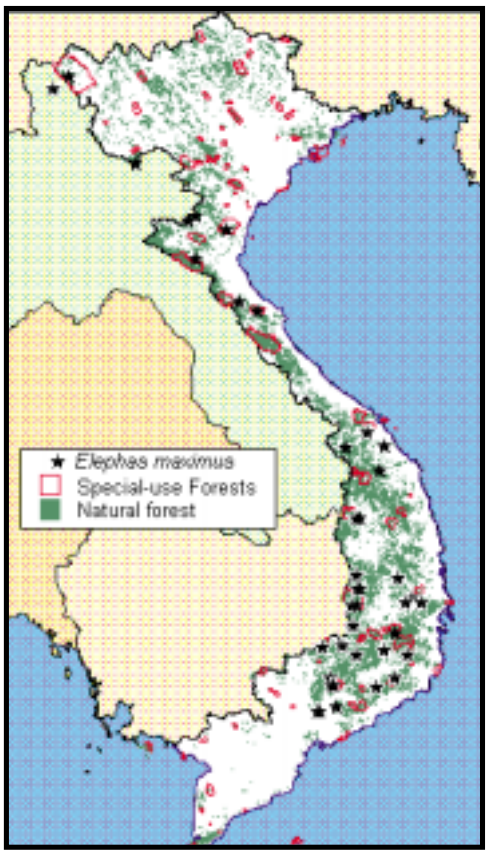



Map 5:
Elevation zones of Vietnam
Forest zones
Special-use Forests
Elevation zones
> 1,200 m
700 - 1,200 m
300 - 700 m
< 300 m
Limestone or unclassified area

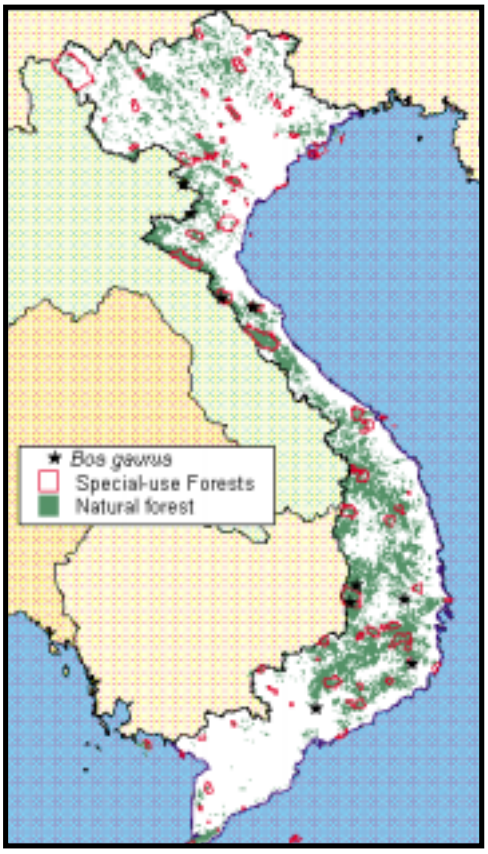
Distribution of Banteng *Bos javenicus*



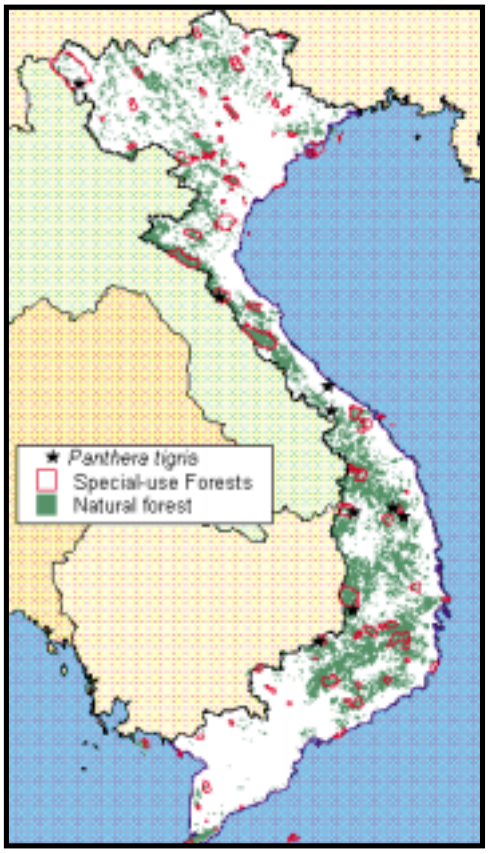
Distribution of Asian Elephant *Elephas maximus*

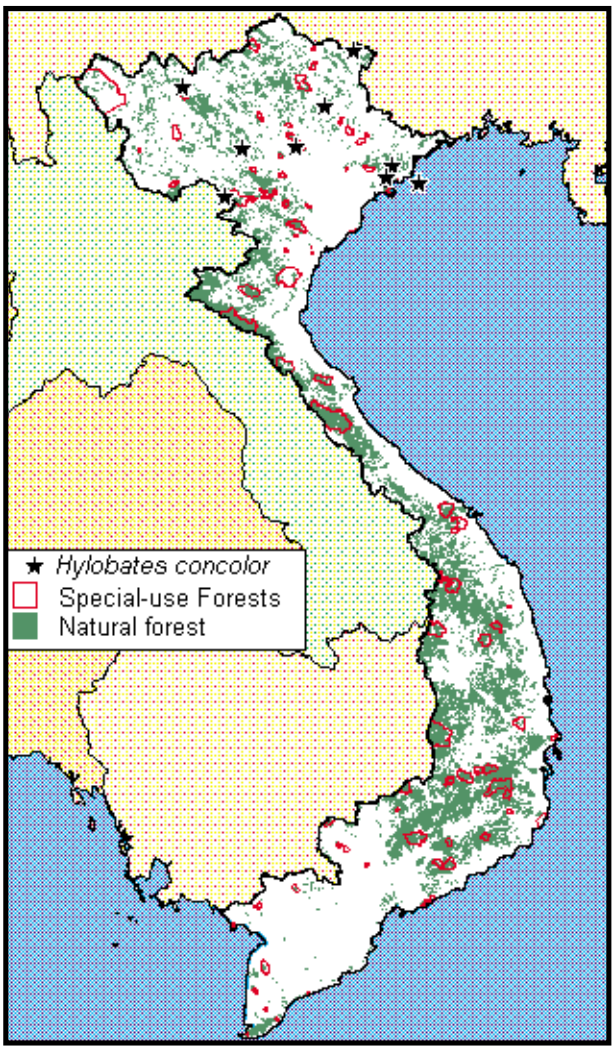


Distribution of Gaur *Bos gaurus*



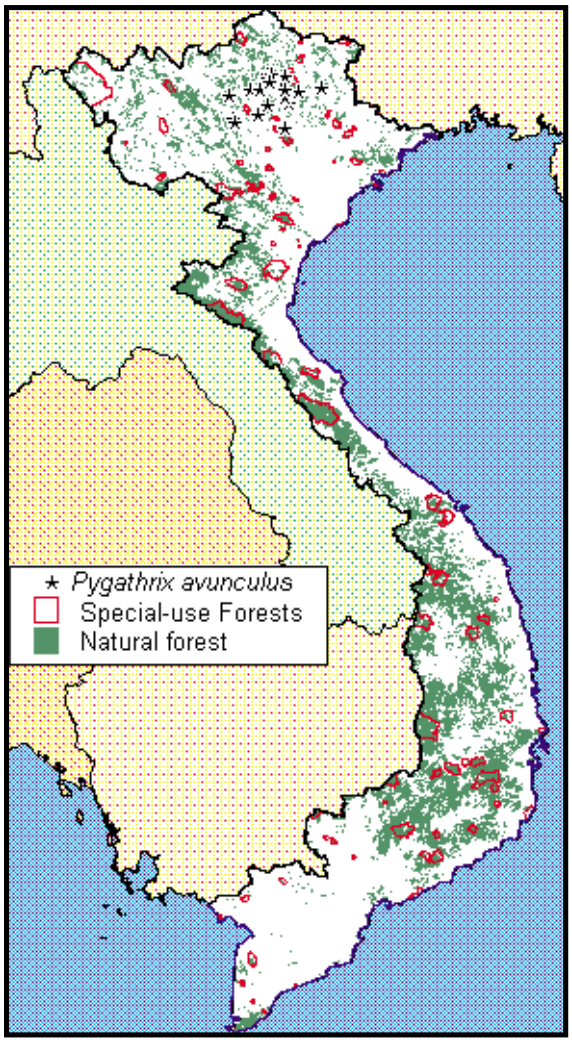
Distribution of Tiger *Panthera tigris*





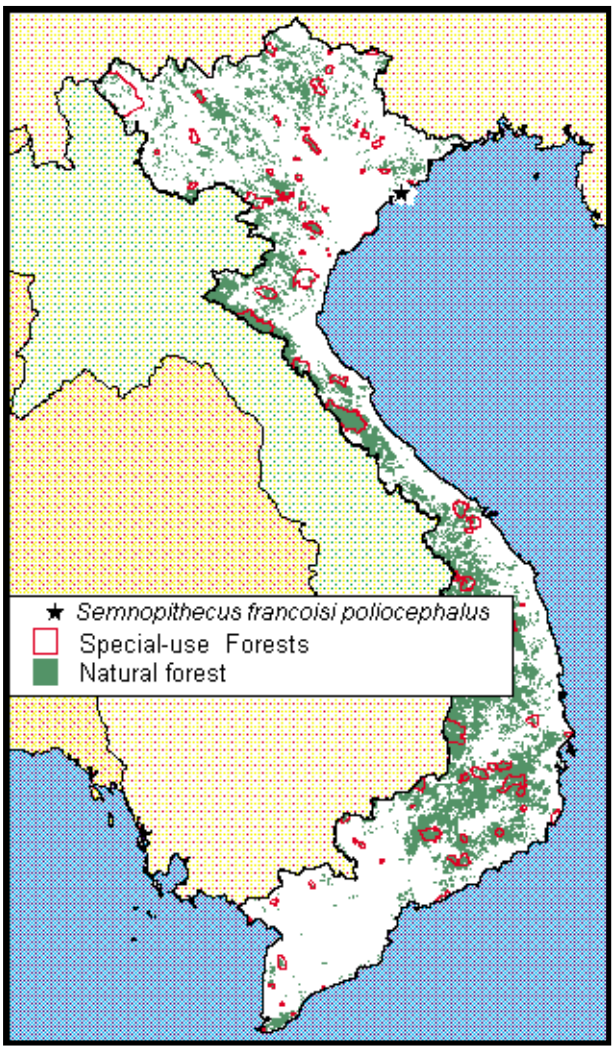
Black Gibbon ***Hylobates concolor***

Black gibbon is known from just one Special-use Forest (Day Huang Lien Nature Reserve). The status and distribution of this species is poorly known. It is under-represented in the protected areas system.

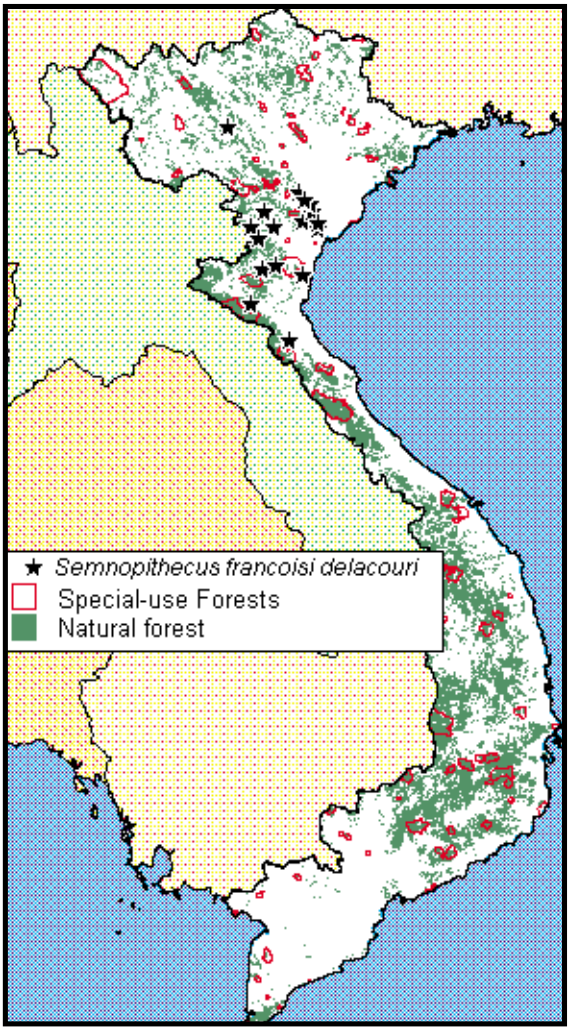


Tonkin Snub-nosed Monkey
Pygathrix avunculus

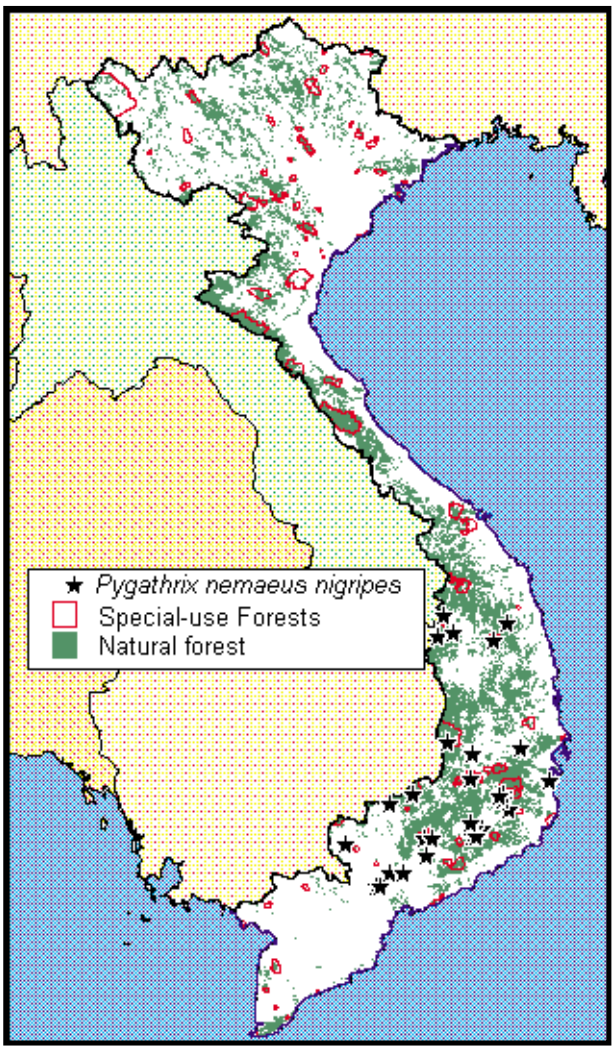
Tonkin snub-nosed monkey is known historically from just one Special-use Forest (Nang Nature Reserve). Remaining forests within the historical range of this species require survey to identify new populations of this Critically threatened and endemic species (see *page 29*).

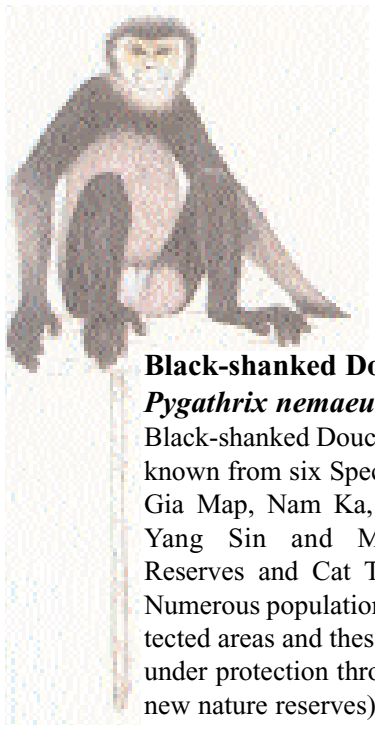


Golden-headed Leaf Monkey
Semnopithecus franoisi poliocephalus
Golden-headed leaf monkey is currently known from just one Special-use Forests (Cat Ba National Park). There is strong evidence to suggest that the population is undergoing rapid decline because of trapping and hunting. To prevent the global extinction of this species, there must be stricter enforcement of national park law and effort must be directed to identify remaining populations elsewhere.



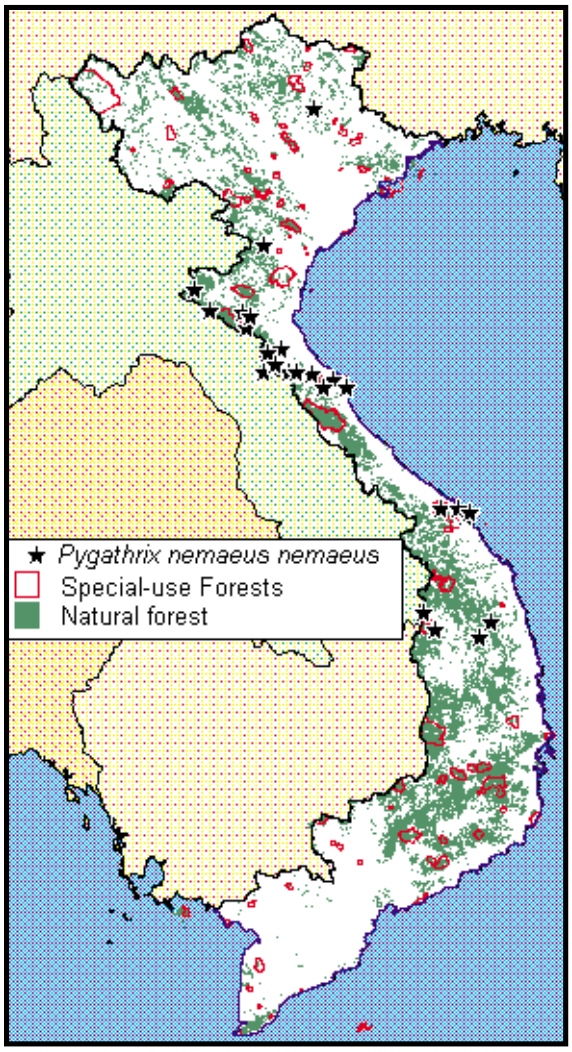
Delacour's Leaf Monkey
Semnopithecus francoisi delacouri
Delacour's Leaf Monkey is currently known from just two Special-use Forests (Cuc Phuong National Park and Huong Son Cultural and Historical Site). To prevent the global extinction of this species, it is vital that the small, scattered populations which remain are afforded protection through the creation of new nature reserves and that strict protection measures are enforced.





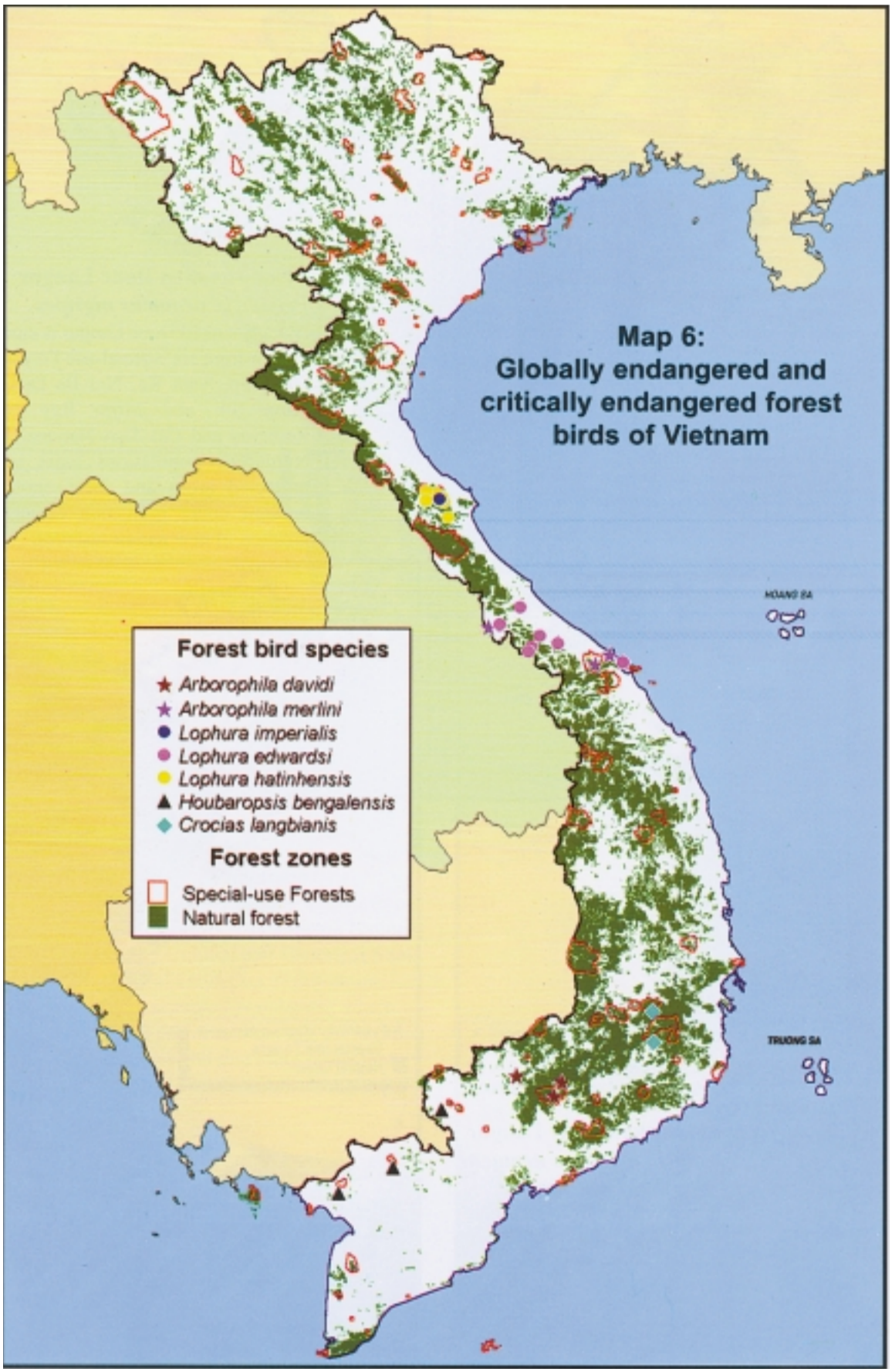
Black-shanked Douc Langur
Pygathrix nemaeus nigripes

Black-shanked Douc Langur is currently known from six Special-use Forests (Bu Gia Map, Nam Ka, Nui Ba Den, Chu Yang Sin and Morn Ray Nature Reserves and Cat Tien National Park. Numerous populations exist outside protected areas and these should be brought under protection through the creation of new nature reserves).



Red-shanked Douc Langur
Pygathrix nemaeus nemaeus

Red-shanked Douc Langur is currently known from Bach Ma National Park, and Pu Mat and Vu Quang Nature Reserves.


Map 6:
Globally endangered and critically endangered forest birds of Vietnam
Forest bird species
Arborophila davidi
Arborophila merlini
Lophura imperialis
Lophura edwardsi
Lophura hatinhensis
Houbaropsis bengalensis
Crocias langbianis
Forest zones
Special-use Forests
Natural forest
HOANG SA
TRUONG SA

Paintinig: M. H. Gronvold

Orange-necked Partridge ***Arborophila davidi***

This critically threatened species was rediscovered in Cat Loc Nature Reserve and Cat Tien National Park. The destruction of forest and conversion to cashew cultivation in Cat Loc Nature Reserve poses a major threat to the integrity of this site.

Paintinig:

Edwards's Pheasant ***Lophura edwardsi***

This critically threatened species is endemic to Vietnam, and is currently unprotected within the reserve network. The creation of the Phong Dien--Dakrong Nature Reserves will probably be the only chance of preventing this species' extinction.

Paintinig:

Bengal Florican ***Houbaropsis bengalensis***

Although not a forest dependent species, this endangered species is the world's most threatened species of bustard. In Vietnam it is on the brink of extinction because of drainage of its wet grassland habitat in the Mekong delta. Although the species is known from the Tram Chiu Nature Reserve, the population at this site is insufficient to conserve the species. It occurs at low density over a wide area and is an example of a dispersed species. Its conservation thus presents a challenge to protected areas planners.

Paintinig: Robert Gillmor

Vietnamese Pheasant
Lophura hatinhensis

This endangered pheasant is endemic to Vietnam and currently known from only one site, Ke Go Nature Reserve in Ha Tinh Province. Extension of this reserve to include the adjacent Net river watershed (Khe Net) in Quang Binh Province would help increase the chances for the species' long-term survival.

Paintinig: Pham Quang

Grey-crowned Crocias
Crocias langbianis

This enigmatic endemic babbler was rediscovered by a BirdLife/FIPI expedition in Chu Yang Su Nature Reserve. This Special-use Forest was highlighted in the Biodiversity Action Plan as a major conservation priority because of its primary landscape features and high levels of endemism.

Forest birds		IUCN category
Arborophila charltonii	Chestnut-necklaced Partridge	VU
A. davidi	Orange-necked Partridge	CR
A. merlini	Annam Partridge	EN
Lophura imperialis	Imperial Pheasant	CR
L. diardi	Siamese Fireback	VU
L. edwardsi	Edwards's Pheasant	CR
L. hatinhensis	Vietnamese Pheasant	EN
Polyplectron germaini	Germain's Peacock Pheasant	VU
Rheinardia ocellata	Crested Argus	VU
Pavo muticus	Green Peafowl	VU
Houbaropsis bengalensis	Bengal Florican	EN
Columba punicea	Pale-capped Pigeon	VU
Harpactes wardi	Ward's Trogon	VU
Alcedo hercules	Blyth's Kingfisher	VU
Aceros nipalensis	Rufous-necked Hornbill	VU
Picus rabieri	Red-collared Woodpecker	VU
Pitta nympha	Fairy Pitta	VU
Garrulax milleti	Black-hooded Laughingthrush	VU
G. yersini	Collared Laughingthrush	VU
Jabouilleia danjoui	Short-tailed Scimitar Babbler	VU
Stachyris herberti	Sooty Babbler	VU
Crocias langbianis	Grey-crowned Crocias	CR
Paradoxornis davidianus	Short-tailed Parrotbill	VU
Sitta solangiae	Yellow-billed Nuthatch	VU
S. formosa	Beautiful Nuthatch	VU

Table 5. Globally threatened resident forest birds used in this analysis
Notes: CR=Critical; EN=Endangered; VU=Vulnerable as per Collar *et al.* (1994)

Beautiful Nuthatch Sitta formosa *and Rufous-necked Hornbill* Aceros nipalensis. *Both species have declined because of habitat loss and additionally hunting in the case of the hornbill.*

Paintinig: Norman Arlott

Tonkin Snub-nosed Monkey

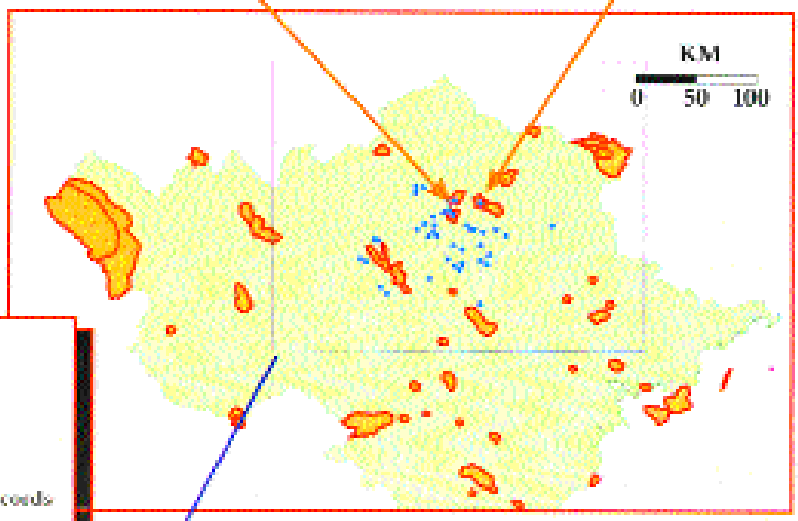
Pygathrix avunculus

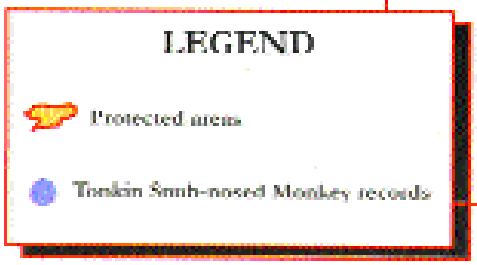
IUCN status
CRITICAL

Tonkin Snub-nosed Monkey is endemic to northern Vietnam

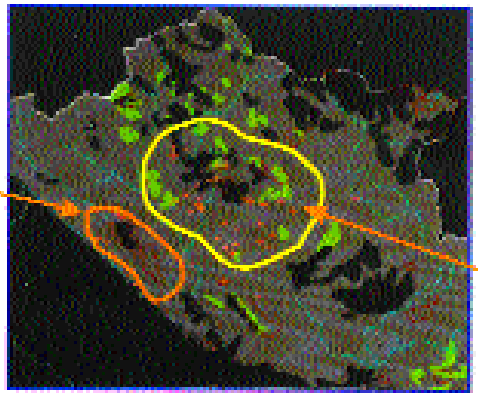
It is currently known from Tat Ke-Ban Bung proposed nature reserve.

However, it should be looked for in Ba Be National Park where there is an historical record.





Even though there is a protected area and historical records of the species new forest maps indicate that there is no suitable habitat remaining.



Remaining suitable forest in northern Vietnam

Forests in this area should be surveyed to find new populations of this monkey

7 PROVINCES

The Special-use Forests in any one province may not be protecting the most important natural forest type, Ecoregion, elevation zone or species. This imbalance needs to be addressed, but is best done so by looking at the gaps in the network initially from an ecological rather than geopolitical view point.

Provinces have the majority of responsibility for the management of protected areas, Nature Reserves being under the jurisdiction of provincial people's committees, as opposed to National Parks which are under direct jurisdiction of MARD.

Many Special-use Forests are found abutting provincial borders, with some adjoining reserves in the neighbouring province. Such contiguous, but separately administered reserves would most efficiently be managed as single entities via a joint management board, perhaps even as National Parks.

- **A number of provinces, primarily in the Red River and Mekong deltas, are now completely deforested, or at least devoid of forest areas large enough to be viable long-term nature conservation units.**
- **A number of provinces (highlighted in red below) have no protected areas, but still retain and have responsibility for important areas of natural forest which should be afforded some protection.**
- **A number of provinces (listed below) have less than 10% of their natural forest cover protected, and therefore should be targeted for expansion of their protected areas.**

- **Some provinces have no terrestrial natural forest, but do have protected areas - these most often support wetland, mangrove or Melaleuca habitats.**

A FIPI/BirdLife survey team discusses a new protected area plan at a provincial workshop.

***Photo:** J.C.Eames*


Map 7:
Provinces and protected areas in Vietnam
HA GIANG
CAO BANG
LAI CHAU
LAO CAI
TUYEN QUANG
BAC CAN
LANG SON
YEN BAI
THAI NGUYEN
QUANG NINH
PHU THO
VINH PHU
BAC GIANG
SON LA
HA NOI
HUNG YEN
HAI PHONG
HOA BINH
HA TAY
HA NAM
THAI BINH
NINH BINH
NAM DINH
THANH HOA
NGHE AN
HA TINH
QUANG BINH
QUANG TRI
THUA THIEN HUE
DA NANG
QUANG NAM
QUANG NGAI
KON TUM
BINH DINH
GIA LAI
PHU YEN
DAC LAC
KHANH HOA
BINH PHUOC
LAM DONG
NINH THUAN
TAY NINH
BINH DUONG
DONG NAI
BINH THUAN
HCMC
LONG AN
DONG THAP
AN GIANG
BA RIA VUNG TAU
TIEN GIANG
VINH LONG
BEN TRE
KIEN GIANG
CAN THO
TRA VINH
SOC TRANG
BAC LIEU
CA MAU
HOANG SA
TRUONG SA

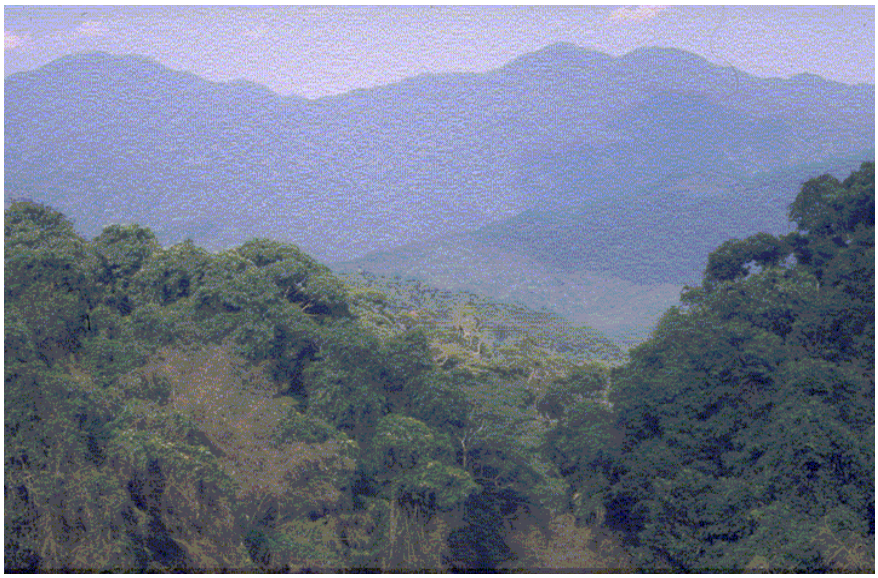
Province	Total area (ha)	Natural forest (ha)	Special-use Forest (ha)
An Giang	331,683	0	7,781
Bac Can	456,289	117,454	34,207
Bac Giang	389,273	38,165	10,753
Bac Lieu	228,570	0	1,034
Bac Ninh	83,096	0	0
Ba Ria-Vung Tau	180,888	19,291	14,237
Ben Tre	228,744	0	0
Binh Dinh	611,426	149,182	0
Binh Duong	205,326	3,228	2,982
Binh Phuc	750,725	279,168	23,628
Binh Thuan	790,917	306,930	50,502
Ca Mau	447,200	3,722	11,011
Can Tho	305,738	0	0
Cao Bang	663,798	122,486	21,908
Da Nang	98,306	39,029	30,388
Dac Lac	1,908,296	1,061,020	185,933
Dong Nai	589,683	155,913	49,462
Dong Thap	342,546	0	7,104
Gia Lai	1,587,222	753,245	41,931
Ha Giang	788,441	231,017	18,705
Ha Nam	90,769	2,467	0
Ha Noi	92,005	1,797	0
Ha Tay	219,919	5,133	9,837
Ha Tinh	591,765	196,216	77,281
Hai Duong	170,297	6,827	1,556
Hai Phong	124,942	13,061	7,064
Ho Chi Minh City	193,191	736	0
Hoa Binh	471,055	170,297	29,681
Hung Yen	93,238	0	0
Khanh Hoa	485,632	152,995	0
Kien Giang	488,413	30,839	36,075
Kon Tum	936,755	606,414	80,846
Lai Chau	1,687,074	299,755	317,311
Lam Dong	1,016,301	602,093	81,690
Lang Son	821,651	65,625	16,533
Lao Cai	801,876	207,680	17,321
Long An	443,454	0	0
Nam Dinh	145,966	0	5,367
Nghe An	1,640,902	683,343	136,759
Ninh Binh	130,746	18,949	11,970
Ninh Thuan	329,239	99,417	23,324
Phu Tho	351,604	45,845	8,601
Phu Yen	475,373	96,364	31,397
Quang Binh	798,973	448,808	147,424
Quang Nam	1,076,919	471,522	22,176
Quang Ngai	506,015	88,920	2,364
Quang Ninh	533,090	121,076	12,821
Quang Tri	459,185	96,437	0

Soc Trang	323,185	0	0
Son La	1,411,030	242,455	75,693
Tay Ninh	392,417	50,282	22,949
Thai Binh	151,579	0	0
Thai Nguyen	386,285	47,687	9,611
Thanh Hoa	1,074,362	277,320	100,223
Thua Thien Hue	493,945	149,564	38,981
Tien Giang	239,532	0	0
Tra Vinh	228,261	0	0
Tuyen Quang	584,702	165,341	14,805
Vinh Long	152,261	0	0
Vinh Phuc	138,867	15,545	12,089
Yen Bai	693,509	175,347	4,497

Table 6. Province area, natural forest cover and protected area
Provinces highlighted in red currently have no Special-use Forests

Province	Total area (ha)	Natural forest (ha)	Special-use Forest area (ha)
Binh Phuc	750,725	279,168	23,628
Gia Lai	1,587,222	753,245	41,931
Ha Giang	788,441	231,017	18,705
Lao Cai	801,876	207,680	17,321
Quang Nam	1,076,919	471,522	22,176
Quang Ngai	506,015	88,920	2,364
Tuyen Quang	584,702	165,341	14,805
Yen Bai	693,509	175,347	4,497

Table 7. Provinces with less than 10% of their natural forest protected



Evergreen forest on the border between Kon Tum and Quang Nam Provinces (Kon Tum Montane Forests Ecoregion). The inclusion of this forest in either Ngoc Linh (Quang Nam) or Song Thanh Dakpring (proposed) Nature Reserves is essential to ensure the conservation of contiguous forest habitats.

***Photo:** J.C.Eames*

8 AN ECOLOGICAL GAP ANALYSIS

8.1 Ensuring adequate representation

The amount of extra protection needed within the various natural forest types, Ecoregions, elevation zones and provinces is a helpful indicator as to where resources should be targeted. However, this needs further analysis if adequate representation within the protected areas network is to be ensured for all biologically distinct units.

The MARD target of 2 million ha as Special-use Forests allows for an increase of 660,000 ha to the current network. Assuming that this increase comes from forested areas, this would lead to approximately 16% of Vietnam's remaining forest being within the protected areas network. In the analyses set out below, we have aimed to increase the protection afforded forest within each ecological variable to 16% (e.g. increasing the protection to 16% of all evergreen forest between 0-300 m in the Annamite Range Forests Ecoregion).

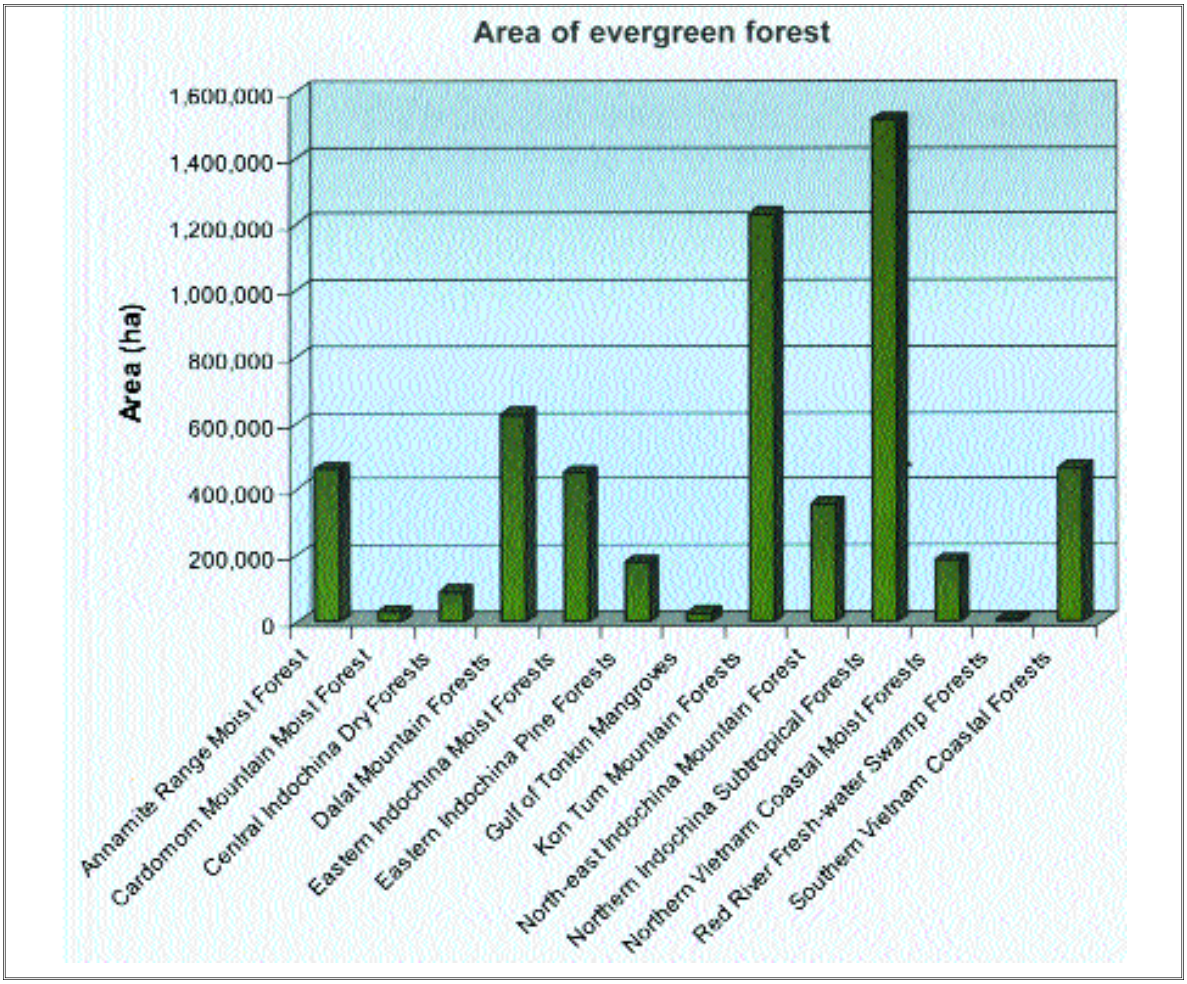
For each natural forest type below, the level of protection is shown within each elevation zone and each Ecoregion. In Appendix 2 this is further refined to show the level of protection afforded each forest type, within each Ecoregion and each elevation zone within that Ecoregion. The extent of forest that needs to be added to the network to ensure equitability is given where this is greater than 1,000 ha.

The data presented for each forest type in Appendix 2 is summarised in one table (see section *8.8 Natural Forest*) that details how much of which type of forest needs to be added, at which elevation, and in which Ecoregion to ensure adequate representation within the protected areas network.

Photo: *J.C.Eames*

Ox-bow lake in dry decid - uous forest (Eastern Indochina Moist Forest Ecoregion). Pristine freshwater wetlands inside forest habitats are now sadly rare in Vietnam and few protected areasa support representative examples.

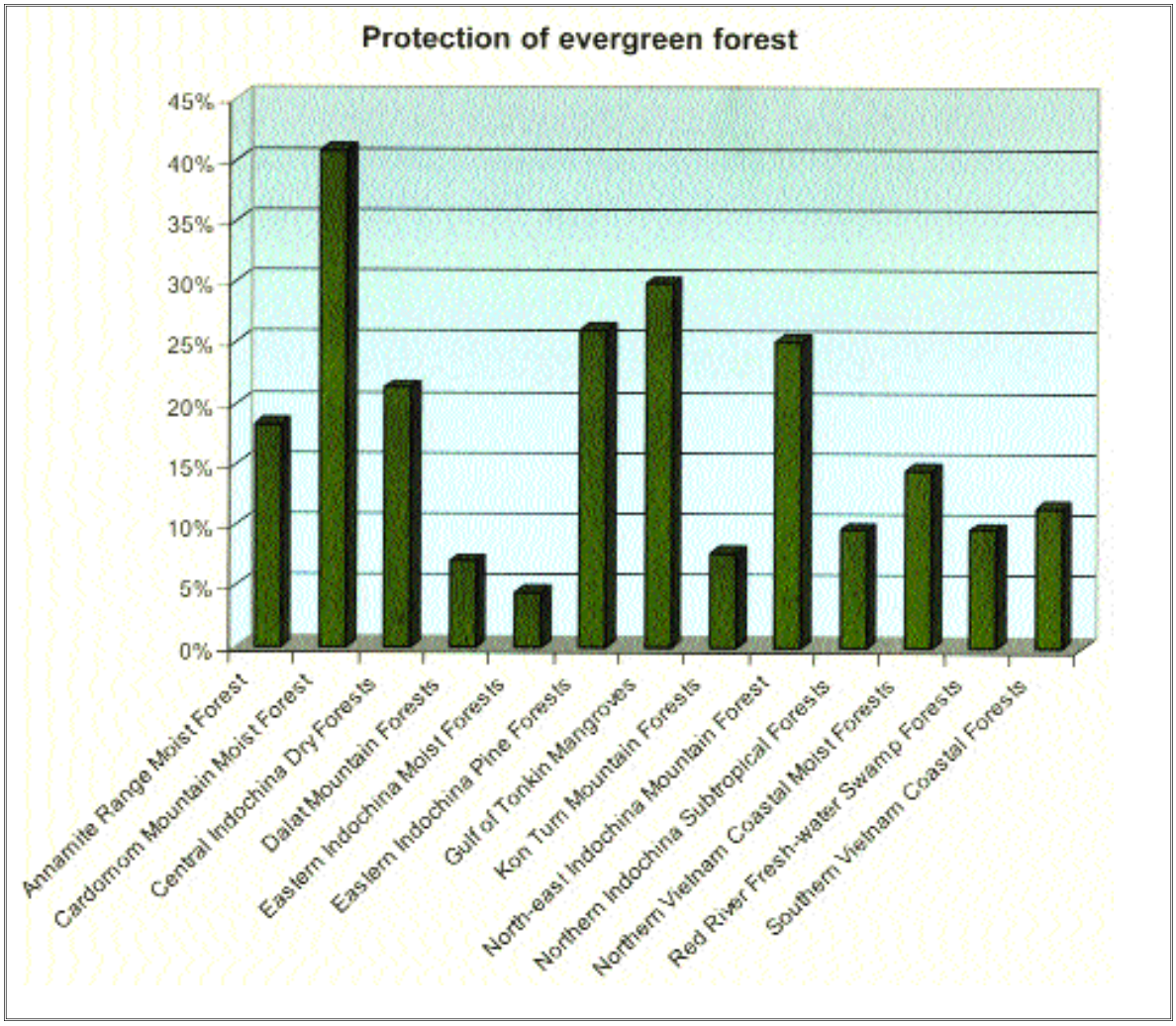
8.2 Evergreen forest



- **Evergreen forest needs further protection within the Ecoregions highlighted in red**

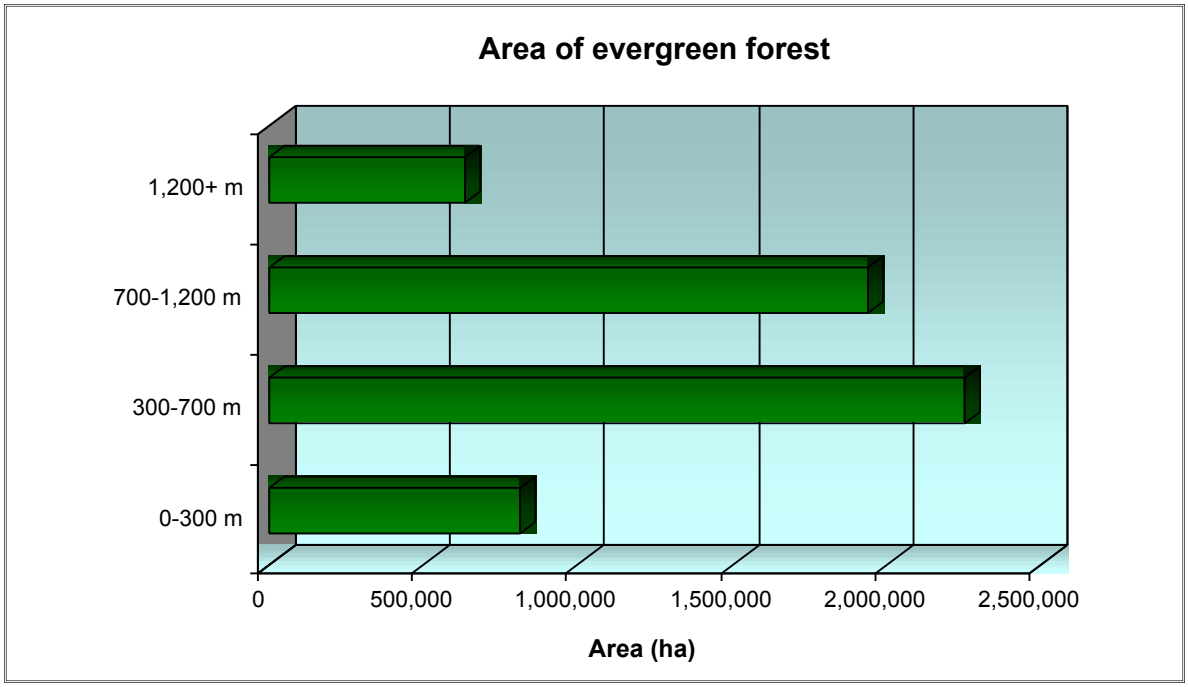
Ecoregion	Evergreen forest area (ha)	Protected evergreen forest area (ha)	Percentage protected
Annamite Range Moist Forests	462,939	84,892	18%
Cardomom Mountains Moist Forests	29,689	12,106	41%
Central Indochina Dry Forests	91,629	19,555	21%
Da Lat Montane Forests	627,563	44,300	7%
Eastern Indochina Moist Forests	451,632	20,304	4%
Eastern Indochina Pine Forests	178,689	46,626	26%
Gulf of Tonkin Mangroves	27,185	8,111	30%
Kon Tum Montane Forests	1,231,732	95,924	8%
North-east Indochina Montane Forests	355,230	89,192	25%
Northern Indochina Subtropical Forests	1,517,908	146,794	10%
Northern Vietnam Coastal Moist Forests	186,056	27,212	15%
Red River Fresh-water Swamp Forests	8,444	821	10%
Southern Vietnam Coastal Forests	465,720	53,423	11%

Table 8. Protection of evergreen forest within Ecoregions



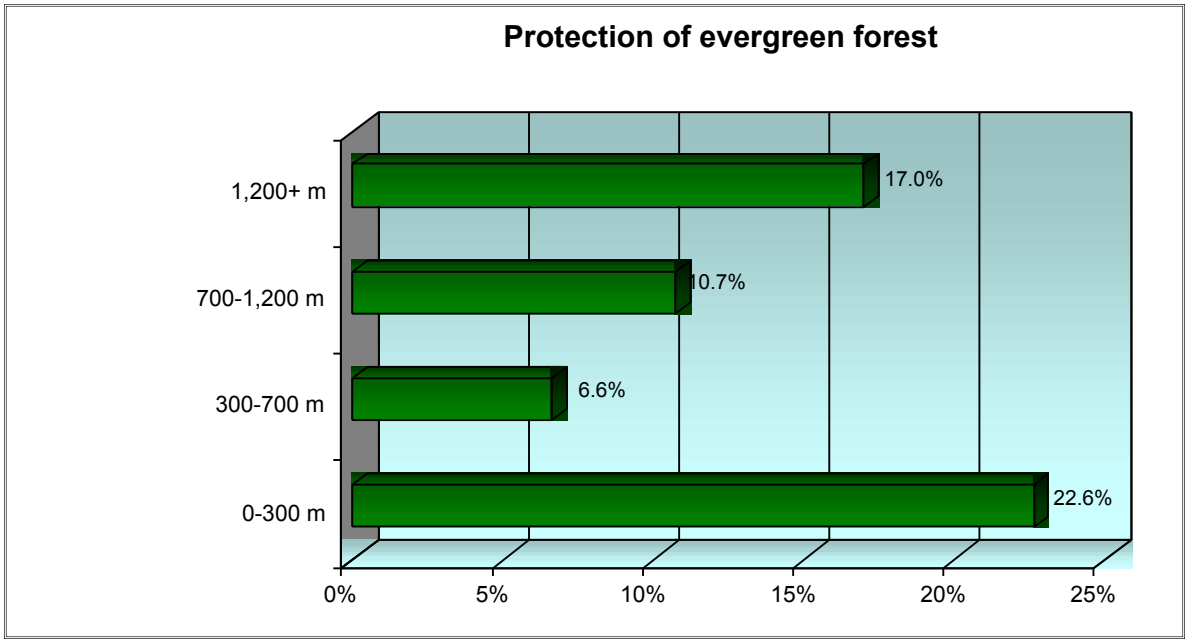
Evergren forest at Cong Troi in Ngoc Linh (Kom Tum) Nature Reserve (Kon Tum Montane Forests Ecoregion).

Photo: *J.C.Eames*

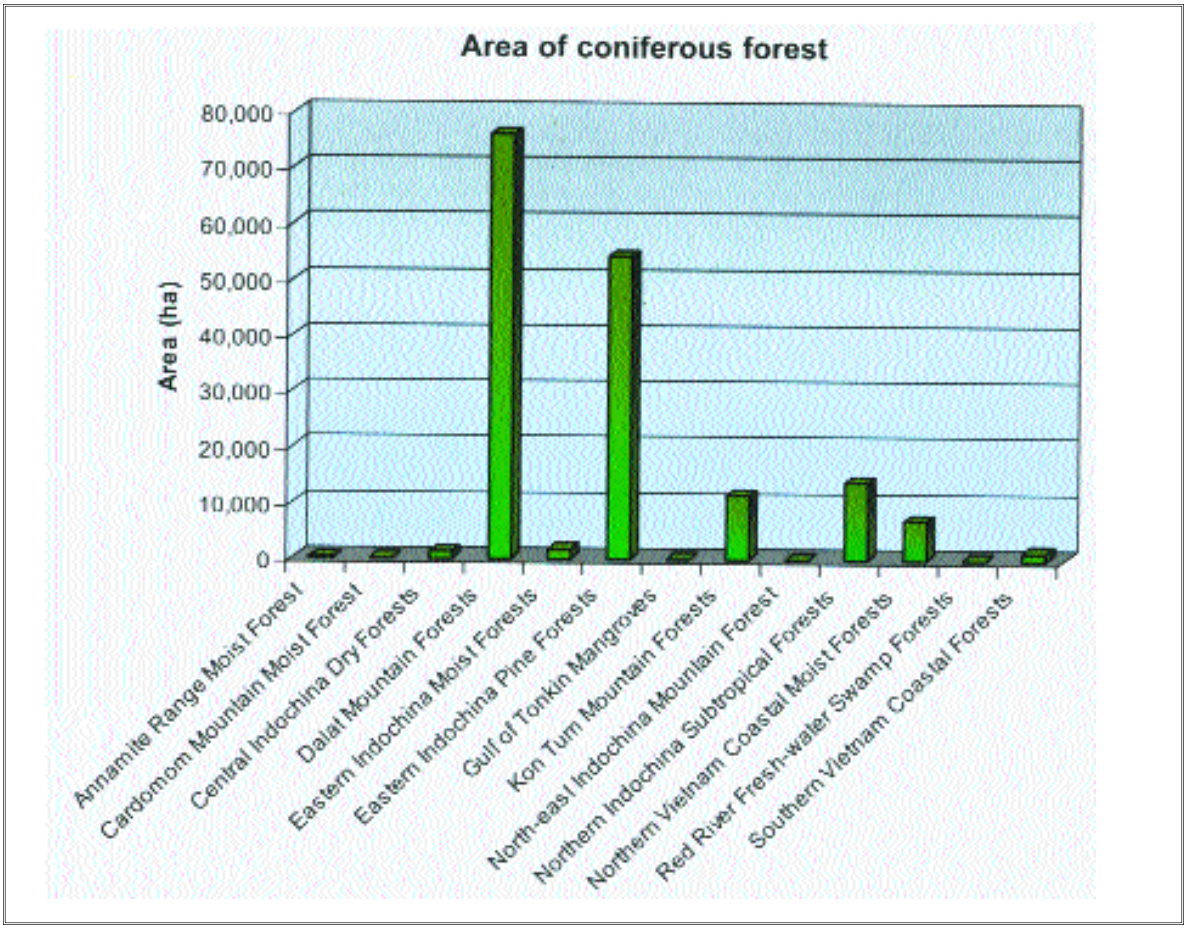


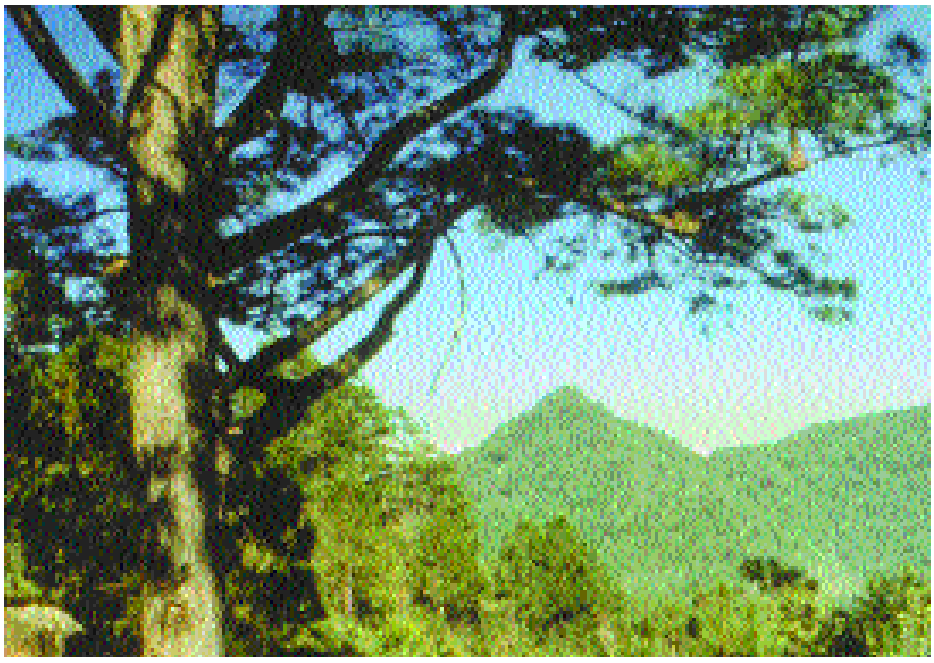
Elevation	Evergreen forest area (ha)	Protected evergreen forest area (ha)
0-300 m	811,383	183,747
300-700 m	2,254,442	149,783
700-1,200 m	1,937,765	208,254
1,200+ m	635,700	107,905

- **Evergreen forest is well protected in 0-300 m and 700-1,200+ m zones.**
- **Evergreen forest needs further protection in the 300-700 m zone.**



8.3 *Coniferous forest*





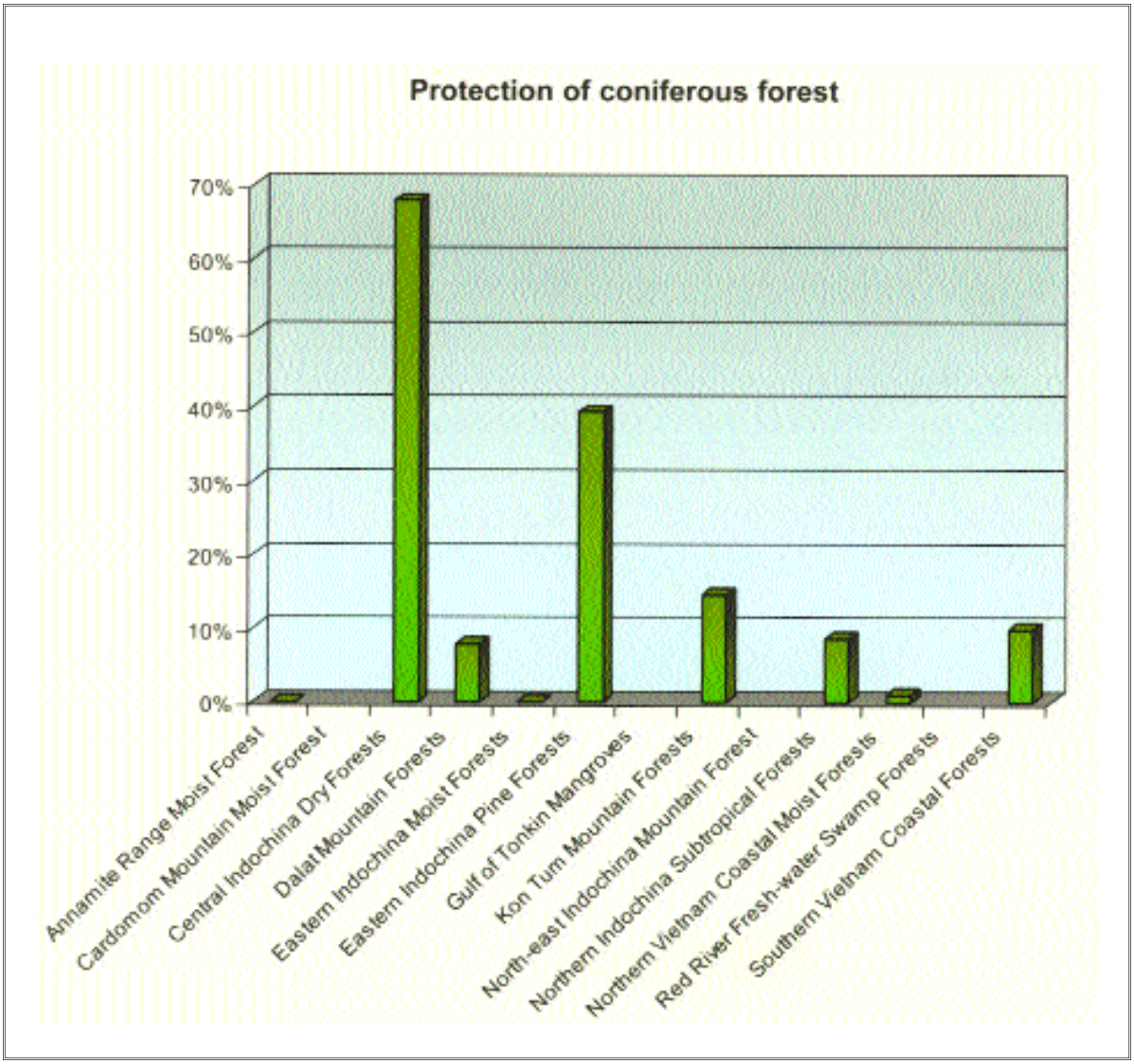
Coniferous forest (foreground) and evergreen forest (background) in Bi Dup-Nui Ba Nature Reserve, Lam Dong Province (Da Lat Montane Forests Ecoregion).

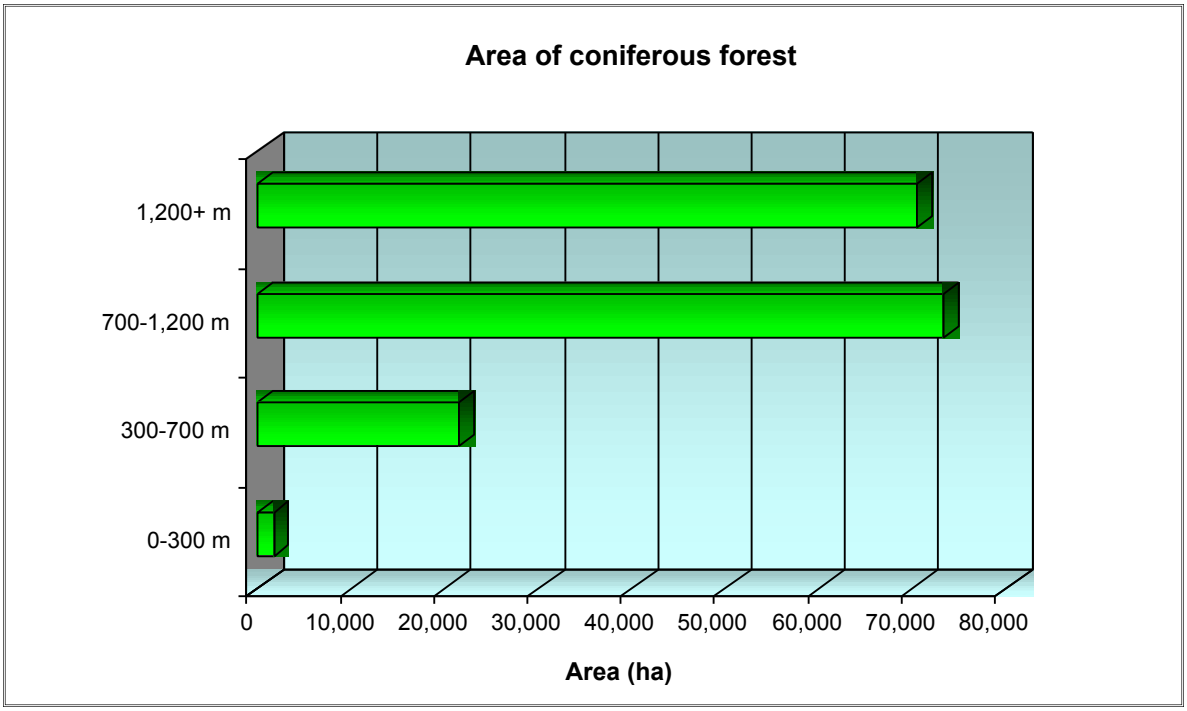
Photo: *J.C.Eames*

Ecoregion	Coniferous forest area (ha)	Protected coniferous forest area (ha)	Percentage protected
Annamite Range Moist Forests	288	0	0%
Central Indochina Dry Forests	1,296	880	68%
Da Lat Montane Forests	75,992	6,036	8%
Eastern Indochina Moist Forests	1,727	0	0%
Eastern Indochina Pine Forests	54,229	21,299	39%
Kon Tum Montane Forests	11,421	1,657	15%
Northern Indochina Subtropical Forests	13,782	1,194	9%
Northern Vietnam Coastal Moist Forests	7,006	71	1%
Southern Vietnam Coastal Forests	1,353	133	10%

Table 10. Protection of coniferous forest within Ecoregions

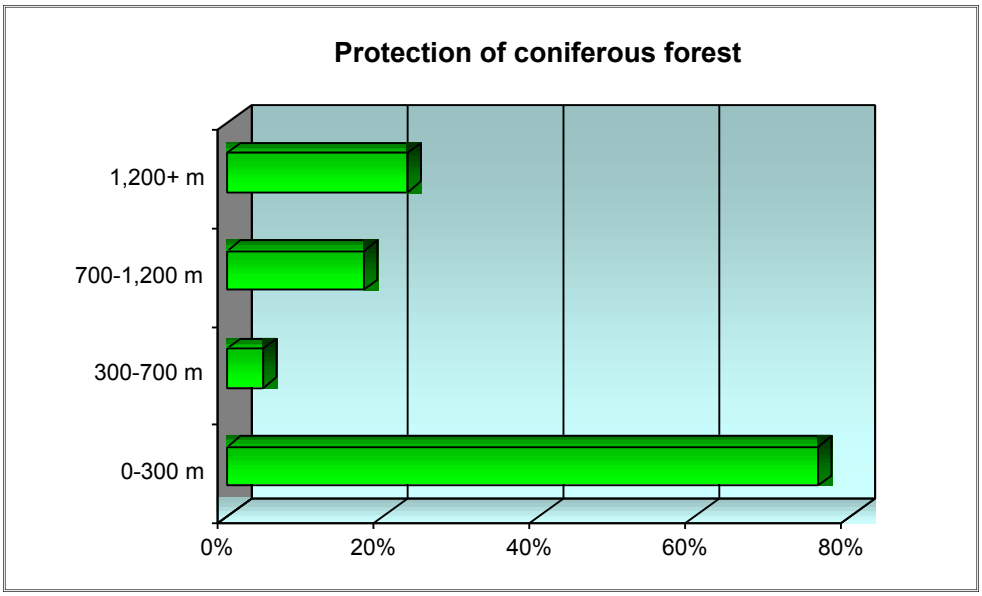
- **Coniferous forest needs further protection within the Ecoregions highlighted in red.**





Elevation	Coniferous forest area (ha)	Protected coniferous forest area (ha)
0-300 m	1,674	1,266
300-700 m	21,585	977
700-1,200 m	73,418	12,805
1,200+ m	70,419	16,224

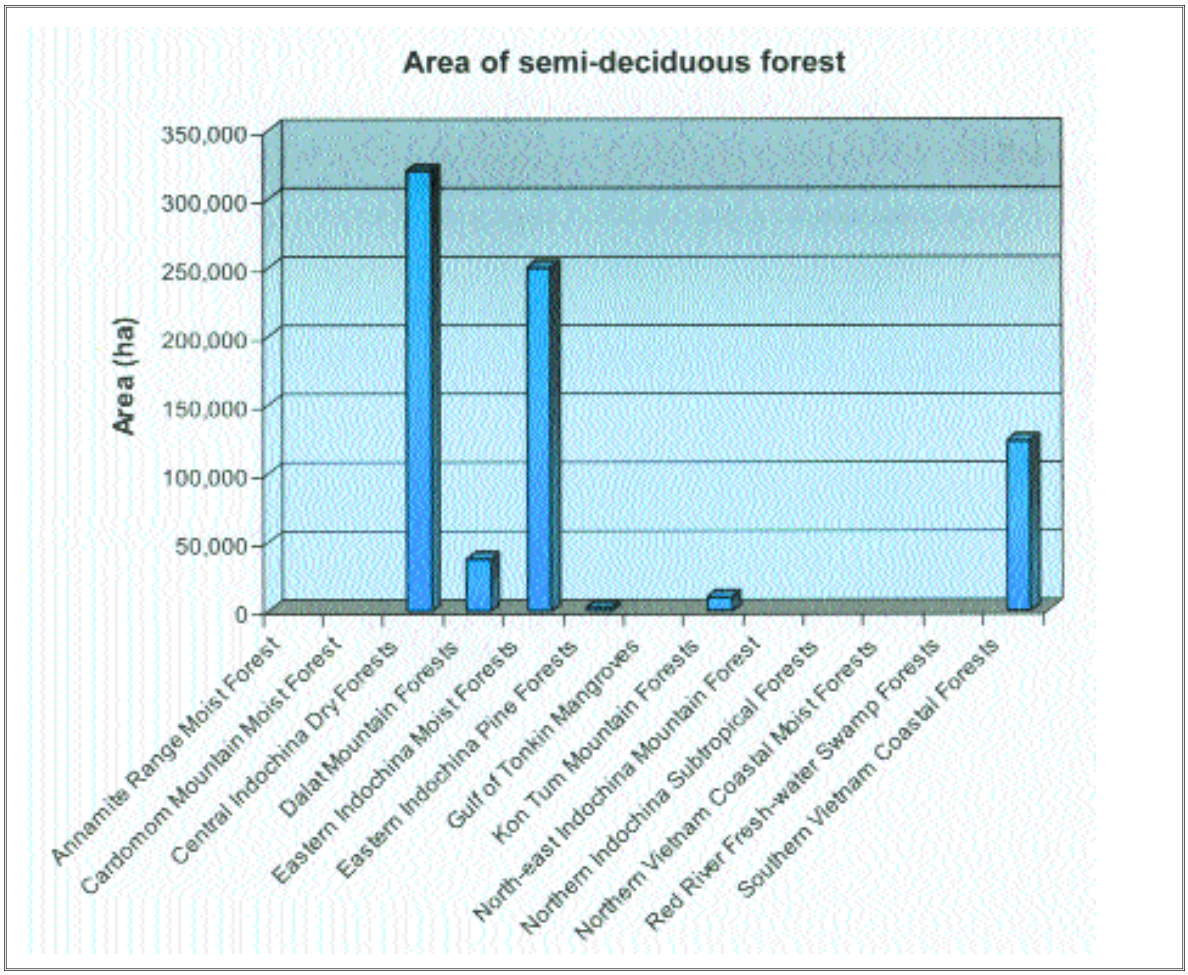
- **Coniferous forest is well protected in the 0-300 m and 700-1,200+ m zones.**
- **Coniferous forest needs further protection in the 300-700 m zone.**



8.4 *Semi-deciduous forest*

Photo: *J.C.Eames*

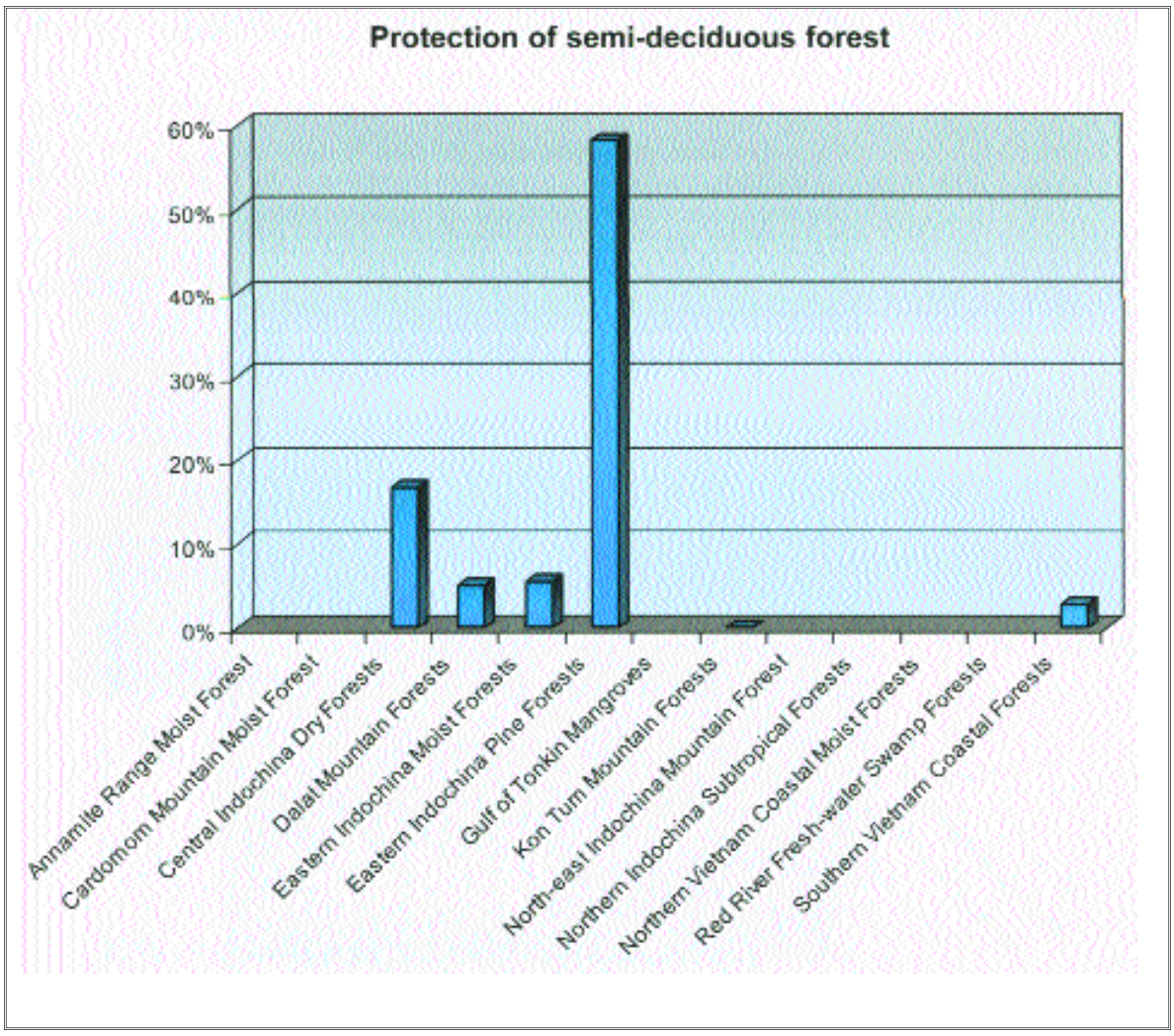
Semi-deciduous forest requires further protection in four Ecoregions and is adequately protected in only two Ecoregions.

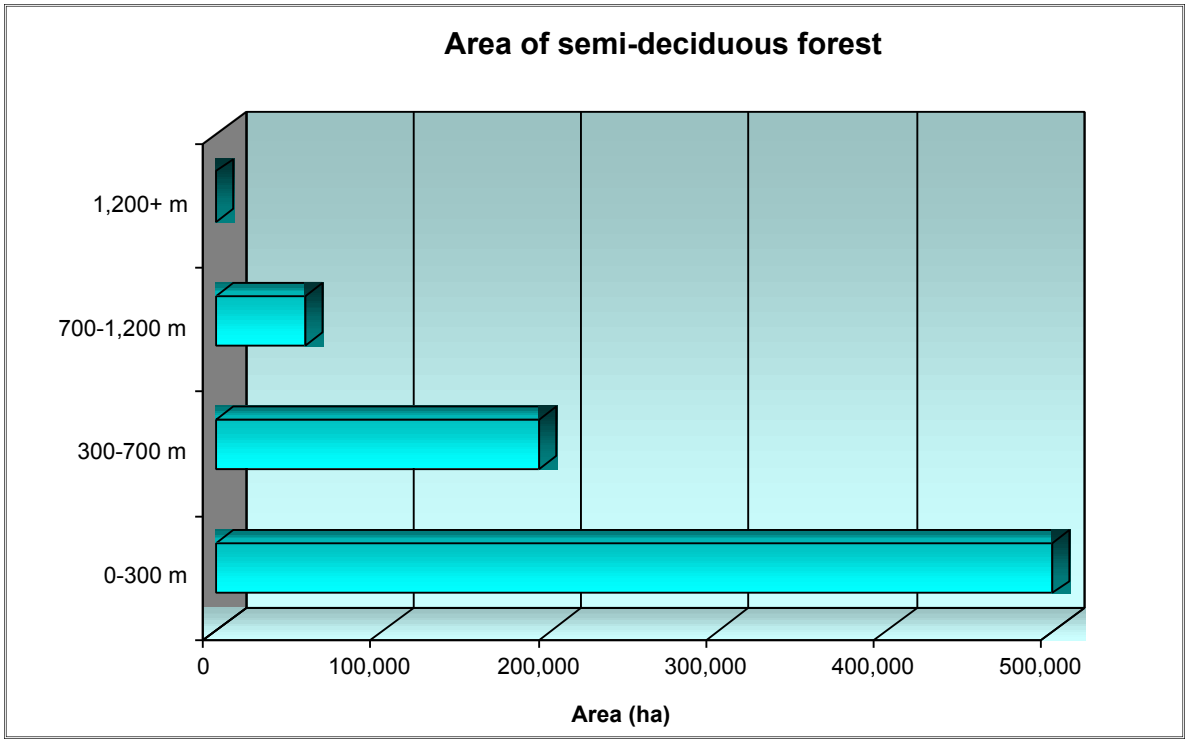


Ecoregion	Semi-deciduous forest area (ha)	Protected semi-deciduous forest area (ha)	Percentage protected
Central Indochina Dry Forests	319,848	53,303	17%
Da Lat Montane Forests	38,057	1,934	5%
Eastern Indochina Moist Forests	249,709	13,663	5%
Eastern Indochina Pine Forests	2,224	1,294	58%
Kon Tum Montane Forests	10,356	0	0%
Southern Vietnam Coastal Forests	123,649	3,388	3%

Table 12. Protection of semi-deciduous forest within Ecoregions

- **Semi-deciduous forest needs further protection within the Ecoregions highlighted in red.**

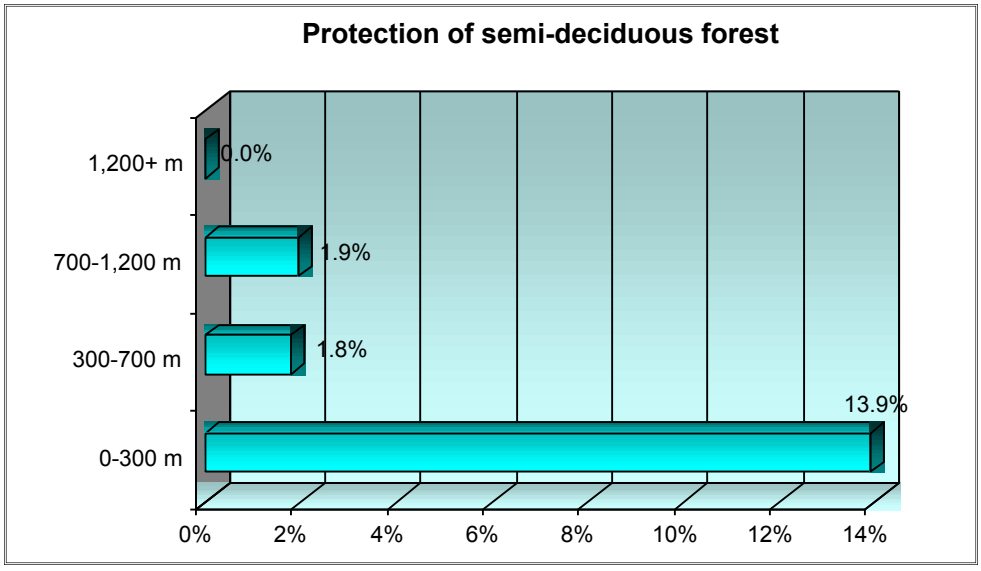




Elevation	Semi-deciduous forest area (ha)	Protected semi-deciduous forest area (ha)
0-300 m	498,437	69,169
300-700 m	192,439	3,397
700-1,200 m	52,918	1,016
1,200+ m	50	0

Table 13. Protection of semi-deciduous forest within elevation zones

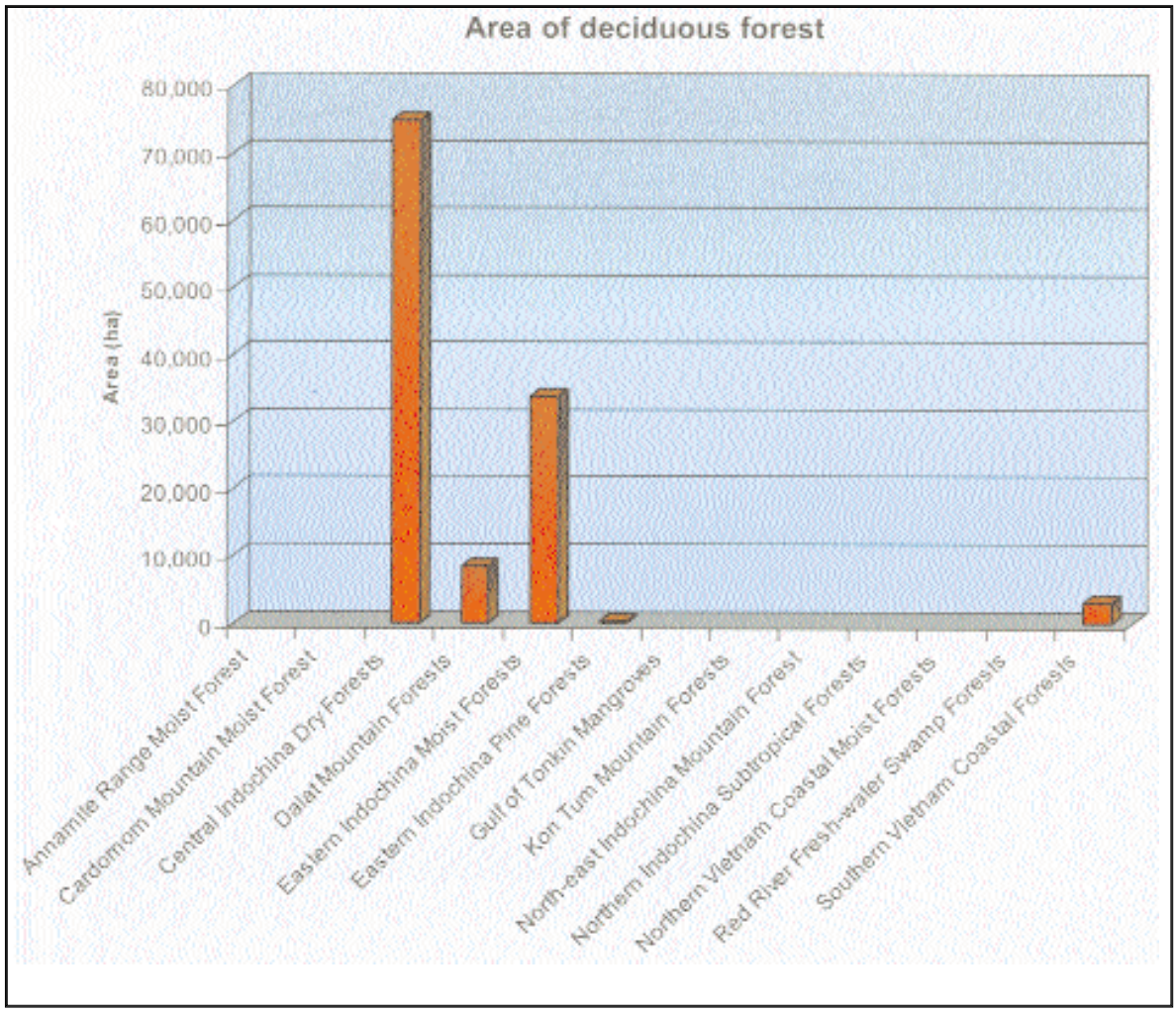
- **Semi-deciduous forest is well protected in the 0-300 m zone.**
- **Semi-deciduous forest needs further protection in the 300-1,200 m. zones**



8.5 *Deciduous forest*

Photo: *J.C.Eames*

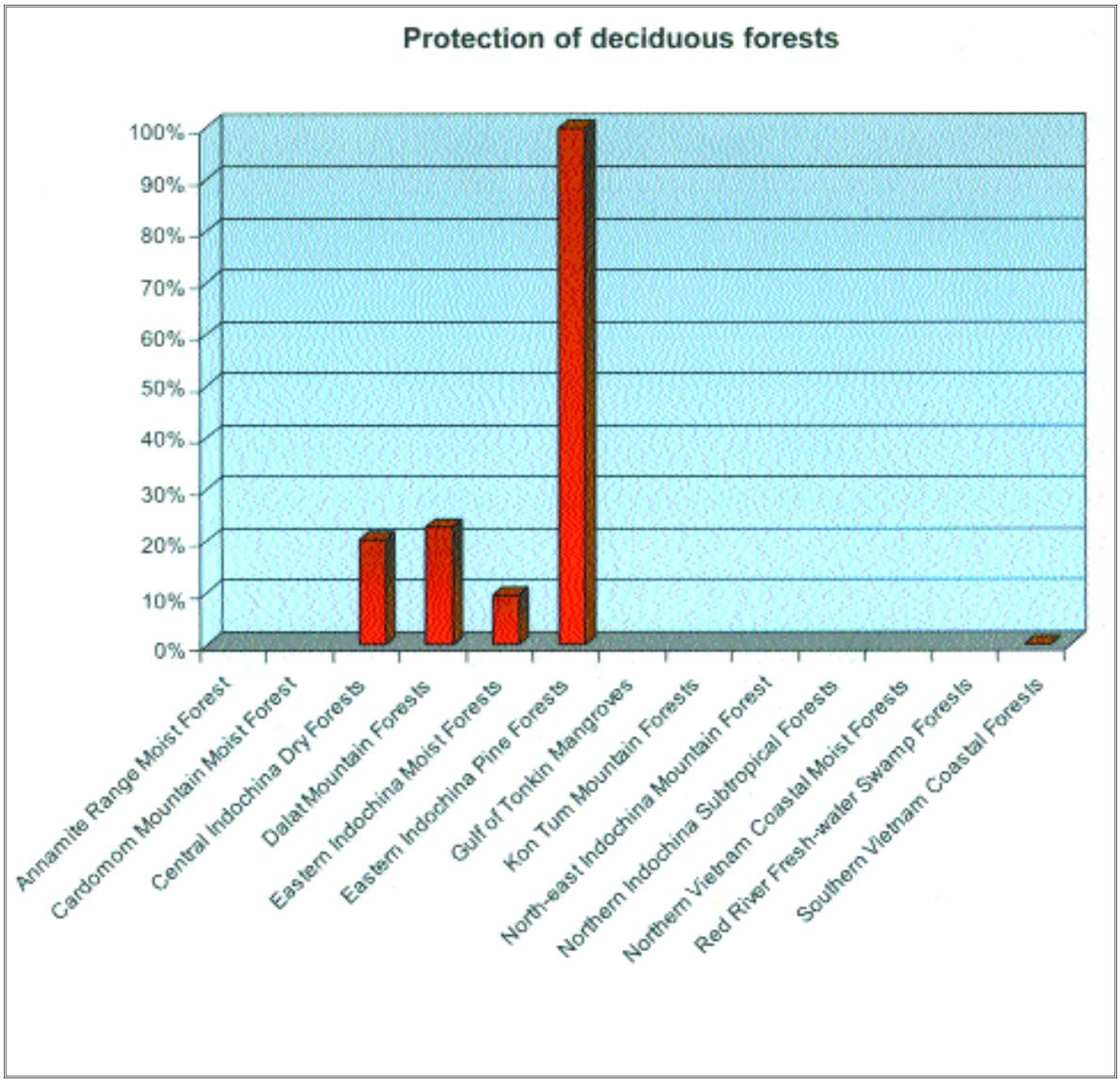
Dry Deciduous Forest (Central Indochina Dry Forests Ecoregion) covers extensive areas of western Dak Lak and Gia Lai provinces. This is a widespread habitat within Indochina. The conservation importance of protected areas supporting this habitat is much reduced if permanent watercourses are excluded.

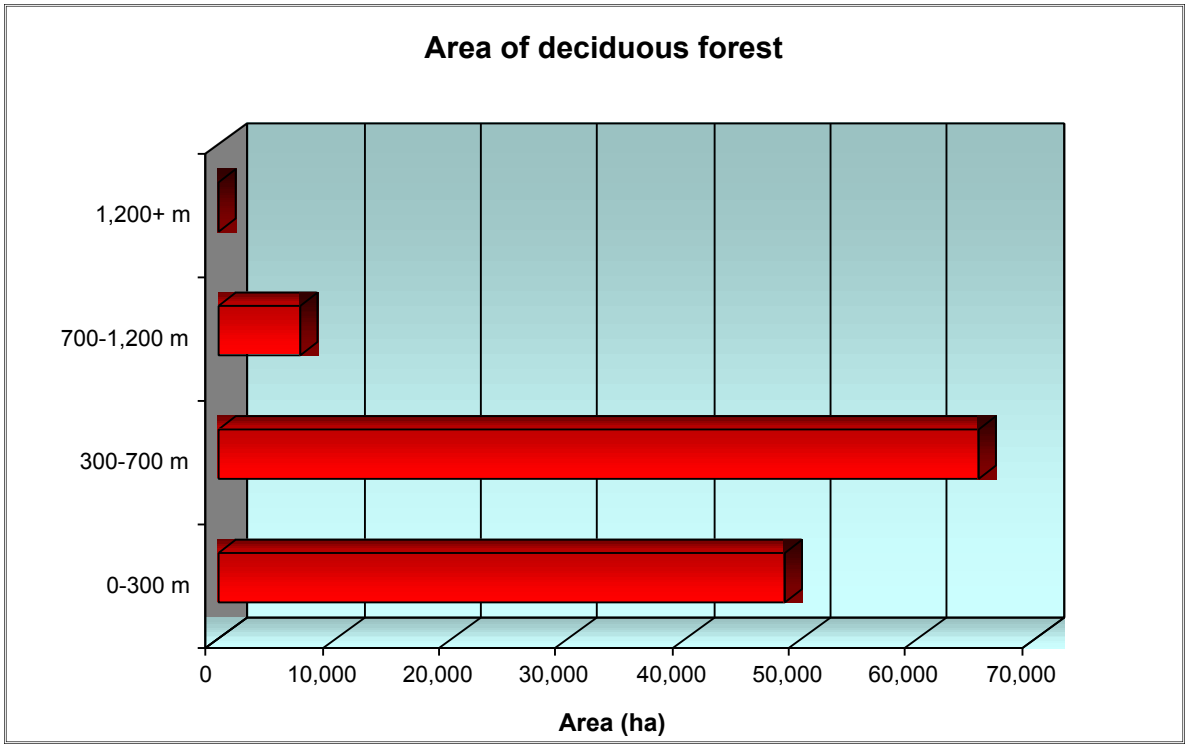


Ecoregion	Deciduous forest area (ha)	Protected deciduous forest area (ha)	Percentage protected
Central Indochina Dry Forests	74,911	15,153	20%
Da Lat Montane Forests	8,620	1,958	23%
Eastern Indochina Moist Forests	33,810	3,251	10%
Eastern Indochina Pine Forests	416	416	100%
Southern Vietnam Coastal Forests	3,123	0	0%

Table 14. Protection of deciduous forest within Ecoregions

- **Deciduous forest needs further protection within the Ecoregions highlighted in red.**

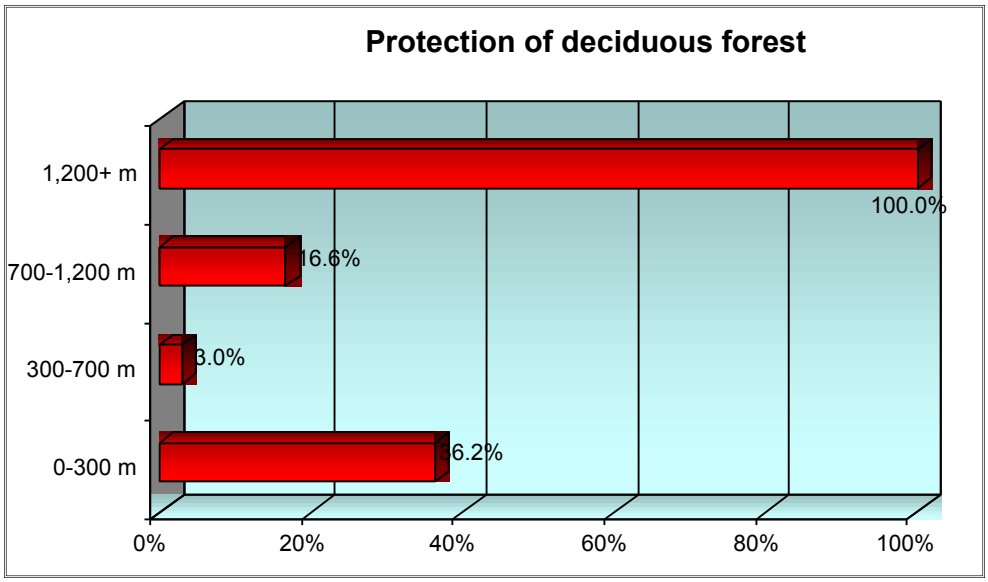




Elevation	Deciduous forest area (ha)	Protected deciduous forest area (ha)
0-300 m	48,645	17,616
300-700 m	65,227	1,968
700-1,200 m	6,971	1,157
1,200+ m	37	37

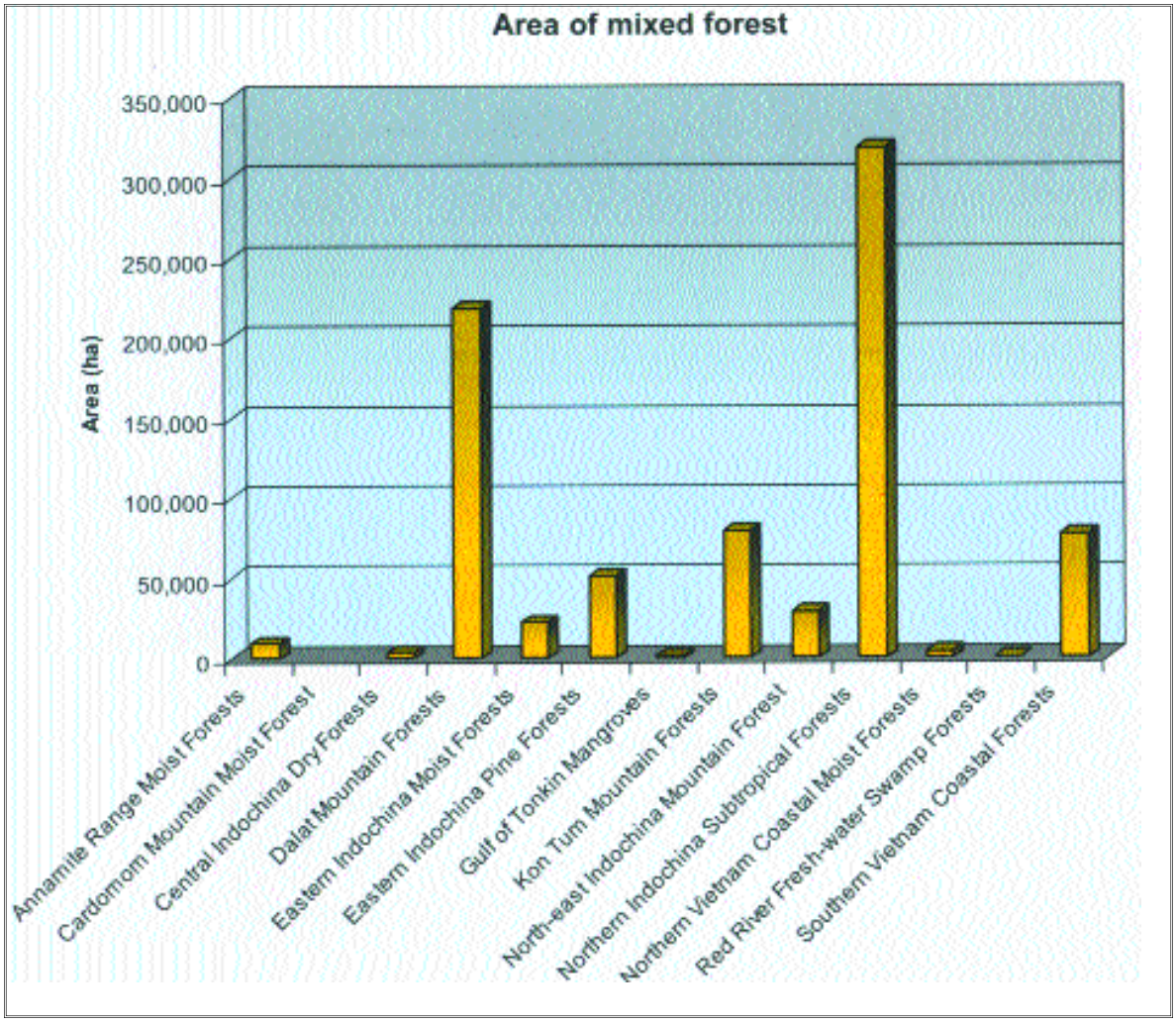
Table 15. Protection of deciduous forest within elevation zones

- **Deciduous forest is well protected in the 0-300 m and 700-1,200+ m zones.**
- **Deciduous forest needs further protection in the 300-700 m zone.**



Mixed forest is well protected in two Ecoregions but requires further protection in ten other Ecoregioins.

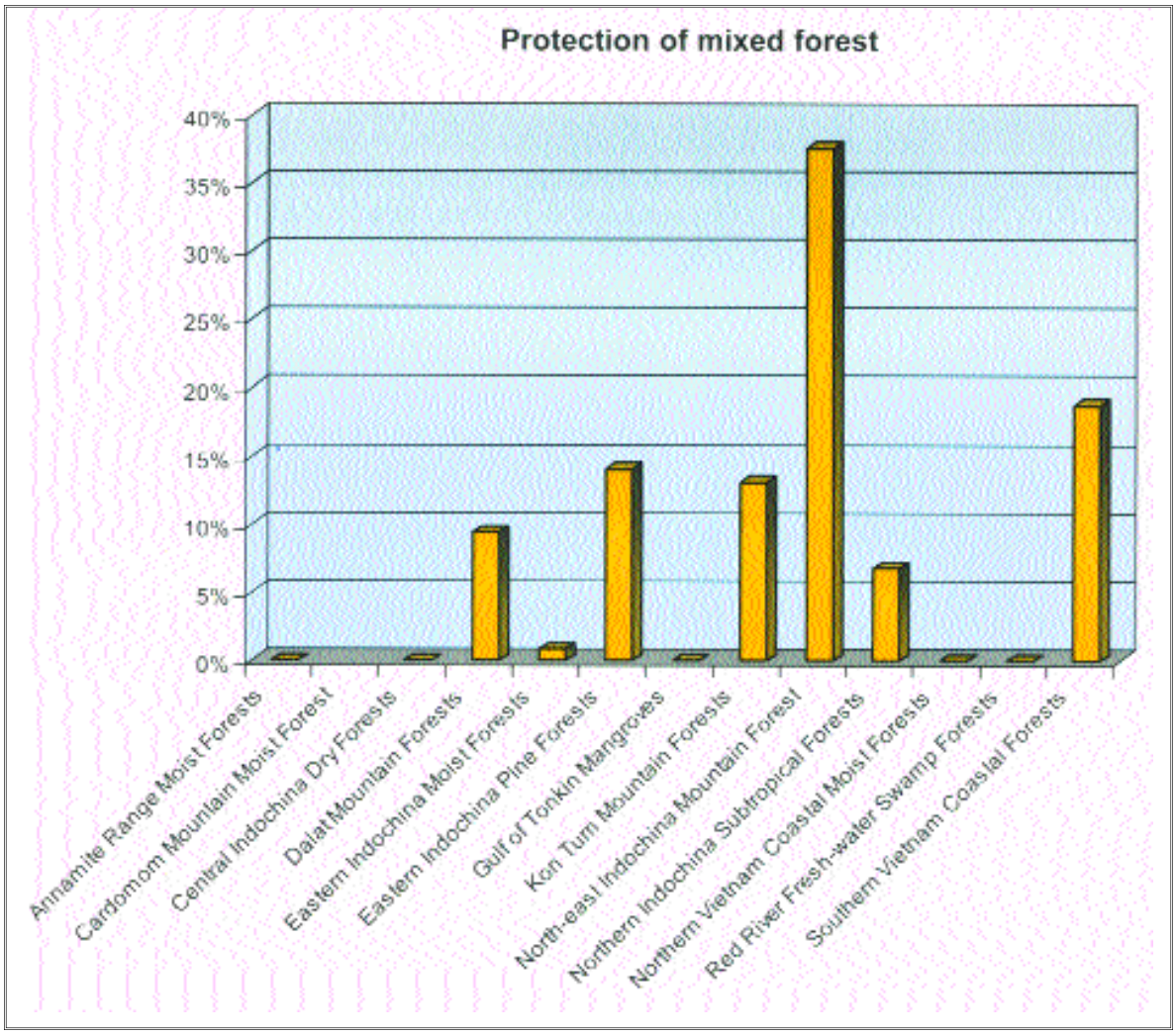
Photo: *BirdLife*

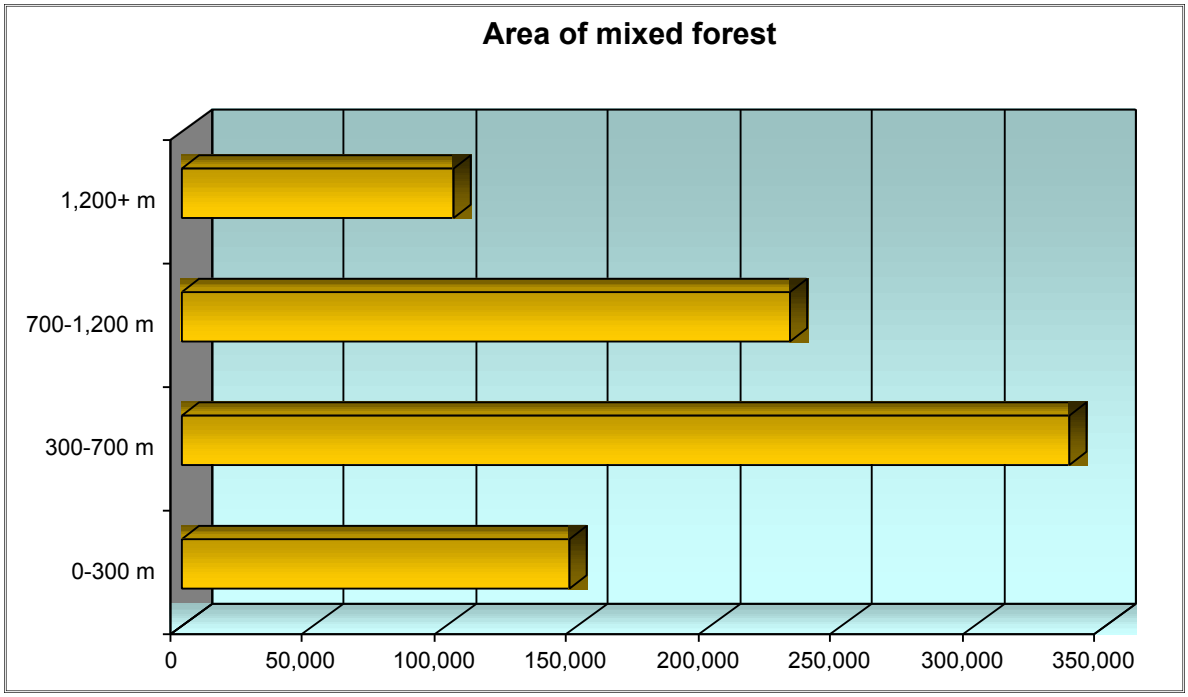


Ecoregion	Mixed forest area (ha)	Protected mixed forest area (ha)	Percentage protected
Annamite Range Moist Forests	9,368	0	0%
Central Indochina Dry Forests	3,500	0	0%
Da Lat Montane Forests	218,924	20,643	9%
Eastern Indochina Moist Forests	22,170	186	1%
Eastern Indochina Pine Forests	51,213	7,171	14%
Gulf of Tonkin Mangroves	958	0	0%
Kon Tum Montane Forests	79,399	10,381	13%
North-east Indochina Montane Forests	29,094	10,944	38%
Northern Indochina Subtropical Forests	319,096	21,582	7%
Northern Vietnam Coastal Moist Forests	4,115	0	0%
Red River Fresh-water Swamp Forests	489	0	0%
Southern Vietnam Coastal Forests	76,980	14,437	19%

Table 16. Protection of mixed forest within Ecoregions

- **Mixed forest needs further protection within the Ecoregions highlighted in red.**

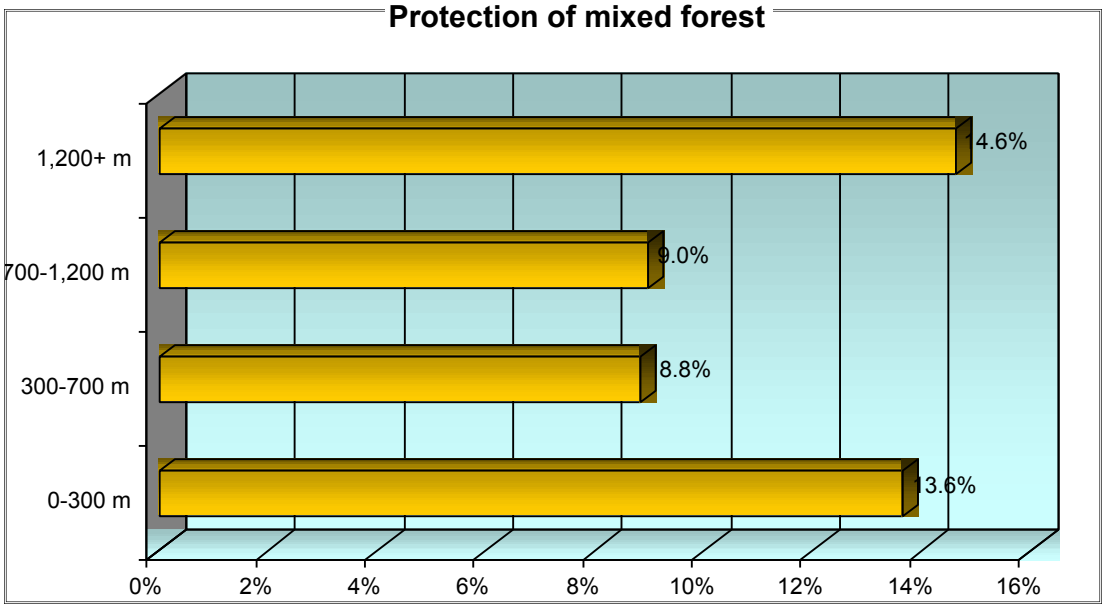




Elevation	Mixed forest area (ha)	Protected mixed forest area (ha)
0-300 m	146,810	20,032
300-700 m	335,541	29,635
700-1,200 m	229,948	20,621
1,200+ m	103,012	15,059

Table 17. Protection of mixed forest within elevation zones

- **Mixed forest is well protected in the 0-300 m and 1,200+ m zones.**
- **Mixed forest needs further protection in all zones between 300 - 1,200.**



8.7 *Limestone forest*

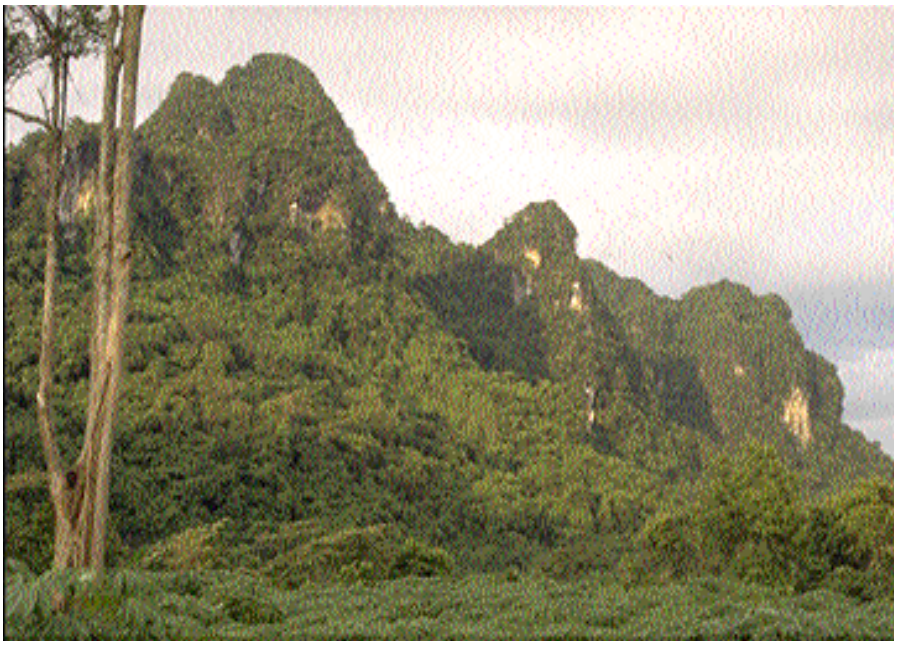
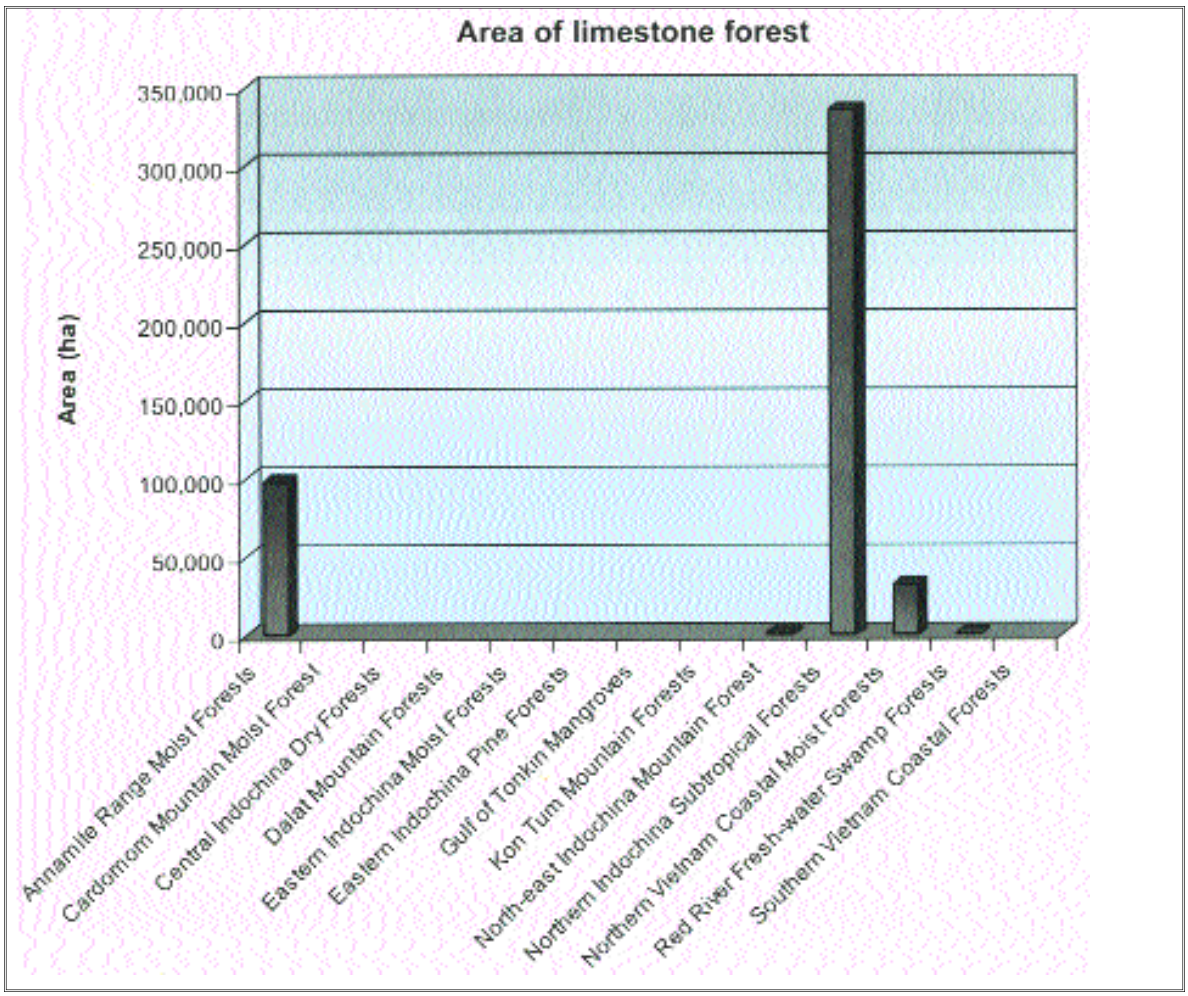
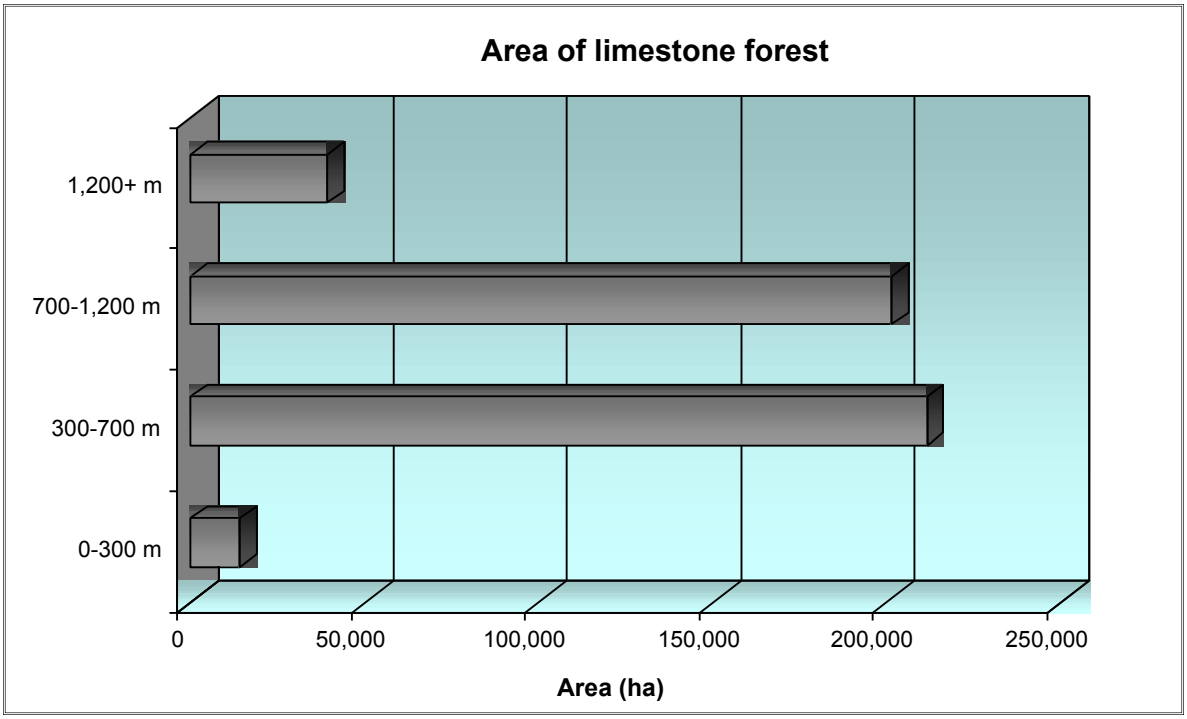


Photo: *J.C.Eames*

Lowland evergreen forest on limestone in Phong Nha Nature Reserve, Quang Binh Province (Annamite Range Moist Forests Ecoregion). An important habitat for Sooty Babbler Stachyiris herberti *and Hatinh Leaf Monkey* Semnopithecus francoisi hatinhensis. *The extension of Phong Nha to encompass the K'Bang limestone area should be considered a priority.*

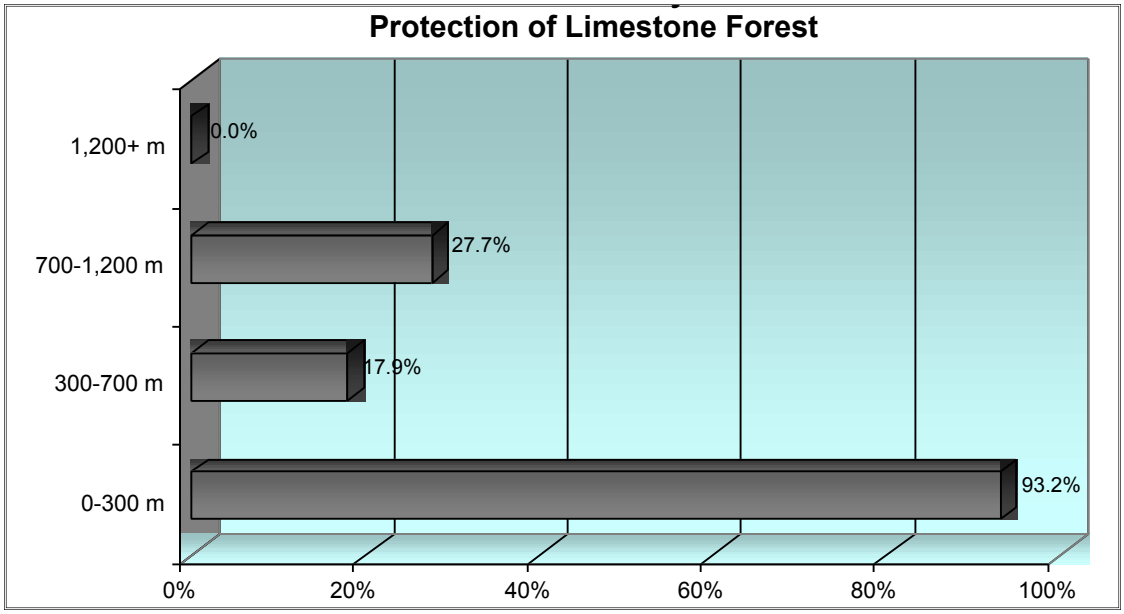


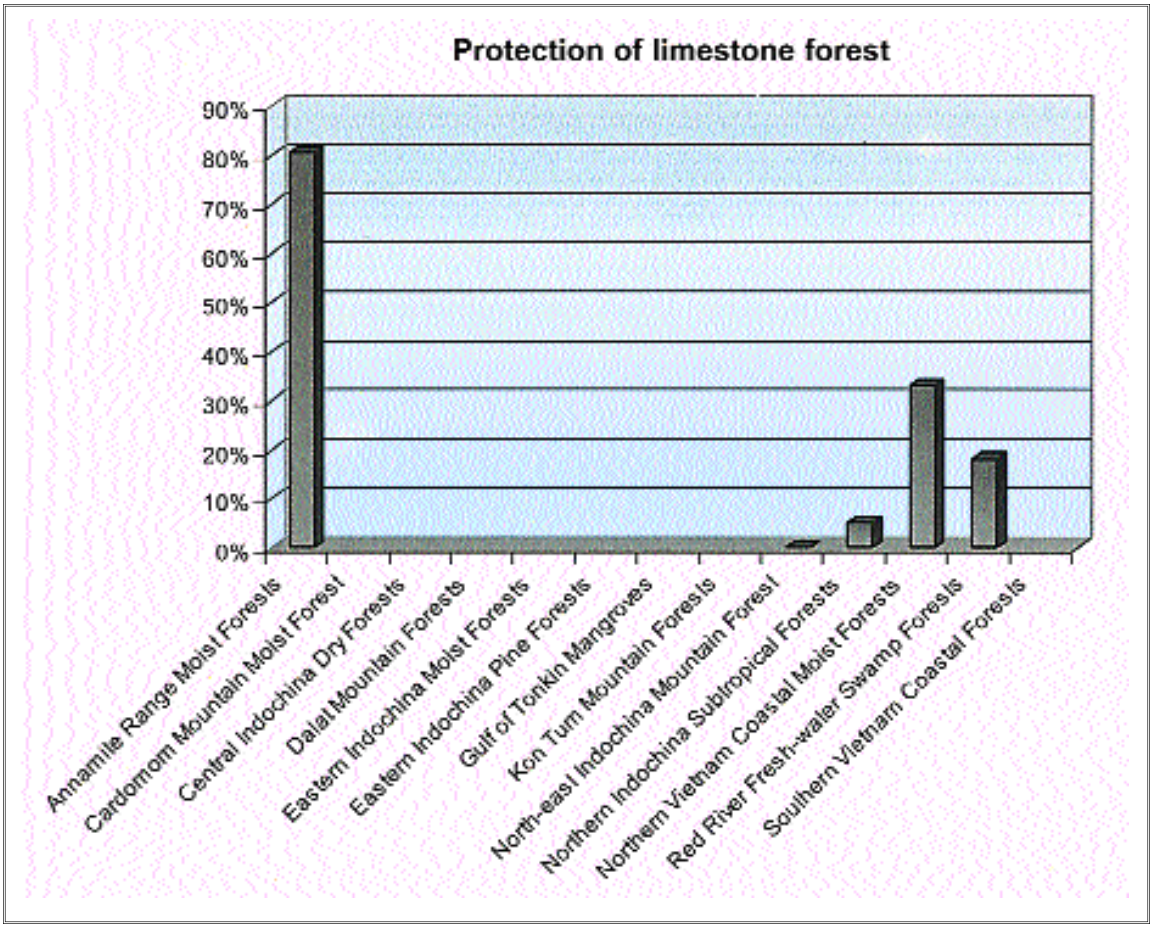


Ecoregion	Limestone forest area (ha)	Protected limestone forest area (ha)	Percentage protected
Annamite Range Moist Forests	98,028	79,027	81%
North-east Indochina Montane Forests	1,042	0	0%
Northern Indochina Subtropical Forests	335,789	17,206	5%
Northern Vietnam Coastal Moist Forests	10,707	10,707	33%
Red River Fresh-water Swamp Forests	284	51	18%

Table 18. Protection of limestone forest within Ecoregions

- **Limestone Forest is well protected in the 0-1,200 m zones.**
- **Limestone Forest needs further protection in the 1,200+ m zone.**





Elevation	Limestone forest area (ha)	Protected limestone forest area (ha)
0-300 m	14,179	13,211
300-700 m	211,866	37,941
700-1,200 m	201,702	55,840
1,200+ m	39,616	0

Table 19. Protection of limestone forest within elevation zones

8.8 Natural forest

The table opposite shows the area of each forest type that needs to be added within each elevation zone and each Ecoregion if the expanded protected area network is to be more equally representative of Vietnamese biodiversity. The addition of these areas would ensure approximately 16% of natural forest is covered within the protected areas network.

The total natural forest area to add is 570,000 ha, realistically allowing the remaining 100,000 ha of non-forest, or bamboo forest land to be incorporated within the new proposed reserve boundaries.

Table 20. The area of each natural forest type within each elevation zone and each Ecoregion that needs to be added to ensure equitable representation

Ecoregion	Evergreen forest (ha)	Coniferous forest (ha)	Semi-deciduous forest (ha)	Deciduous forest (ha)	Mixed forest (ha)	Limestone forest (ha)	Total forest area to add (ha)
Annamite Range Moist Forests							
0-300 m							
300-700 m	27,650				1,450		**29,100**
700-1,200 m							
1,200+ m							
Cardomom Mountains Moist Forests							
0-300 m							
300-700 m							
700-1,200 m							
1,200+ m							
Central Indochina Dry Forests							
0-300 m							
300-700 m	5,100		7,600	4,700			**17,400**
700-1,200 m							
1,200+ m							
Da Lat Montane Forests							
0-300 m	4,700						**4,700**
300-700 m	14,750		1,000				**15,750**
700-1,200 m	39,000	3,450	2,550		13,050		**58,050**
1,200+ m		2,400					**2,400**
Eastern Indochina Moist Forests							
0-300 m	4,500		8,400		3,300		**16,200**
300-700 m	27,700		14,000	3,800			**45,500**
700-1,200 m	19,700		3,950				**23,650**
1,200+ m							
Eastern Indochina Pine Forests							
0-300 m							
300-700 m	1,550						**1,550**
700-1,200 m					2,350		**2,350**
1,200+ m							
Gulf of Tonkin Mangroves							
0-300 m							
300-700 m	3,050						**3,050**
700-1,200 m							
1,200+ m							

Ecoregion	Evergreen forest (ha)	Coniferous forest (ha)	Semi-deciduous forest (ha)	Deciduous forest (ha)	Mixed forest (ha)	Limestone forest (ha)	Total forest area to add (ha)
Kon Tum Montane Forests							
0-300 m	11,000				2,700		**13,700**
300-700 m	32,300						**32,300**
700- 1,200 m	58,950						**58,950**
1,200+ m					2,200		**2,200**
North-east Indochina Montane Forests							
0-300 m							
300-700 m							
700-1,200 m							
1,200+ m							
Northern Indochina Subtropical Forests							
0-300 m							
300-700 m	85,5000	1,550			25,450	15,550	**128,050**
700-1,200 m	17,450				4,250	20,400	**42,100**
1,200+ m	16,750				1,050	6,350	**24,150**
Northern Vietnam Coastal Moist Forests							
0-300 m							
300-700 m	11,650	1,050					**12,700**
700-1,200 m							
1,200+ m							
Red River Fresh-water Swamp Forests							
0-300 m							
300-700 m	1,000						**1,000**
700-1,200 m							
1,200+ m							
Southern Vietnam Coastal Forests							
0-300 m	10,550		11,400				**21,950**
300-700 m	5,300		4,250				**9,550**
700-1,200 m	4,800						**4,800**
1,200+ m							

9 EXPANDING THE PROTECTED AREAS NETWORK

9.1 Identifying new protected areas

The analyses for Natural Forest types in section *8.1:Ensuring adequate representation* identified the area of each particular forest type within each elevation zone in each Ecoregion that needs to be added to the protected areas network. This alone would be adequate to identify, through mapping, which areas to add to the protected areas network, but other factors help refine the selection, such as:

- **Provinces that require further protection**
- **The occurrence of Globally Threatened species**
- **The largest available contiguous areas of forest**
- **Contiguity with trans-national or trans-provincial protected areas**
- **Existing, well documented proposals or recommendations**

9.2 New protected areas for the 21st Century

The following areas (Table 21) have been identified as satisfying the current requirements for expanding the protected areas network. They complement the existing network, and in combination fully represent all high level ecological its within the country. They also help in increasing the protection afforded many globally threatened species.

Photo: *J.C.Eames*

Grassland and semi-deciduous forest (Eastern Indochina Moist Forests Ecoregion) in Easo proposed Nature Reserve, Dak Lak Province. Semi-deciduous forest is poorly represented within the current protected areas network. If protected, this site would conserve populations of Banteng Bos javanicus *and Gaur* Bos gaurus.

Proposed new protected area or extension	Province(s)	Ecoregion(s)	Forest type(s)	Globally threatened species	Area (ha) of extension/ proposal
Tat Ke-Ban Bung [Na Hang] plus extension	Tuyen Quang; Bac Can	Northern Indochina Subtropical Forests	Evergreen; Limestone; Mixed; Bamboo	*Nycticebus pygmaeus; Macaca arctoides; M. assamensis; Pygathrix avunculus; Semnopithecus francoisi francoisi*	99,600
Ky Thuong	Quang Ninh	Northern Indochina Subtropical Forests	Evergreen; Bamboo	*Hylobates concolor*	17,400
area not yet identified		Red River Freshwater Swamp Forests	Evergreen		2,500
area not yet identified		Gulf of Tonkin Mangroves	Evergreen		2,800
Pu Hoat and Xuan Lien	Nghe An; Thanh Hoa	Northern Indochina Subtropical Forests	Evergreen; Mixed; Bamboo	*Bos gaurus; Pygathrix nemaeus nemaeus; Semnopithecus phayrei; Macaca arctoides; Jabouilleia danjoui*	120,000
Khe Net [Ke Go extension]	Ha Tinh; Quang Binh	Annamite Range Moist Forests	Evergreen	*Macaca arctoides; M. assamensis; Pygathrix nemaeus nemaeus; Hylobates gabriellae; Arborophila charltonii; Lophura hatinhensis; L. imperialis; Rheinardia ocellata; Alcedo hercules; Picus rabieri; Jabouilleia danjoui*	16,500
Phong Nha extension	Quang Binh	Annamite Range Moist Forests	Evergreen; Mixed; Bamboo	*Semnopithecus francoisi hatinhensis; Macaca arctoides; M. assamensis; Stachyris herbeti*	12,200
Phong Dien and Dakrong	Quang Tri; Thua Thien Hue	Annamite Range Moist Forests; Kon Tum Montane Forests	Evergreen	*Bos gaurus; Macaca arctoides; M. nemestrina; Pygathrix nemaeus nemaeus; Hylobates gabriellae; Arborophila merlini; Alcedo hercules; Jabouilleia danjoui; Lophura diardi; L. edwardsi; Picus rabieri; Rheinardia ocellata*	60,000
Bach Ma extension	Da Nang; Thua Thien Hue	Northern Vietnam Coastal Moist Forests	Evergreen	*Macaca arctoides; Pygathrix nemaeus nemaeus; Arborophila merlini; Rheinardia ocellata*	22,500
Ngoc Linh (Quang Nam) and Song Thanh-Dakpring	Quang Nam	Kon Tum Montane Forests	Evergreen; Mixed	*Elephas maximus; Bos gaurus; Macaca arctoides; M. assamensis; Alcedo hercules; Picus rabieri; Sitta solangiae; Rheinardia ocellata; Jabouilleia danjoui*	120,000
Kong Cha Rang / Kon Ka Kinh link extension	Gia Lai	Kon Tum Montane Forests	Evergreen	*Panthera tigris; Pygathrix nemaeus cinereus; Macaca arctoides; M. nemestrina; Alcedo hercules; Picus rabieri; Rheinardia ocellata; Lophura diardi; Garrulax milleti; Jabouilleia danjoui; Sitta solangiae*	16,500
South-east Gia Lai province	Gia Lai	Eastern Indochina Moist Forests	Evergreen; Deciduous	*Bos javanicus; Hylobates gabriellae; Pavo muticus*	37,800
Nui Ba extension	Binh Dinh	Eastern Indochina Moist Forests; Southern Vietnam Coastal Moist Forests	Evergreen	*Hylobates gabriellae; Pavo muticus; Polyplectron germaini; Arborophila davidi*	6,800
Yok Don extension	Dac Lac	Central Indochina Dry Forests	Evergreen; Semi-deciduous; Deciduous	*Hylobates gabriellae; Elephas maximus; Bos gaurus; B. javanicus; Pavo muticus; Cairina scutulata*	16,100

Southern Dac Lac area not yet identified	Dac Lac	Eastern Indochina Moist Forests	Evergreen	*Hylobates gabriellae; Pavo muticus*	10,300
Ea So	Dac Lac	Eastern Indochina Moist Forests	Evergreen; Deciduous	*Bos gaurus; B. javanicus; Nycticebus pygmaeus; Macaca nemestrina; Columba punicea; Lophura diardi; Pavo muticus*	22,000
Chu Yang Sin extension	Lam Dong	Eastern Indochina Pine Forests; Da Lat Montane Forests	Evergreen; Mixed; Bamboo	*Elephas maximus; Hylobates gabriellae; Pygathrix nemaeus nigripes; Macaca arctoides; M. nemestrina; Nycticebus pygmaeus; Alcedo hercules; Polyplectron germaini; Jabouilleia danjoui; Crocias langbianis; Pavo muticus; Garrulax milleti; G. yersini; Sitta solangiae*	16,400
Bi Dup-Nui Ba extension south	Lam Dong	Eastern Indochina Pine Forests; Da Lat Montane Forests	Evergreen; Mixed	*Hylobates gabriellae; Pygathrix nemaeus nigripes; Crocias langbianis; Garrulax milleti; G. yersini; Sitta solangiae*	38,200
Bi Dup-Nui Ba extension east	Khanh Hoa	Da Lat Montane Forests	Evergreen	*Hylobates gabriellae; Pygathrix nemaeus nigripes; Crocias langbianis; Garrulax milleti; G. yersini; Sitta solangiae*	7,400
Ta Dung plus extension	Lam Dong	Da Lat Montane Forests	Evergreen; Mixed; Bamboo	*Hylobates gabriellae; Pygathrix nemaeus nigripes; Crocias langbianis; Garrulax milleti; G. yersini; Sitta solangiae*	17,000
South-west Lam Dong province	Lam Dong	Da Lat Montane Forests	Evergreen; Mixed; Bamboo	*Hylobates gabriellae; Pygathrix nemaeus nigripes; Crocias langbianis; Garrulax milleti; G. yersini; Sitta solangiae*	27,700
Cat Loc	Lam Dong	Da Lat Montane Forests; Southern Vietnam Coastal Moist Forests	Evergreen; Mixed; Bamboo	*Rhinoceros sondiacus; Bos gaurus; Arborophila davidi; Polyplectron germaini; Lophura diardi*	23,500
Kalon Song Mao extension	Binh Thuan	Southern Vietnam Coastal Moist Forests	Evergreen; Semi-deciduous; Deciduous	*Pavo muticus; Arborophila davidi; Polyplectron germaini*	13,300
Tan Phu	Dong Nai	Southern Vietnam Coastal Moist Forests	Evergreen	*Elephas maximus; Hylobates gabriellae; Pygathrix nemaeus nigripes; Arborophila davidi; Polyplectron germaini; Lophura diardi*	19,000
Lo Go Sa Mat extension	Tay Ninh	Southern Vietnam Coastal Moist Forests	Evergreen	*Hylobates gabriellae; Pygathrix nemaeus nigripes; Arborophila davidi; Polyplectron germaini; Lophura diardi*	9,700

Table 21. Recommended expansions of the protected areas network of Vietnam for the 21st Century. The areas listed in this table are only suggestions, detailed field surveys will be required in order to assess the feasibility of establishing or expanding a protected area in each case, and to optimise boundary design. No specific recommendations have been made for the Red River Freshwater Swamp Forest and Gulf of Tonkin Mangrove Ecoregions, and southern Dac Lac province; and, in all cases, field surveys will be required to identify suitable areas. Globally threatened species are listed where there is good evidence they have (at some time) been recorded from the area - the lists are not comprehensive and tend to reflect significant differences in field survey effort between sites.

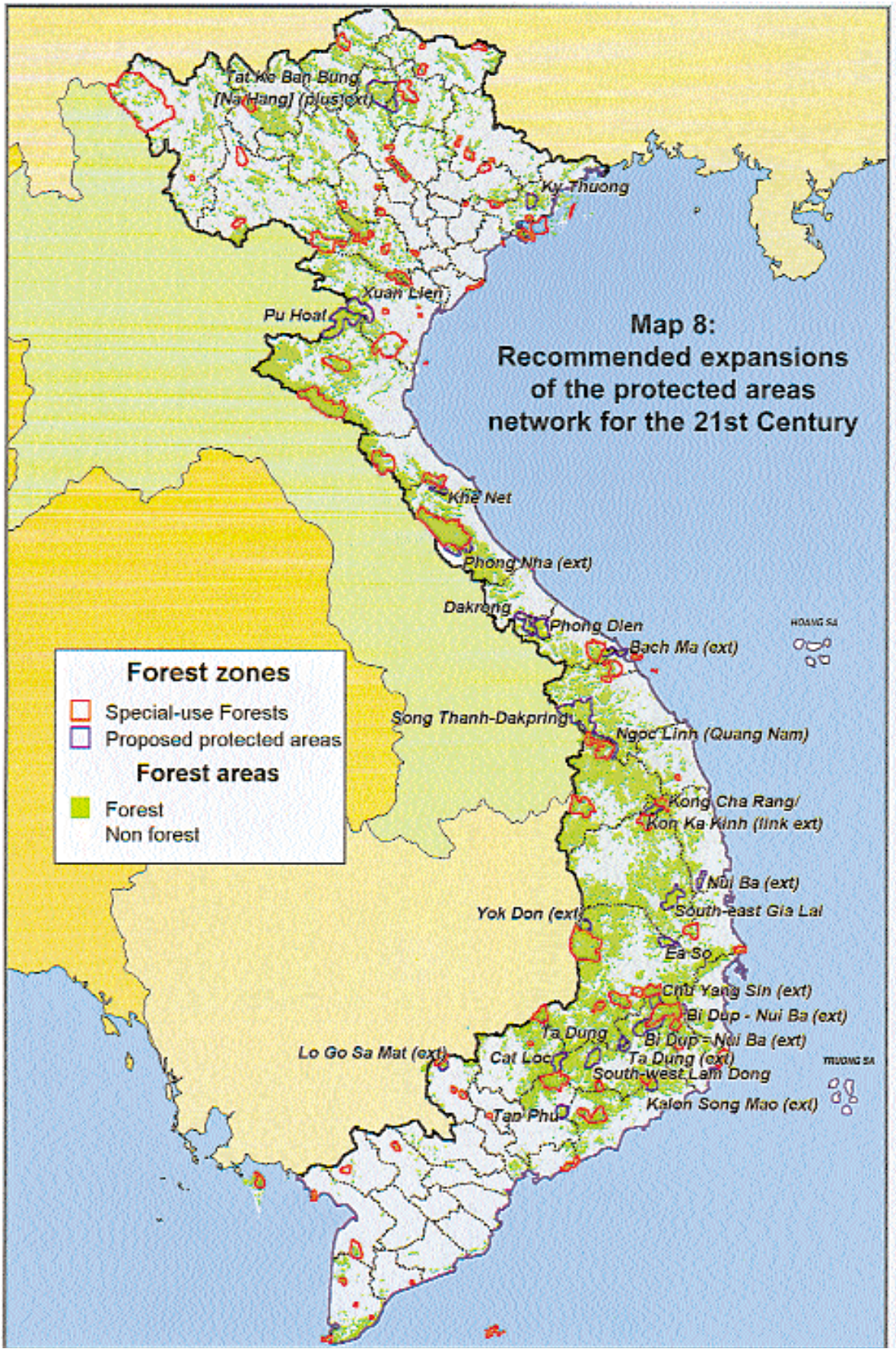

Map 8:
Recommended expansions of the protected areas network for the 21st Century
Forest zones
Special-use Forests
Proposed protected areas
Forest areas
Forest
Non forest
Tat Ke Ban Bung [Na Hang] (plus ext)
Ky Thuong
Xuan Lien
Pu Hoat
Khe Net
Phong Nha (ext)
Dakrong
Phong Dien
Bach Ma (ext)
Song Thanh-Dakpring
Ngoc Linh (Quang Nam)
Kong Cha Rang/ Kon Ka Kinh (link ext)
Nui Ba (ext)
Yok Don (ext)
South-east Gia Lai
Ea So
Chu Yang Sin (ext)
Bi Dup - Nui Ba (ext)
Ta Dung
Bi Dup - Nui Ba (ext)
Lo Go Sa Mat (ext)
Cat Loc
Ta Dung (ext)
South-west Lam Dong
Kalon Song Mao (ext)
Tan Phu
HOANG SA
TRUONG SA

Photo: *Gerry Gomez*

Evergreen forest in the Khe Net watershed, Quang Binh Province (Annamite Range Moist Forests Ecoregion). This forest adjoins Ke Go Nature Reserve in Ha Tinh Province, and is part of the largest tract of evergreen forest remaining in the low - lands of this region. The addition of Khe Net to the protected areas network would significantly enhance the conservation value and viability of Ke Go Nature Reserve.

The proposed protected areas listed above will add 755,200 ha to the current network (making a total of 2,100,000 ha). The selection of reserves goes a long way to redressing the imbalance in the current network.

- **Natural forest**

Significant areas of evergreen forest would be added, almost doubling the representation of this forest type in the protected areas network. About 15% of each natural forest type would be supported.

Painting: Kamol Kamophalin

Collared Laughingthrush Garrulax yersini. *This vulnerable species is endemic to the Da Lat Montane Forests Ecoregion. It is known only from Chu Yang Sin and Bi Dup-Nui Ba Nature Reserves.*

- **Ecoregions**

Significant increases in coverage would be made within previously poorly represented Ecoregions such as the North Indochina Subtropical Forests, Kon Tum Montane Forests and Da Lat Montane Forests. Representation of forest within each Ecoregion would be above 15%. Although Red River Freshwater Swamp Forests are included in Table 21, no examples of this forest type are known to remain. Den Hung in Vinh Phu Province is included under this heading but is known to only support evergreen forest.

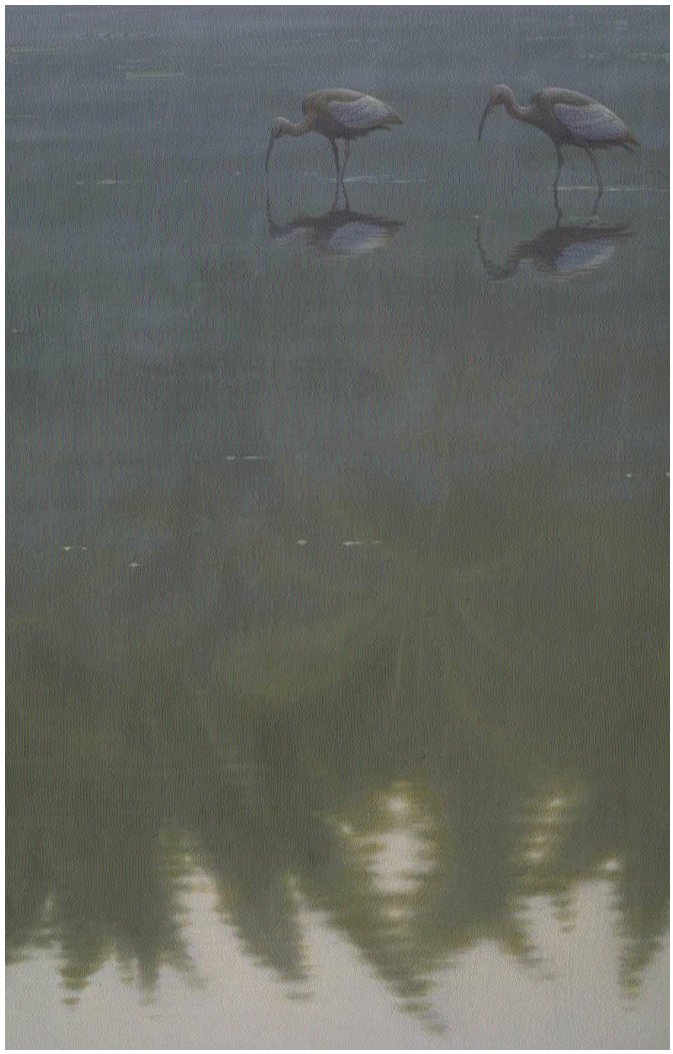
- **Provinces**

A number of provinces currently have no Special-use Forests. The proposed expansion of the protected areas network would add reserves to three such provinces, namely Khanh Hoa, Binh Dinh,and Quang Tri.

- **Globally Threatened species**

The Globally Threatened species listed below (Table 22) all benefit from additional coverage as a result of the proposal for expanding the protected areas network. Indeed, some of the species listed (e.g. *Lophura edwardsi*) are totally unprotected by the current network. Other critical species such as Gloden_headed Leaf Monkey *Semnopithecus francoisi poliocephalus*, Grey-crowned Crocias *Crocias langbianis* and Imperial Pheasant *Lophura imperi - alis* would still only be conserved in simple protected areas - a less than ideal situation.

Globally threatened very large mammals
Bos gaurus
B. javanicus
Elephas maximus
Panthera tigris
Globally threatened primates
Hylobates concolor
H. gabriellae
Macaca arctoides
M. assamensis
M. nemestrina
Nycticebus pygmaeus
Pygathrix avunculus
P. nemaeus nemaeus
P. n. nigripes
P. n. cinereus
Semnopithecus phayrei
S. francoisi francoisi
S. f. hatinhensis
S. f. delacouri
Globally threatened forest birds
Alcedo hercules
Arborophila charltonii
A. davidi
A. merlini
Crocias langbianis
Jabouilleia danjoui
Lophura diardi
L. edwardsi
L. hatinhensis
L. imperialis
Pavo muticus
Picus rabieri
Polyplectron germaini
Rheinardia ocellata
Sitta solangiae



Painting: Chris Rose

Giant Ibis Pseudibis gigantea. *An example of a Critically threat - ened bird species dependent on forest wetlands which is now extinct in Vietnam.*

Table 22: Globally threatened species represented in the proposed new protected areas

- **National Parks**

A number of Special-use Forests (or proposed reserves) stand out as especially important in terms of representation of particular Ecoregions. With at least one National Park in each Ecoregion, these centrally managed protected areas would represent much of Vietnam's biodiversity. Suggestions for such a network are listed below (Table 23). The list does not include all current National Parks, but rather highlights good, representative areas, a number of which would benefit from being amalgamated into single conservation management units.

Ecoregion	Proposed priority area
Annamite Range Moist Forests	Phong Nha Nature Reserve plus extension
Cardomom Mountains Moist Forests	Phu Quoc Nature Reserve
Central Indochina Dry Forests	Yok Don National Park plus extension
Da Lat Montane Forests and Eastern Indochina Pine Forests	Chu Yang Sin and Bi Dup-Nui Ba Nature Reserves plus extensions
Eastern Indochina Moist Forests	South-east Gia Lai province (proposed nature reserve)
Gulf of Tonkin Mangroves	Cat Ba National Park
Kon Tum Montane Forests	Ngoc Linh (Kon Tum) Nature Reserve, and Song Thanh-Dakpring and Ngoc Linh (Quang Nam) proposed nature reserves
North-east Indochina Montane Forest	Pu Mat Nature Reserve
Northern Indochina Subtropical Forests	Ba Be National Park and Tat Ke-Ban Bung [Na Hang] proposed nature reserve
Northern Vietnam Coastal Moist Forests	Bach Ma National Park plus extension
Southern Vietnam Coastal Forests	Cat Tien National Park and Cat Loc proposed nature reserve

Table 23. Priority areas for conservation of terrestrial forest: a proposal

- **If the proposasls in Table 23 were to be implemented, it would require the upgrading of six Nature Reserves to National Parks and the creation of an entirely new National Park.**

9.3 *Degazetting protected areas*

Photo: *BirdLife*

Bach Ma National Park, Thua Thien - Hue Province (Northern Vietnam Coastal Moist Forests Ecoregion) now supports more than 18,100 ha of scrub, grassland and agricultural land.

A number of Special-use Forests support little or no natural forest, whilst others may support important forest areas but embrace even larger areas of agricultural land, scrub, or grassland. Over 500,000 ha of such non-forest land is currently included within the protected areas network - this will in many cases incur needless management expense. With careful redefinition of reserve boundaries, or degazetting of whole areas to exclude such impoverished habitat, other more biologically important areas could be added to the protected areas network.

The Special-use Forests listed below support no, or insignificant amounts of natural forest. They should all be degazetted or have their management categories redefined.

Protected area	Total area (ha)
Ai Chi Lang Cultural and Historical Site	2,126
Bac Son Cultural and Historical Site	4,226
Cu Lao Cham Nature Reserve	199
Den Ba Trieu Cultural and Historical Site	1,119
Dong Son Cultural and Historical Site	290
Hon Chong Cultural and Historical Site	1,366
Lam Son Cultural and Historical Site	3,239
Nam Don Nature Reserve	20,064
Nui Cam Nature Reserve	7,781
Pac Bo Cultural and Historical Site	2,802

Table 24. Protected areas that support no natural forest

The areas listed below also have small amounts, and a low percentage of natural forest cover. They should all be degazetted or have their management categories redefined.

The areas listed below support less than 25% natural forest cover. The smallest of these protected areas could be considered for degazetting, but all of them warrant reassessment in terms of their current boundaries, and attempts must be made to exclude non-forest land. Alternatively, these reserves could be managed for reforestation or as wildlife corridors if they are contiguous with other Special-use Forests.

Protected area	Natural forest (ha)	Scrub, grassland, agriculture (ha)	Total area (ha)	Natural forest cover
Boi Loi	21	1,531	2,982	1%
Cam Son	401	6,710	10,753	4%
Trung Khanh	48	9,044	9,092	1%

Table 25. Protected areas with less than 10% natural forest cover

The areas listed below all support more than 20,000 ha of non-forest land. Ways of reducing the extent of scrub, grassland and agriculture within their current boundaries must be sought.

Protected area	Natural forest (ha)	Scrub, grassland, agriculture (ha)	Total area (ha)	Natural forest cover
Deo Ngoan Muc	761	4,319	5,080	15%
Huu Lien	1,284	8,898	10,182	13%
Muong Nhe	58,368	256,274	314,642	19%
Muong Phang	599	2,071	2,670	22%
Nui Pia Oac	2,089	7,924	10,014	21%
Rung Kho Phan Rang	2,659	15,336	18,245	15%
Sop Cop	1,762	7,612	9,375	19%

Table 26. Protected areas with less than 25% natural forest cover

Protected area	Natural forest (ha)	Scrub, grassland, agriculture (ha)	Total area (ha)	Natural forest cover
Muong Nhe	58,368	256,274	314,642	19%

Table 27. Protected areas with more that 20,000 ha of agricultural land, scrub and non-natural grassland

In particular:

- **Muong Nhe Nature Reserve is the largest protected area in Vietnam, alone representing 14% of the land currently under protection.**
- **Muong Nhe Nature Reserve supports less than 19% (highly fragmented) natural forest cover, or conversely, is 81% scrub, grassland and agriculture.**
- **Proposals to extend Muong Nhe to 314,000 ha (an increase of 132,000 ha) will mean that over 250,000 ha of non-forest land will be supported inside its boundaries.**
- **The proposed extension to Ben En National Park will increase the non-forest area of the reserve to almost 60,000 ha.**

The following sites have been listed for degazetting on the FPD (1998) list. However, they still support sizeable and important natural forest areas, and their status should be reassessed prior to any further suggestion of degazetting.

- **Kalong Song Mao supports nearly all of the protected semi-deciduous forest within the Da Lat Montane Forests Ecoregion (and a significant area of under-protected evergreen forest). Extension of this reserve is supported by our analysis.**
- **Lo Go Sa Mat supports approximately 50% of all protected evergreen forest within the Eastern Indochina Moist Forest Ecoregion. Extension of this reserve is supported by our analysis.**
- **Nui Than supports a significant area of Evergreen Forest in the 300-700 m zone of the North Vietnam Coastal Moist Forest Ecoregion.**

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APPENDIX 1: CURRENT SPECIAL-USE FOREST RESERVES

Special-use Forest	Category	Province	Decree date	Area (ha)
Ai Chi Lang	Cultural and Historical Site	Lang Son	1986	1,000
Ba Be	National Park	Bac Can	1977	5,000
Ba Mun	Nature Reserve	Quang Ninh	1977	1,800
Ba To	Cultural and Historical Site	Quang Ngai	1986	500
Ba Vi	National Park	Ha Tay	1977	2,144
Bac Son	Cultural and Historical Site	Lang Son	1977	4,000
Bach Ma	National Park	Thua Thien Hue	1986	40,000
Bai Chay	Cultural and Historical Site	Quang Ninh	1986	562
Ban Dao Son Tra	Nature Reserve	Da Nang	1977	4,000
Bana-Nui Chua	Nature Reserve	Da Nang	1986	5,217
Ben En	National Park	Thanh Hoa	1986	12,000
Bi Dup-Nui Ba[1]	Nature Reserve	Lam Dong	1986	13,000
Bien Lac-Nui Ong	Nature Reserve	Binh Thuan	1986	2,000
Binh Chau Phuoc Buu	Nature Reserve	Ba Ria-Vung Tau	1986	5,474
Boi Loi	Cultural and Historical Site	Binh Duong	1986	2,000
Bu Gia Map	Nature Reserve	Binh Phuoc	1986	16,000
Cac Dao Vinh Ha Long	Nature Reserve	Quang Ninh	1986	1,000
Cam Son	Cultural and Historical Site	Bac Giang	1986	15,000
Cat Ba	National Park	Hai Phong	1986	15,200
Cat Tien[2]	National Park	Dong Nai	1978	45,000
Chu Yang Sin	Nature Reserve	Dac Lac	1986	20,000
Con Dao	National Park	Ba Ria-Vung Tau	1984	6,000
Con Son	Cultural and Historical Site	Hai Duong	1986	282
Cu Lao Cham	Nature Reserve	Quang Nam	1986	1,535
Cuc Phuong	National Park	Ninh Binh/Thanh Hoa/Hoa Binh	1962	25,000
Dao Ho Song Da	Cultural and Historical Site	Hoa Binh	1986	3,000
Dat Mui	Nature Reserve	Ca Mau	1986	4,000
Den Ba Trieu	Cultural and Historical Site	Thanh Hoa	1986	300
Den Hung	Cultural and Historical Site	Phu Tho	1977	285
Deo Ca Hon Nua	Cultural and Historical Site	Phu Yen	1986	10,000
Deo Ngoan Muc	Nature Reserve	Ninh Thuan	1986	2,000
Do Son	Cultural and Historical Site	Hai Phong	1986	267
Duong Minh Chau	Nature Reserve	Tay Ninh	1986	5,000
Ho Lac	Cultural and Historical Site	Dac Lac	1986	10,000
Hoang Lien	Nature Reserve	Lao Cai	1986	5,000
Hom Me	Nature Reserve	Thanh Hoa	1986	500
Hon Chong	Cultural and Historical Site	Kien Giang	1986	3,000
Huong Son	Cultural and Historical Site	Ha Tay	1986	500
Huu Lien	Nature Reserve	Lang Son	1986	3,000
Kalon Song Mao	Nature Reserve	Binh Thuan	1986	20,000
Ke Go	Nature Reserve	Ha Tinh	1996	24,801
Kon Ka Kinh	Nature Reserve	Gia Lai	1986	28,000
Kong Cha Rang	Nature Reserve	Gia Lai	1986	16,000
Krong Trai	Nature Reserve	Phu Yen	1986	19,000
Lam Son	Cultural and Historical Site	Thanh Hoa	1986	300
Lo Go Sa Mat	Nature Reserve	Tay Ninh	1986	10,000
Mom Ray	Nature Reserve	Kon Tum	1982	10,000
Muong Nhe	Nature Reserve	Lai Chau	1986	182,000
Muong Phang	Cultural and Historical Site	Lai Chau	1986	1,000
Nam Ca	Nature Reserve	Dac Lac	1986	20,000
Nam Don	Nature Reserve	Son La	1986	18,000

Nam Lung	Nature Reserve	Dac Lac	1986	20,000
Ngoc Linh	Nature Reserve	Kon Tum	1986	20,000
Ngoc Trao	Cultural and Historical Site	Thanh Hoa	1986	300
Ngu Hanh Son[3]	Cultural and Historical Site	Quang Nam	1986	400
Nui Ba Den	Cultural and Historical Site	Tay Ninh	1986	2,000
Nui Ba Ra	Cultural and Historical Site	Binh Phuoc	1986	940
Nui Cam	Nature Reserve	An Giang	1986	1,500
Nui Coc[3]	Cultural and Historical Site	Thai Nguyen	1986	6,000
Nui Dai Binh	Nature Reserve	Lam Dong	1986	5,000
Nui Pia Oac	Nature Reserve	Cao Bang	1986	10,000
Nui Thanh	Cultural and Historical Site	Quang Nam	1986	1,500
Pa Co Hang Kia	Nature Reserve	Hoa Binh	1986	1,000
Pac Bo	Cultural and Historical Site	Cao Bang	1977	3,000
Phong Nha	Nature Reserve	Quang Binh	1986	5,000
Phong Quang	Nature Reserve	Ha Giang	1986	2,000
Phu Quoc	Nature Reserve	Kien Giang	1986	5,000
Pu Huong	Nature Reserve	Nghe An	1986	5,000
Pu Mat[4]	Nature Reserve	Nghe An	1986	8,500
Rung Kho Phan Rang	Nature Reserve	Ninh Thuan	1986	1,000
Rung Thong Da Lat[3]	Cultural and Historical Site	Lam Dong	1977	4,000
San Chim Bac Lieu[5]	Nature Reserve	Bac Lieu	1986	500
San Chim Ca Mau[5]	Nature Reserve	Ca Mau	1986	
San Chim Ca Mau[5]	Nature Reserve	Ca Mau	1986	
Sop Cop	Nature Reserve	Son La	1986	5,000
Tam Dao	National Park	Vinh Phuc/Thai Nguyen/Tuyen Quang	1977	19,000
Tam Nong (Tram Chim)	Nature Reserve	Dong Thap	1993	7,500
Tam Quy	Nature Reserve	Thanh Hoa	1986	350
Tan Trao	Cultural and Historical Site	Tuyen Quang	1977	1,081
Thac Ba	Cultural and Historical Site	Yen Bai	1986	5,000
Thuong Tien	Nature Reserve	Hoa Binh	1986	1,500
Trung Khanh	Nature Reserve	Cao Bang	1986	3,000
U Minh Thuong	Nature Reserve	Kien Giang	1993	8,509
Vo Doi	Nature Reserve	Ca Mau	1986	2,000
Vu Quang	Nature Reserve	Ha Tinh	1986	16,000
Xuan Nha	Nature Reserve	Son La	1986	60,000
Xuan Son	Nature Reserve	Phu Tho	1986	4,585
Xuan Thuy	Nature Reserve	Nam Dinh	1994	7,100
Yen Tu	Nature Reserve	Quang Ninh	1986	5,000
Yok Don[6]	National Park	Dac Lac	1986	20,000

Information in this table was taken from MARD (1996) and refers as closely as possible to the information given for each area at the time they were decreed. Consequently, the names used sometimes differ from those now in common usage and the areas will differ from those calculated from the digitized boundaries (see 1.3 Data sources and protocols).

APPENDIX 2: AREA AND PROTECTION OF NATURAL FOREST TYPES, WITH REQUIREMENTS FOR FUTURE PROTECTION

Ecoregion	Evergreen forest (ha)	Protected evergreen forest (ha)	Percentage protected	Protected area to add (ha)
Annamite Range Moist Forests				
0-300 m	34,594	27,921	81%	0
300-700 m	362,913	30,028	8%	27,650
700-1,200 m	62,959	26,941	41%	0
1,200+ m	2,470	0	0%	0
Cardomom Mountains Moist Forests				
0-300 m	29,689	12,106	41%	0
300-700 m	0			
700-1,200 m	0			
1,200+ m	0			
Central Indochina Dry Forests				
0-300 m	43,250	17,313	40%	0
300-700 m	45,899	2,241	5%	5,100
700-1,200 m	2,480	0	0%	0
1,200+ m	0			
Da Lat Montane Forests				
0-300 m	45,548	2,568	6%	4,700
300-700 m	203,575	17,811	9%	14,750
700-1,200 m	316,381	11,617	4%	39,000
1,200+ m	62,057	12,302	20%	0
Eastern Indochina Moist Forests				
0-300 m	146,673	18,957	13%	4,500
300-700 m	180,290	1,154	1%	27,700
700-1,200 m	124,164	192	0%	19,700
1,200+ m	503	0	0%	0
Eastern Indochina Pine Forests				
0-300 m	285	0	0%	0
300-700 m	13,376	594	4%	1,550
700-1,200 m	90,485	19,725	22%	0
1,200+ m	74,542	26,306	35%	0
Gulf of Tonkin Mangroves				
0-300 m	8,111	8,111	100%	0
300-700 m	19,074	0	0%	3,050
700-1,200 m	0			
1,200+ m	0			
Kon Tum Montane Forests				
0-300 m	93,989	4,055	4%	11,000
300-700 m	262,443	9,671	4%	32,300
700-1,200 m	688,536	51,228	7%	58,950
1,200+ m	186,763	30,968	17%	0

North-east Indochina Montane Forests				
0-300 m	18,856	11,280	60%	0
300-700 m	157,858	30,360	19%	0
700-1,200 m	135,849	34,950	26%	0
1,200+ m	42,664	12,600	30%	0
Northern Indochina Subtropical Forests				
0-300 m	38,458	29,804	77%	0
300-700 m	797,373	42.064	5%	85,500
700-1,200 m	420,016	49,744	12%	17,450
1,200+ m	262,059	25,180	10%	16,750
Northern Vietnam Coastal Moist Forests				
0-300 m	45,748	13,298	29%	0
300-700 m	116,155	6,900	6%	11,650
700-1,200 m	23,365	6,658	28%	0
1,200+ m	786	355	45%	0
Red River Fresh-water Swamp Forests				
0-300 m	286	286	100%	0
300-700 m	7,831	227	3%	1,000
700-1,200 m	327	307	94%	0
1,200+ m	0			
Southern Vietnam Coastal Forests				
0-300 m	301,022	37,617	12%	10,550
300-700 m	87,648	8,726	10%	5,300
700-1,200 m	73,197	6,887	9%	4,800
1,200+ m	3,852	192	5%	0

Current protection of evergreen forest and requirements for further protection

Ecoregion	Coniferous forest (ha)	Protected coniferous forest (ha)	Percentage protected	Protected area to add (ha)
Da Lat Montane Forests				
0-300 m	18	0	0%	0
300-700 m	1,841	24	1%	0
700-1,200 m	35,465	2,227	6%	3,450
1,200+ m	38,666	3,784	10%	2,400
Eastern Indochina Pine Forests				
0-300 m	0			
300-700 m	51	0	0%	0
700-1,200 m	24,908	9,658	39%	0
1,200+ m	29,269	11,640	40%	0

Current protection of coniferous forest and requirements for further protection

Ecoregion	Semi-deciduous forest (ha)	Protected semi-deciduous forest (ha)	Percentage protected	Protected area to add (ha)
Central Indochina Dry Forests				
0-300 m	266,084	52,389	20%	0
300-700 m	53,339	913	2%	7,600
700-1,200 m	424	0	0%	0
1,200+ m	0			
Da Lat Montane Forests				
0-300 m	8,905	782	9%	0
300-700 m	12,168	962	8%	1,000
700-1,200 m	16,980	188	1%	2,550
1,200+ m	4	0	0%	0
Eastern Indochina Moist Forests				
0-300 m	133,585	12,999	10%	8,400
300-700 m	91,576	663	1%	14,000
700-1,200 m	24,547	0	0%	3,950
1,200+ m	0			
Eastern Indochina Pine Forests				
0-300 m	0			
300-700 m	759	466	61%	0
700-1,200 m	1,464	828	57%	0
1,200+ m	0			
Kon Tum Montane Forests				
0-300 m	0	0	0%	0
300-700 m	5,488	0	0%	0
700-1,200 m	4,865	0	0%	0
1,200+ m	1	0	0%	0
Southern Vietnam Coastal Forests				
0-300 m	89,862	2,997	3%	11,400
300-700 m	29,106	390	1%	4,250
700-1,200 m	4,636	0	0%	0
1,200+ m	44	0	0%	0

Current protection of semi-deciduous forest and requirements for further protection

Ecoregion	Deciduous forest (ha)	Protected deciduous forest (ha)	Percentage protected	Protected area to add (ha)
Central Indochina Dry Forests				
0-300 m	42,246	14,738	35%	0
300-700 m	32,009	414	1%	4,700
700-1,200 m	655	0	0%	0
1,200+ m	0			
Da Lat Montane Forests				
0-300 m	0			
300-700 m	5,446	789	15%	0
700-1,200 m	3,136	1,131	36%	0
1,200+ m	37	37	100%	0
Eastern Indochina Moist Forests				
0-300 m	6,113	2,878	47%	0
300-700 m	26,107	372	1%	3,800
700-1,200 m	1,589	0	0%	0
1,200+ m	0			
Eastern Indochina Pine Forests				
0-300 m	0			
300-700 m	390	390	100%	0
700-1,200 m	26	26	100%	0
1,200+ m	0			
Southern Vietnam Coastal Forests				
0-300 m	285	0	0%	0
300-700 m	1,273	0	0%	0
700-1,200 m	1,564	0	0%	0
1,200+ m	0			

Current protection of deciduous forest and requirements for further protection

Ecoregion	Mixed forest (ha)	Protected mixed forest (ha)	Percentage protected	Protected area to add (ha)
Annamite Range Moist Forests				
0-300 m	0			
300-700 m	9,143	0	0%	1,450
700-1,200 m	224	0	0%	0
1,200+ m	0			
Central Indochina Dry Forests				
0-300 m	449	0	0%	0
300-700 m	3,050	0	0%	0
700-1,200 m	0			
1,200+ m	0			
Da Lat Montane Forests				
0-300 m	31,553	4,205	13%	0
300-700 m	76,419	11,568	15%	0
700-1,200 m	95,707	2,286	2%	13,050
1,200+ m	15,245	2,582	17%	0
Eastern Indochina Moist Forests				
0-300 m	21,889	186	1%	3,300
300-700 m	270	0	0%	0
700-1,200 m	9	0	0%	0
1,200+ m	0			
Eastern Indochina Pine Forests				
0-300 m	0			
300-700 m	1,617	0	0%	0
700-1,200 m	33,971	3,102	9%	2,350
1,200+ m	15,624	4,069	26%	0
Gulf of Tonkin Mangroves				
0-300 m	0			
300-700 m	958	0	0%	0
700-1,200 m	0			
1,200+ m	0			
Kon Tum Montane Forests				
0-300 m	17,187	57	0%	2,700
300-700 m	16,843	2,796	17%	0
700-1,200 m	29,182	7,118	24%	0
1,200+ m	16,185	408	3%	2,200
North-east Indochina Montane Forests				
0-300 m	596	596	100%	0
300-700 m	14,029	2,928	21%	0
500-700 m	8,522	5,176	61%	0
700-1,200 m	5,762	2,116	37%	0
1,200+ m	183	127	70%	0

Northern Indochina Subtropical Forests				
0-300 m	2,506	1,650	66%	0
300-700 m	104,565	1,853	2%	14,900
500-700 m	92,313	4,209	5%	10,550
700-1,200 m	63,976	5,997	9%	4,250
1,200+ m	55,734	7,872	14%	1,050
Northern Vietnam Coastal Moist Forests				
0-300 m	0			
300-700 m	4,115	0	0%	0
700-1,200 m	0			
1,200+ m	0			
Red River Fresh-water Swamp Forests				
0-300 m				
300-700 m	457	0	0%	0
700-1,200 m	31	0	0%	0
1,200+ m				
Southern Vietnam Coastal Forests				
0-300 m	72,627	13,335	18%	0
300-700 m	3,231	1,102	34%	0
700-1,200 m	1,082	0	0%	0
1,200+ m	39	0	0%	0

Current protection of mixed forest and requirements for further protection

Ecoregion	Limestone forest (ha)	Protected limestone forest (ha)	Percentage protected	Protected area to add (ha)
Annamite Range Moist Forests				
0-300 m	4,065	3,101	76%	0
300-500 m	36,501	22,776	62%	0
500-700 m	0			
700-1,200 m	57,461	53,148	92%	0
1,200+ m	0			
North-east Indochina Montane Forests				
0-300 m	0			
300-500 m	1,042	0	0%	0
500-700 m	0			
700-1,200 m	0			
1,200+ m	0			
Northern Indochina Subtropical Forests				
0-300 m	6,843	6,839	100%	0
300-500 m	126,909	7,674	6%	12,650
500-700 m	18,178	0	0%	2,900
700-1,200 m	144,240	2,692	2%	20,400
1,200+ m	39,616	0	0%	6,350
Northern Vietnam Coastal Moist Forests				
0-300 m	3,217	3,217	100%	0
300-500 m	29,001	7,489	26%	0
500-700 m	0			
700-1,200 m	0			
1,200+ m	0			
Red River Fresh-water Swamp Forests				
0-300 m	51	51	100%	0
300-500 m	232	0	0%	0
500-700 m	0			
700-1,200 m	0			
1,200+ m	0			

Current protection of limestone forest and requirements for further protection