BirdLife International Vietnam Programme
in collaboration with the
Forest Inventory and Planning Institute

An Investment Plan for Ke Go Nature Reserve, Ha Tinh Province, Vietnam

A Contribution to the Management Plan

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by

Le Trong Trai
and
Nguyen Huy Dung
Forest Inventory and Planning Institute

Nguyen Cu
BirdLife International Vietnam Programme

Le Van Cham
Forest Inventory and Planning Institute

and

Jonathan C. Eames
and
Genevieve Chicoine
BirdLife International Vietnam Programme

Translated from the Vietnamese
by
Nguyen Kim Lien

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Project Leaders: Nguyen Huy Phon (FIPI)
Nguyen Huu Dong (FIPI)
Vu Van Dung (FIPI)
Jonathan C. Eames (BirdLife International)

Project Team Members: Le Trong Trai (FIPI)
Nguyen Huy Dung (FIPI)
Nguyen Cu (BirdLife International, seconded from IEBR)
Le Van Cham (FIPI)
Tran Quoc Dung (FIPI)
Tran Van Tri (Ha Tinh Provincial Forest Protection Department)
Vu Van Dung (FIPI)
Jonathan C. Eames (BirdLife International)
Genevieve Chicoine (BirdLife International)

Maps: Nguyen Khac Thang (FIPI)
Ha Quy Quynh (IEBR)

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Copies available from: BirdLife International Vietnam Programme
11 Lane 167, Tay Son, Dong Da
Hanoi, Vietnam

Tel/Fax: + (84) 4 851 7217
E-mail: birdlife@netnam.org.vn

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Foreword

This report was first published in August 1996, in Vietnamese. It was researched, written and produced by staff from the Forest Resources and Environment Centre (FREC) of the Forest Inventory and Planning Institute (FIPI) (which is itself part of the Ministry of Agriculture and Rural Development (MARD)) and the BirdLife International Vietnam Programme. This report is the first management plan for a protected area born of the collaboration between FIPI and BirdLife International and thus it represents an important milestone in the development of the relationship between these organisations. It was also the first technical output produced under a project funded by the Commission of European Communities, entitled: The Conservation of Biodiversity in the Annamese Lowlands and the Da Lat Plateau, Vietnam.

The decision to translate and publish this report three years after it was first written was taken for a number of reasons. It was always intended to publish this report in English so that the important baseline information it contains becomes more widely accessible to all those with an interest in the conservation of this site, with particular regard to the Endangered Vietnamese Pheasant *Lophura hatinhensis*. This need has become particularly pressing since BirdLife International is currently developing a major integrated conservation and development project for Ke Go Nature Reserve. It is hoped that the information contained within this report will provide useful background data for those involved in the development of the new project document.

This report also represents a landmark achievement for BirdLife International in its long association with the conservation of this site. BirdLife International, in collaboration with the Centre for Natural Resources and Environmental Studies (CRES), first initiated field surveys for the enigmatic Vietnamese Pheasant in 1988. In early 1990, the two organisations identified the forests of Ke Go as being potentially important for the conservation of this species. In 1994, BirdLife International, in association with the IUCN Species Survival Commission, undertook a comprehensive conservation assessment of the northern part of the Annamese Lowlands Endemic Bird Area (EBA). This research concluded that the forests centred on the border between Ha Tinh and Quang Binh provinces were probably one of the most important remaining forests representative of the Annamese Lowlands EBA and, certainly, one of the most important within the northern part of the EBA. Also during this period, the Danish BirdLife partners, Dansk Ornitologisk Forening (DOF) and Sveriges Ornithologiska Forening (SOF) conducted a survey of the area.

During 1995 therefore, as part of a European-Union-funded project, BirdLife International and FIPI, in conjuction with the Ha Tinh Provincial Forest Protection Department, initiated management planning activities in the Ke Go area. Following a lengthy consultative period, an investment plan was completed in 1996 and a nature reserve was decreed as part of the national system of Special-use Forests on 28 December 1996 (Decision: 970/TAG), ratified on 13 May 1997 by the government of Vietnam (Decision: 519 QD/UB-NL2) and, on 31 May 1997, by the Ha Tinh Provincial People's Committee (Decision: 93 NN/TCCB-CV).

Since 1996, BirdLife International, in conjunction with the organisers of the British Birdwatching Fair, has provided funding to the department of agriculture and rural development (DARD) of Ha Tinh province to assist with the implementation of the management plan for Ke Go Nature Reserve. This has resulted in the construction and provision of equipment for two guard stations. BirdLife International has also sponsored and provided training and equipment for forest guards and organised and facilitated orientation meetings for local government staff.

In 1999, BirdLife International hopes to secure funding for a major conservation initiative at this site.

Acknowledgements

We wish to thank the Forest Protection Department, the International Cooperation Department of the Ministry of Agriculture and Rural Development (MARD), Dr Le Sau, Director of the Forest Inventory and Planning Institute (FIPI) and Dr Dang Huy Huynh, former Director of the Institute of Ecology and Biological Resources (IEBR), for permitting the secondment of Dr Nguyen Cu to this project. We express our special thanks to Mr Nguyen Huu Dong, Director and Mr Vu Van Dung, Vice-director, of the Forest Resources and Environment Centre (FREC) of FIPI for sharing their valuable expertise with us.

We would like to convey our gratitude to the leaders of Ha Tinh province, to the leaders of the districts and communes visited, and to the directors and staff of the Ha Tinh Provincial Forest Development (FDD) and Forest Protection Departments (FPD) who enthusiastically assisted with the implementation of this project.

Conventions Used

Plant names, sequence and species limits follow Pham Hoang Ho (1991). Mammal names (common and scientific), sequence and species limits follow Corbet and Hill (1992), with scientific names given at first mention and in Appendix 2. Bird names (common and scientific), sequence and species limits follow Inskipp *et al.* (1996) (except in the case of Chestnut-necklaced Partridge *Aborophila charltonii* which follows Sibley and Monroe (1990)), with scientific names given at first mention and in Appendix 3. Reptile names follow Nguyen Van Sang and Ho Thu Cuc (1996).

Diacritical marks are omitted from Vietnamese names since they are presented in anglicised form.

Locality names follow Department of Cartography 1:50,000 series maps (1978).

A globally threatened species is any species assigned a category of threat in the 1996 IUCN Red List of Threatened Animals (IUCN 1996); the term excludes any species listed as Near Threatened or Data Deficient.

Endemic Bird Area refers to an area supporting at least two restricted-range bird species. A restricted-range bird species is a species with a global breeding range of less than 50,000 km^2.

Abbreviations and Acronyms Used

CITES	-	Convention on International Trade in Endangered Species
CRES	-	Centre for Natural Resources and Environmental Studies
DARD	-	Department of Agriculture and Rural Development
DBH	-	Diameter at Breast Height
DOF	-	Dansk Ornitologisk Forening
EBA	-	Endemic Bird Area
FDD	-	Forest Development Department
FIPI	-	Forest Inventory and Planning Institute, Hanoi
FPD	-	Forest Protection Department
FREC	-	Forest Resources and Environment Centre
GNP	-	Gross National Product
ICBP	-	International Council for Bird Preservation (now BirdLife International)
IUCN	-	World Conservation Union
MARD	-	Ministry of Agriculture and Rural Development
MOF	-	Ministry of Forestry (now part of MARD)
NGO	-	Non-Governmental Organisation
PRA	-	Participatory Rural Appraisal
SOF	-	Sveriges Ornithologiska Forening
WPF	-	Watershed Protection Forest

Executive Summary

Ke Go proposed nature reserve is located in Huong Khe, Cam Xuyen and Ky Anh districts, Ha Tinh province. It comprises a 24,801 ha area within one of the largest remaining blocks of broadleaf evergreen forest in the level lowlands of central Vietnam. The proposed nature reserve encompasses a representative sample of the lowland forest habitats which formerly extended throughout the coastal plains of central Vietnam but which have now been largely cleared for agriculture. These forests of central Vietnam are a biodiversity "hotspot": the Annamese Lowlands Endemic Bird Area (EBA) (ICBP 1992). The conservation importance of the Annamese Lowlands EBA is reflected by the fact that five bird species have their global ranges confined to this area. When established, Ke Go Nature Reserve will aim to conserve the populations of two of these species, Vietnamese Pheasant *Lophura hatinhensis* and Imperial Pheasant *L. imperialis*, which are confined to the northern part of the EBA. The proposed boundary of the nature reserve includes all the known localities in Ha Tinh province for these critically endangered species.

The topography of most of Ke Go proposed nature reserve consists of gently undulating hills below 300 m. Almost the entire area is forested but has been logged and undisturbed primary forest is virtually absent. While the hill tracts support logged primary forest, the more accessible lowland areas support secondary forest formations of varying successional stages. To date, 46 species of mammal, 270 species of bird and 562 species of plant have been recorded in the proposed nature reserve. Ke Go proposed nature reserve also conserves populations of 10 species of birds and 10 species of mammals considered globally threatened (IUCN 1996). The high species diversity and levels of endemism within Ke Go proposed nature reserve make its conservation a priority of international importance.

The forest of Ke Go proposed nature reserve has previously been classified as production forest and, as a result, has been subject to commercial logging for a number of years. However, the commercial timber value of the forest has declined significantly, to the extent that commercial exploitation is now of dubious economic viability. Within the proposed nature reserve, commercial timber extraction by Ky Anh II and Ha Dong Forest Enterprises continues in only a few forest areas adjoining the border with Quang Binh province.

Although there are no human settlements inside the proposed nature reserve, villagers from seven adjacent communes utilise forest resources, including timber, palm leaves and rattans. Local people engage in these activities in order to alleviate shortfalls in food production and to generate cash income.

Much of the proposed nature reserve lies within the watershed of Ke Go reservoir, which provides irrigation to villages in Cam Xuyen district. It should be noted, however, that the reservoir is of no conservation value and lies outside the boundary of the proposed nature reserve. In addition, watercourses throughout the south-eastern part of the proposed nature reserve drain into the watershed of the Gianh River, the major river system in northern Quang Binh province. Hence, preservation of forest cover within the proposed nature reserve is of great economic importance to the surrounding agricultural areas. The proposed nature reserve also has some potential for environmental education and promoting public awareness. The proposed nature reserve is, however, considered to have low potential for tourism.

The nature reserve's principal aim and management actions should centre on wildlife conservation, particularly the conservation of Vietnamese Pheasant and its habitat. To be successful, priority must be given to reconciling these management objectives with current resource use by local villagers within the nature reserve.

The aforementioned reasons provide the justification for the area to be designated a nature reserve

rather than a national park. The nature reserve will be created by the amalgamation of 5,905 ha currently managed by Ha Dong Forest Enterprise, 11,385 ha currently included in Ke Go Watershed Protection Forest (WPF) and 7,511 ha currently managed by Ky Anh II Forest Enterprise. This management plan proposes to divide the core zone of the nature reserve into two areas: a strict protection area of 20,537 ha and a forest rehabilitation area of 4,264 ha. These areas were identified on the basis of their biodiversity, the current condition of the vegetation and present land-use. It is proposed to establish the headquarters on the south-eastern boundary of the nature reserve, in Ky Thuong commune. Five new guard stations will be constructed and two existing guard stations upgraded.

Ke Go proposed nature reserve and the surrounding forests form part of one of the largest blocks of lowland forest in central Vietnam. This entire forest area is under state ownership and under the jurisdiction and management of the Ha Tinh Provincial Forest Development (FDD) and Forest Protection Departments (FPD), either as production forest or as WPF. Much of the forest area surrounding the proposed nature reserve is also subject to various levels of exploitation by villagers from adjoining communes.

It is rare in Vietnam for a protected area to be adjacent to or contiguous with other forest areas, as is the case with Ke Go nature reserve. The absence of adjacent forested areas often seriously compromises land-management options in the surrounding buffer zone. In this respect, Ke Go nature reserve presents a unique opportunity to develop management strategies for the sustainable development of the entire forest block. To ensure the long-term viability of the nature reserve and the surrounding forests, it is important that forest management in the buffer zone be sustainable and compatible with the aims of the nature reserve.

Long-term viability of the nature reserve will also require the revision of the existing management plans for Ha Dong, Ky Anh II, Cam Xuyen and Tuyen Hoa Forest Enterprises. Priority management recommendations for these forest enterprises should include: (a) an immediate moratorium on all logging in those forest compartments which border the nature reserve; (b) strict adherence to a 30-year felling cycle and rigorous attention to regulations governing the minimum diameter at breast height (DBH) of felled trees in all forest compartments; (c) a prohibition on the establishment of permanent settlements; and (d) a hunting ban. It is additionally proposed that reforestation with non-indigenous species be phased out and that further reforestation in the forest enterprises and Ke Go WPF be undertaken using locally obtained seeds from native tree species.

More difficult to reconcile will be the extraction of timber and non-timber forest products, from the nature reserve and surrounding forest areas, by villagers from the seven adjoining communes. In the proposed buffer zone, 35% of households are not self-sufficient in rice production. The situation is particularly severe in Cam Son commune, where 65% of households do not produce sufficient rice for their own consumption. Most of these households compensate for this shortfall by collecting and selling forest products. Villages with the highest degree of dependency on the nature reserve should be targeted first for rural development projects. The provision of assistance and resources should be conditional on the villagers recognising the nature reserve and pledging to discontinue non-sustainable activities that contribute to the decline of wildlife and the deterioration of natural habitats. Rural development projects that could be considered include: (a) introduction of higher yielding rice varieties and fertilisers; (b) improvements to the irrigation system; (c) introduction of and training in new agro-forestry practices; (d) small-scale infrastructure projects, such as wells, bridges and hydro-electricity generators; (e) road improvement; (f) increased teacher-pupil ratios, improved teachers' working conditions and upgraded school buildings and educational materials; and (g) credit schemes.

Before implementing any rural development projects, participatory rural appraisals (PRAs) must be conducted in the targeted villages to more accurately assess the needs and aspirations of the communities concerned. It is envisaged that this consultation process would result in project proposals which could be bilaterally funded and jointly implemented by development NGOs in collaboration with local institutions. Indeed, this management plan recommends the establishment of a nature reserve advisory committee, consisting of representatives from the village to the provincial level, as well as central government bodies and NGOs that are involved or interested in the progress of Ke Go Nature Reserve. This committee would work together with the nature reserve management authority to revise and then implement the management plan, in addition to developing and initiating activities in the buffer zone.

The creation of Ke Go Nature Reserve will have numerous and varied benefits. It will conserve the world's only known population of Vietnamese Pheasant as well as populations of Imperial Pheasant and other endemic and globally threatened species. It will protect a significant part of the watershed of Ke Go reservoir, thereby safeguarding the supply of water for irrigation of agricultural land in Cam Xuyen district. The introduction of a sustainable system of forest management throughout the nature reserve and buffer zone area could ensure a constant supply of forest products for local people.

The establishment of Ke Go Nature Reserve will fill an important gap in the protected areas system of Vietnam and, by addressing an issue of international conservation concern, will assist Vietnam to fulfil its obligations under the Convention on Biodiversity.

Tóm Tắt Dự Án

Khu bảo tồn thiên nhiên Kẻ Gỗ dự kiến thành lập với diện tích 24.800 ha, nằm trong vùng ranh giới huyện Cẩm Xuyên, Kỳ Anh và Hương Khê, tỉnh Hà Tĩnh. Đây là vùng rừng thường xanh cây lá rộng còn lại khá lớn thuộc dạng rừng trên địa hình thấp đã được hình thành từ lâu dọc theo vùng đồng bằng ven biển miền Trung Việt Nam mà hiện nay phần lớn đã biến thành vùng đất canh tác nông nghiệp. Khu bảo tồn thiên nhiên Kẻ Gỗ sẽ là nơi bảo vệ một khu vực tiêu biểu của sinh cảnh rừng nói trên. Vùng rừng địa hình thấp miền Trung Việt Nam là một trong các điểm nóng đối với việc bảo vệ đa dạng sinh học toàn cầu, và được gọi là vùng chim đặc hữu rừng địa hình thấp miền Trung (ICBP 1992). Sự phong phú về đa dạng sinh học ở đây thể hiện ở tỷ lệ các loài đặc hữu cao, và có 4 loài chim mà vùng phân bố của chúng chỉ hạn chế trong một khu vực nhỏ này. Mục đích của khu bảo tồn thiên nhiên Kẻ Gỗ là nhằm bảo vệ quần thể của 2 loài gà lôi mà vùng phân bố thế giới của chúng chỉ hạn chế trong phần phía bắc của vùng này. Ranh giới của khu bảo tồn thiên nhiên đã được đề xuất bao quanh tất cả các vùng rừng hiện nay ở tỉnh Hà Tĩnh, là những nơi đã tìm thấy loài Gà lôi lam đuôi trắng và cũng là nơi đã tìm được lại mẫu Gà lôi lam mào đen vào năm 1990.

Nhìn chung địa hình khu bảo tồn thiên nhiên Kẻ Gỗ có hình lượn sóng và có độ cao dưới 300 m so với mặt biển. Phần lớn diện tích trong khu đều có rừng bao phủ, nhưng dạng rừng nguyên sinh thì hầu hết đã bị khai thác và chặt phá. Trên các dãy đồi cao là nơi còn lại một vài mẫu rừng nguyên sinh xen lẫn loại rừng sau khai thác chọn ở mức độ khác nhau, còn ở các vùng núi và thung lũng thấp là nơi dễ dàng khai thác, nay chỉ còn lại rừng thứ sinh bao phủ với cấu trúc không đồng nhất. Tại khu bảo tồn thiên nhiên Kẻ Gỗ cho đến nay đã phát hiện được 270 loài chim, 47 loài thú trong đó có có cả loài Mang lớn Megamutiacus vuquangesis là 1 trong 2 loài thú mới của thế giới được tìm thấy ở Việt Nam gần đây, và 567 loài thực vật. Khu bảo tồn Kẻ Gỗ là nơi bảo vệ 10 loài chim và 18 loài thú hiện đang bị đe dọa tuyệt chủng ở mức độ khác nhau (Annon. 1992, Collar et al. 1994). Nhờ có sự đa dạng về thành phần loài và có tính đặc hữu cao trong thế giới động thực vật cho nên khu bảo tồn thiên nhiên Kẻ Gỗ đóng vai trò quan trọng quốc tế và được xếp vào hàng ưu tiên trong chiến lược bảo vệ đa dạng sinh học.

Do trước đây được xếp vào loại rừng sản xuất cho nên vùng rừng Kẻ Gỗ đã vị khai thác trong nhiều năm. Vì vậy hiện nay giá trị gỗ thương phẩm đã bị giảm sút, tuy nhiên ảnh hưởng về mặt kinh tế đối với các lâm trường hiện nay chưa rõ. Việc khai thác gỗ tận dụng ở lâm trường Kỳ Anh và Hà Đông vẫn còn đang tiếp tục mặc dầu chỉ hạn chế trong một số ít tiểu khu rừng nằm dọc theo đường biên giới Hà Tĩnh-Quảng Bình. Mặc dầu không có hiện tượng nhân dân định cư bên trong khu bảo tồn, nhưng dân làng từ 9 xã lân cận và một vài xã khác thường vào khu vực bảo vệ để khai thác gỗ, lá nón, mây song, và những thứ khác... đồng thời tiến hành săn bắt động vật. Sự thiếu hụt lương thực hàng năm trong các gia đình buộc họ phải tìm nguồn thu nhập một cách chính đáng từ các hoạt động này. Phần lớn khu bảo tồn thiên nhiên Kẻ Gỗ gắn liền với rừng đầu nguồn của hồ chứa nước Kẻ Gỗ là nơi cấp tưới nước cho vùng Cẩm Xuyên. Phía đông nam của khu bảo tồn đóng vai trò quan trọng trong việc bảo vệ vùng rừng đầu nguồn sông Gianh, là hệ thống sông chính ở phía bắc tỉnh Quảng Bình. Do vậy xét về mặt kinh tế khu bảo tồn này còn có ý nghĩa lớn trong việc bảo vệ nguồn nước sinh hoạt và sản xuất nông nghiệp ở các vùng xung quanh. Khu bảo tồn thiên nhiên là nơi chứa đựng tiềm năng về giáo dục môi trường và nâng cao sự hiểu biết của mọi người về nhiều mặt. Bản thân khu bảo tồn này không chứa đựng tiềm năng lớn về du lịch, tuy vậy nó ở ngay bên cạnh hồ Kẻ Gỗ là nơi có thể trở thành điểm du lịch, nghỉ ngơi trong khu vực. Mục đích chính của khu bảo tồn thiên nhiên và các hoạt động quản lý ở đây là tập trung vào việc bảo vệ động vật hoang dại, đặc biệt là việc bảo vệ loài Gà lôi lam đuôi trắng và bảo vệ rừng đầu nguồn. Mọi thành quả đạt được trước tiên là phụ thuộc vào sự kết hợp các mục tiêu quản lý và sử dụng tài nguyên hiện nay của các cộng đồng địa phương sống xung quanh khu bảo tồn.

Từ các nguyên nhân nêu trên, chúng ta thấy khu vực được lựa chọn để tổ chức bảo vệ mang tính chất của khu bảo tồn thiên nhiên chứ không phải là một vườn quốc gia. Khu bảo tồn thiên nhiên sẽ được hình thành bởi các khu rừng sau: 11.385 ha hiện đang thuộc sự quản lý của dự án bảo vệ rừng đầu nguồn Kẻ Gỗ, 7.511 ha rừng thuộc lâm trường Kỳ Anh, và 5.905 ha rừng do lâm trường Hà Đông quản lý.

Theo kế hoạch quản lý được ghi trong dự án thì khu bảo tồn này được chia thành 2 khu: khu bảo vệ nghiêm ngặt gồm 20.537 ha, và khu phục hồi sinh thái gồm 4.264 ha. Các khu vực này được xác định trên cơ sở giá trị đa dạng sinh học của mỗi vùng cũng như tình trạng thực vật và sử dụng đất hiện nay.

Trụ sở ban quản lý khu bảo tồn sẽ được xây dựng ở vùng ranh giới phía đông nam, thuộc xã Kỳ Thượng hoặc ở cạnh khu vực đường số 22 đi vào khu bảo tồn. Dự kiến xây dựng 7 trạm gác, trong đó có 5 trạm mới và 2 trạm cũ sẽ được xây dựng lại.

Khu bảo tồn thiên nhiên Kẻ Gỗ và các vùng rừng xung quanh là một phần của khu rừng địa hình thấp rộng lớn nhất ở miền Trung Việt Nam. Vùng rừng trong khu bảo vệ thuộc sở hữu Nhà nước và nằm trong khu vực chịu sự quản lý của Sở Lâm Nghiệp và Chi Cục Kiểm Lâm tỉnh Hà Tĩnh, bao gồm cả 2 loại rừng sản xuất và rừng đầu nguồn. Phần lớn các vùng rừng xung quanh khu bảo tồn đều là những nơi mà nhân dân các xã vùng lân cận từ trước đến nay thường săn bắt, khai thác gỗ và các lâm sản khác.

Do kết quả của tỷ lệ tăng dân số ở nông thôn cao, đặc biệt ở vùng núi của Việt Nam khi các khu bảo vệ nằm ở vùng ven hoặc vùng giáp ranh với các khu rừng khác là những nơi mà việc quản lý đất đai chưa được chặt chẽ nên thường xảy ra những tổn thương đáng kể. Về mặt này khu bảo tồn Kẻ Gỗ có hoàn cảnh khá thuận lợi khi đề xuất các chiến lược quản lý, phát triển bền vững đối với khu rừng bên trong. Để đảm bảo sự tồn tại lâu dài của khu bảo tồn và các vùng rừng xung quanh thì điều quan trọng là việc quản lý rừng ở vùng đệm phải mang tính lâu dài và phù hợp với mục đích của khu bảo tồn. Vì vậy cần phải có sự thay đổi các kế hoạch quản lý hiện nay ở lâm trường Hà Đông và Tuyên Hóa. Tuy nhiên, ngay từ bước đầu tiên hiện nay khi đặt vấn đề xây dựng khu bảo vệ Kẻ Gỗ, thì điều cần ưu tiên số một là nên tìm giải pháp ngừng ngay việc khai thác gỗ ở các tiểu khu nằm dọc gianh rới khu bảo tồn, thực hiện triệt để chu kỳ khai thác 30 năm, đặc biệt lưu tâm đến đường kính tối thiểu của cây trong tất cả các tiểu khu rừng, ngăn cấm việc tổ chức tái định cư và săn bắn. Trong công tác phục hồi rừng nên giảm dần việc trồng các loài cây nhập nội và tới đây ở các lâm trường và đơn vị bảo vệ rừng đầu nguồn Kẻ Gỗ cần tiến hành thu lượm các loại hạt giống của các loài bản địa để phục vụ việc trồng rừng.

Điều khó khăn hơn là khi tiến hành điếu phối việc sử dụng gỗ và các nguồn tài nguyên khác trong khu bảo tồn và các vùng rừng xung quanh đối với nhân dân ở các xã lân cận. Nếu chỉ tính trong 7 xã vùng đệm đã có đến 39% số gia đình thiếu lương thực hàng năm. Tình trạng này đặc biệt thường gặp ở một số xã như Cẩm Sơn có đến 63% hộ gia đình thiếu hụt lương thực trong năm. Phần lớn các hộ gia đình này phải sống chủ yếu dựa vào việc khai thác tài nguyên rừng. Các địa phương có tình trạng bị thiếu hụt lương thực cao thì mức độ khai thác tài nguyên rừng ở đó càng mạnh và đây cũng chính là các đối tượng cần được hỗ trợ để phát triển. Việc cung cấp lương thực không phải là biện pháp bảo đảm tính lâu bền. Hình thức giúp đỡ phải bằng việc đưa vào các giống lúa có năng suất cao, phân bón, hoàn thiện hệ thống thủy lợi áp dụng nông lâm kết hợp, đề ra các dự án nhỏ về cơ sở hạ tầng như giếng nước, cầu cống, thủy điện nhỏ, củng cố giao thông, tăng cường giáo dục như đảm bảo tỷ lệ học sinh đến trường, cải thiện đời sống giáo viên, gia tăng nguồn thu nhập ở các trường, tạo quỹ tiết kiệm,... Đánh giá một cách xác đáng hơn các nhu cầu và nguyện vọng của các cộng đồng có liên quan, đặc biệt việc đánh giá cần được thực hiện ở các xã điểm. Qua điều tra người

ta thấy rằng kết quả của các cuộc tọa đàm trực tiếp sẽ đưa ra được những yêu cầu để hình thành các dự án về khả năng cung cấp tài chính do các tổ chức phi chính phủ đảm nhiệm trong sự liên kết với các cơ sở ở địa phương.

Dự án khả thi cũng đề xuất ý kiến thành lập Ban tư vấn bên cạnh Ban quản lý khu bảo tồn. Nó sẽ gồm các đại diện của địa phương, tỉnh và trung ương, và các tổ chức phi chính phủ có liên quan hoặc có sự quan tâm trực tiếp đối với khu bảo tồn Kẻ Gỗ. Ban tư vấn sẽ trực tiếp đóng góp ý kiến với Ban quản lý khu bảo tồn để hoàn thiện và điều chỉnh kế hoạch quản lý, hỗ trợ cho việc phát triển và các hoạt động bước đầu ở vùng đệm.

Việc thành lập khu bảo tồn Kẻ Gỗ sẽ mang lại nhiều lợi ích khác nhau: là nơi bảo tồn quần thể Gà lôi lam đuôi trắng của thế giới, là vùng hiện nay đã biết có Gà lôi lam mào đen, và còn là nơi bảo vệ các loài động vật hoang dại, đặc hữu và đang bị đe dọa khác. Bên cạnh đó là giá trị bảo vệ khu rừng đầu nguồn hồ Kẻ Gỗ là nơi cung cấp nước tưới tiêu và sinh hoạt cho nhiều vùng ở Cẩm Xuyên và Thạch Hà, cũng như vùng thượng nguồn sông Gianh. Việc đề xuất hệ thống quản lý bền vững khu rừng trong khu bảo tồn và vùng đệm sẽ góp phần cung cấp thêm các sản phẩm rừng, có tác dụng điều hòa khí hậu, góp phần bảo vệ cuộc sống của nhân dân các địa phương xung quanh.

Xây dựng khu bảo tồn thiên nhiên Kẻ Gỗ sẽ lấp được một chỗ trống quan trọng trong hệ thống khu bảo vệ của cả nước, và cho ra đời thêm một khu bảo vệ mang tính quốc tế, điều đó sẽ góp phần làm cho Việt Nam hoàn thành bổn phận của mình trong công ước quốc tế về bảo vệ đa dạng sinh học toàn cầu.

1. Introduction

1.1 Geography, Demographics, Economics and Environment

Geography. The Socialist Republic of Vietnam is a relatively narrow strip running north-south along the eastern coast of the Indochinese Peninsula. With a 3,000 km coastline, Vietnam extends from 23°37.5' to 8°00.5'N. It is approximately 525 km across at its widest point and 47 km across at its narrowest point. Vietnam's total land area is 331,689 km^2. Mountain ranges extend along Vietnam's border with the People's Republic of China in the north and along the borders with the Lao People's Democratic Republic and the Kingdom of Cambodia in the west. The highest point is Mount Fan Si Pan in the far north at 3,143 m, although average mountain altitudes are around 1,000 m. Vietnam is topographically complex with the exception of the narrow, coastal lowlands of the central region and the southern Mekong Delta region.

Demographics. The population of Vietnam is approximately 77 million people (1998) with a growth rate of 2.3% (at this rate, the population will double in 32 years time). The country is comprised of 61 provinces with 570 urban centres. Eighty percent of the population live in rural areas. Two cities have over 1 million inhabitants: Ho Chi Minh City (formerly Saigon) and Hanoi, the capital. Literacy rates are high: 93% for males and 83% for females. Life expectancy is 62 years for males and 67 years for females (Pham Ngoc Dang 1998).

Economics. Vietnam is currently undergoing an economic transition towards a more open economy. Vietnam's annual per capita gross national product (GNP) is about US$250 (World Bank 1997). GNP has been growing rapidly for the past decade. Vietnam's leading exports in order of contribution to GNP are crude oil, coal, rice, coffee, textiles, marine products, shoes, tea, cashew nuts and rubber. It is the world's third largest rice exporter and the fifth largest coffee exporter.

Environment. Economic growth, infrastructure development, population growth, protracted wars and the development of agriculture, forestry and fishing industries have resulted in over-exploitation of Vietnam's natural resources. The environment in Vietnam has largely been compromised; forest cover has undergone a massive decline and is now estimated at less than 20% of the country's total land area (less than 10% primary forest) (Vo Quy 1998). Gross deforestation has been accompanied by degradation of arable land, soil erosion, destruction of water catchments, diminished groundwater sources, siltation and ecological degradation of coastal and submerged areas and a loss of overall biodiversity within Vietnam.

1.2 Conservation

The government of Vietnam recognised the necessity for conserving and rehabilitating the natural environment at the end of the 1970s. Its first priority was to provide areas for settling war veterans. The second priority was chemical detoxification and remediation for human resettlement of areas affected by chemical defoliants. The third priority was given to reforestation, establishing reserves and the conversion of forests into cultivated land (MOF 1991a). Only in the 1990s has the conservation emphasis moved towards protecting endangered habitats and species.

Vietnam's forests are divided into three categories (MOF 1991a,b):

(a) **Production Forests.** These are forested areas which can be allocated to any organisation or individual (with management requirements and harvesting regulations) for domestic commercial timber needs as stipulated in Vietnam's Forestry Law, Articles 28-34;

(b) **Protection Forests.** These forested areas can be allocated to forestry agencies, people's committees, or to the people directly, with the main purposes of watershed protection, soil erosion control and foreshore protection with special provisions as per Articles 35-37; and

(c) **Special-use Forests.** These are forested lands allocated for environment conservation, tourism, educational purposes, national defence and other special uses. These lands can be allocated to organisations and agencies in the state forestry sector which are expected to generate revenues outside of the strict protection areas and follow management procedures as per Articles 39-41. Special-use Forests are further subdivided into:

(i) *Cultural and Historical Sites* to preserve and maintain areas of national and cultural interest and importance;

(ii) *Nature Reserves* intended to preserve all representative forest types and to conserve biodiversity; and

(iii) *National Parks* to protect and conserve all major types of wildlife and habitat types found within of Vietnam.

Vietnam currently has proposals for 105 protected areas, comprising 976,000 ha or 3% of the total land area. Under Special-use Forest classification there are 10 national parks, 61 nature reserves and 34 cultural of historical sites (Dang Huy Huynh 1998). Vietnam is actively gazetting new sites as part of its treaty obligations under the Convention on Biological Diversity. The policy document entitled *Renovation of Strategies for Forestry Development until the Year 2000* contains a commitment to expand Vietnam's system of Special-use Forest to 2 million ha by the year 2000, thereby doubling its network of Special-use Forests.

Vietnam supports approximately 275 mammal species, 826 bird species, 260 reptile species, 82 amphibian species, 500 freshwater fish species, 2,000 marine fish species and 12,000 plant species (Dang Huy Huynh 1998, MacKinnon 1996).

1.3 Field Survey and Objectives

Field Survey. The management plan for Ke Go Nature Reserve (Project VN 0008-02) presented in this report is based on a field survey carried out between April and August 1995. The study area included the watershed of Ke Go reservoir, the Rao Boi watershed in Ha Dong Forest Enterprise, the watershed of the Chin Xai and Cat Bin streams, and Gat Che Me valley. The proposed nature reserve includes areas in Cam Xuyen, Ky Anh and Huong Khe districts, Ha Tinh province.

Socio-economic data was collected from five forest enterprises in the area and the seven communes located within the proposed nature reserve buffer zone (Cam My, Cam Lac, Cam Son, Cam Thinh, Ky Tay, Ky Thuong and Huong Trach).

Objectives. The objectives of the project were to:

- assess the conservation potential of Ke Go proposed nature reserve based on current biological and socio-economic factors;
- assess the status of rare and ecologically and/or economically valuable species in the area, including restricted-range and globally threatened species;
- estimate the population size and distribution of two endemic bird species: Vietnamese Pheasant and Imperial Pheasant;

- propose boundaries for the nature reserve and buffer zone;
- assess the local human impact on the forest through a socio-economic survey;
- propose a basic management plan for Ke Go Nature Reserve and introduce guidelines for its implementation; and
- propose guidelines to enhance, in a sustainable manner, the socio-economic development of the human population in the buffer zone of Ke Go Nature Reserve.

1.4 Current Legislative Status

At the time of writing, Ke Go Nature Reserve was not included on the list of Special-use Forests in Vietnam (Decree 194/CT of the Chairman of the Council of Ministers). Nevertheless, it was possible to begin this project with the agreement of the government of Vietnam based on two official documents:

- a forestry development plan approved by the former Ministry of Forestry (MOF) (now incorporated in the Ministry of Agriculture and Rural Development (MARD)) proposing the expansion of Special-use Forests from 1.2 million to 2 million ha; and
- an official project document entitled Management Plan for Ke Go Nature Reserve (VN 0008-02) signed by the former MOF on 12 July 1994.

These official documents provided FIPI and MARD with the authority to begin the project in conjunction with BirdLife International.

2. Site Features

2.1 Location

Ke Go proposed nature reserve is situated in Cam Xuyen, Ky Anh and Huong Khe districts, southern Ha Tinh province, central Vietnam (Map 1). The proposed nature reserve is about 20 km south-west of Ha Tinh town and 40 km from Ky Anh town on National Highway 1A. It is bounded by the coordinates 18°00' to 18°09'N and 105°50' to 106°07'E.

Ke Go proposed nature reserve is delineated by the Rao Cat and Rao Con streams and Ke Go reservoir to the north; the Rao Boi watershed to the west; the border between Ha Tinh and Quang Binh provinces to the south; and the Khe Canh and Cat Bin watersheds to the east. The proposed nature reserve covers 24,801 ha, of which 11,385 ha is currently managed by Ke Go Reservoir Watershed Protection Forest (WPF), 5,905 ha by Ha Dong Forest Enterprise and 7,511 ha by Ky Anh II Forest Enterprise. Ke Go reservoir is situated outside of the proposed nature reserve (Map 2).

According to MacKinnon (1996), Ke Go proposed nature reserve is situated in sub-unit 5c (North Annam) of the Indochinese sub-region of the Indomalayan realm.

2.2 Topography

Most of Ke Go proposed nature reserve is below 300 m and is comprised of gently undulating country with low hills, a landscape typical of central Vietnam. These hills, which include Moc Tam Lo (414 m), Dong Moc (467 m), Moc Len (497 m) and Moc Buoi (500 m), have average slopes of 16 to 25°. The north-eastern part of the reserve, including the Cat Bin watershed, is much flatter, with slopes of less than 7°.

2.3 Geology and Soils

The majority of the proposed nature reserve area is made up of Palaeozoic era sedimentary bedrock. This comprises upper Ordovician, Silurian and mid-Devonian sediments, and smaller amounts of upper Devonian, Carboniferous and Permian sediments, all with a high carbonate content. The composition of sediments consists of clay, sand, conglomerate, pebbles, gravel, broken stones and limestone.

In certain areas, the soil shows signs of magmatic intrusion of acidic granite and rhyolite. Sediments along a number of rivers and streams, such as the Ngan Sau, Rao Tram, Rao Pheo and Rao Buoi, are the result of an accumulation of these igneous rocks. The stratigraphy is characterised by very thin, coarse-grained stone layers with a large proportion of rock crystals. Ke Do and Da Den hills are also characterised by this geological formation.

On the other hand, the areas of Thach Ha, Cam Xuyen and Ke Go and the upstream section of the Rao Pheo stream mainly consist of crystalline sedimentary rock formed by deposition of coarse rocks. The associated soil is particularly subject to erosion. Indeed, where the vegetation cover is minimal, fertile soil is rare and the land is mostly made up of bare and exposed rock, making forest rehabilitation difficult (Maps 3 and 4).

In summary, the main geological features of Ke Go proposed nature reserve area are:

- coarse-grained sedimentary rock made of fine and coarse grains of sand, conglomerate and

gravel, with a high carbonate content;
- fine-grained argillite (a fine-grained mudstone) sedimentary rock; and
- sedimentary rock made of granitic and rhyolitic crystals.

2.4 Meteorology

The climate of Ke Go proposed nature reserve is typical of the lower elevations of central Vietnam. Precipitation is high, with an average annual rainfall of approximately 2,600 mm. This high level of precipitation may be explained by the location of Hoanh Son mountain to the east of of the proposed nature reserve. Clouds and winds coming from the north are often blocked by this mountain, increasing rainfall over Ke Go. Drizzle is often prolonged for many days during December, January and, sometimes, February. The mean relative humidity for these months is 90.5%. The rainy season occurs from August to October, with the highest level of precipitation occuring between September and October (Table 1).

Table 1: Mean Rainfall during September and October

Weather Station	Mean Rainfall September (mm)	Mean Rainfall October (mm)
Ha Tinh	531.2	651.8
Huong Khe	543.1	481.2
Ky Anh	641.7	680.0
Tuyen Hoa	530.0	582.0

Period of measurement: 1958 to 1985

The forest in Ke Go proposed nature reserve is extremely humid, even when it is not raining, as annual evaporation only accounts for half of annual rainfall (Table 2).

Table 2: Annual Evaporation Level compared with Mean Annual Rainfall

Weather Station	Mean Annual Evaporation (mm)	Mean Annual Rainfall (mm)
Ha Tinh	799.8	2,642.3
Huong Khe	1,006.6	2,304.5
Ky Anh	1,161.3	2,928.9
Tuyen Hoa	1,030.5	2,266.5

Period of measurement: 1958 to 1985

The climate of Ke Go is also influenced by a warm and dry west wind which blows from Laos from April to July, with peak intensity in June and July. It induces a drier and warmer climate. Humidity is at its lowest and temperatures are at their highest levels during this time (Table 3).

Table 3: Mean Temperature and Relative Humidity

Weather Station	Temperature (June) (°C)	Temperature (July) (°C)	Annual Temperature (°C)	Humidity (June) (%)	Humidity (July) (%)	Annual Humidity (%)
Ha Tinh	29.1	29.3	23.8	77	74	86
Huong Khe	28.5	29.0	23.5	78	74	85
Ky Anh	29.4	29.8	24.0	74	70	84
Tuyen Hoa	28.8	29.2	23.8	76	72	84

Period of measurement: 1958 to 1985

2.5 Hydrology

There are three main watersheds in Ke Go proposed nature reserve:

(a) **Rao Boi Watershed.** The Rao Boi watershed feeds the Ngan Sau River, which flows through Huong Khe and Duc Tho districts, where it meets the Ngan Pho River, which then flows into the Lam River and thence into the South China Sea.

(b) **Ke Go Reservoir Watershed.** Ke Go reservoir is fed by a number of rivers and permanent streams: the Rao Con, Rao Len, Rao Buoi, Rao Mon, Rao Cat, Rao Cai, Rao Pheo and Rao Truong. Ke Go reservoir has the largest catchment within the proposed nature reserve.

(c) **Chin Xai-Cat Bin Watershed.** The Chin Xai stream originates on the slopes of Bac Toc mountain, in the south of the proposed nature reserve, from where it flows into the Cat Bin stream. The Cat Bin stream, which originates in the north-east of the proposed nature reserve, flows through a low, flat valley before it reaches the Khe Canh River. The Khe Canh River flows into the Rao Moc River, which, in turn, becomes the Gianh River, one of the most important rivers in Quang Binh province.

2.6 Flora Overview

An initial survey of Ke Go proposed nature reserve recorded 562 vascular plant species belonging to 365 genera and 115 families (Table 4). The list of 562 species includes 288 timber species, 44 species of medicinal plants and 18 species of ornamental plants.

Table 4: Plants Recorded in Ke Go Proposed Nature Reserve

Taxon	Families	Genera	Species
Lycopodiophyta	2	2	2
Polypodiophyta	10	12	18
Pinophyta	2	2	3
Magnoliopsida	85	288	457
Liliopsida	16	61	82
Total	115	365	562

Of the 115 plant families found in Ke Go, 14 contain 10 or more species: the Euphorbiaceae (50 species), Fabaceae (33), Lauraceae (27), Poaceae (24), Rubiaceae (24), Asteraceae (19), Sterculiaceae (15), Moraceae (14), Meliaceae (13), Arecaceae (13), Fagaceae (12), Sapindaceae (12), Orchidaceae (11) and Verbenaceae (11). Three additional families (the Dipterocarpaceae, Theaceae and Magnoliaceae) are represented by fewer species but are considered to play significant ecological roles in the forest ecosystem.

2.7 Vegetation Types

The vegetation of Ke Go proposed nature reserve can be divided into four categories according to the level of human impact: (a) lightly disturbed broadleaf evergreen forest; (b) heavily disturbed broadleaf evergreen forest; (c) plantation forest; and (d) scrub and grassland (Table 5).

Table 5: Vegetation Cover in Ke Go Proposed Nature Reserve

Vegetation Type	Area (ha)	%
Lightly Disturbed Broadleaf Evergreen Forest	5,945	24.0
Heavily Disturbed Broadleaf Evergreen Forest	18,339	73.9
Plantation Forest	424	1.7
Scrub and Grassland	93	0.4
Total	24,801	100.0

Lightly Disturbed Broadleaf Evergreen Forest

A quarter of Ke Go proposed nature reserve is still covered by lightly disturbed broadleaf evergreen forest. Despite the selective logging of commercial tree species, there has been no severe deterioration of the ecosystem in these areas. These patches of forest are located in remote and/or inaccessible areas, such as on the steep hillsides of Bac Toc, Moc Len, Moc Buoi and Moc Tam Lo mountains, and the hills adjacent to the southern boundary of the proposed nature reserve.

Primary broadleaf evergreen forest is characterised by a high diversity and abundance of tree species with no dominance of any particular species at altitudes below 300 m. The most common tree taxa are: *Cinnamomum* spp., *Castanopsis* spp., *Lithocarpus* spp., *Michelia* spp., *Schima wallichii*, *Polyalthia nemoralis*, *Dacryodes dungii*, *Nephelium cuspidatum* var. *bassacensis*, *Paranephelium spirei*, *Syzygium* spp., *Madhuca pasquieri*, *Manglietia hainanensis*, *Erythrophleum fordii* and *Sindora tonkinensis*. The composition of the forest above 300 m is dominated by *Hopea* spp., which comprise 30 to 40% of the mature trees.

This forest type is stratified into four main layers of vegetation:

(a) **Canopy Layer.** The canopy layer (20 to 25 m) is generally closed and includes most of the economically valuable tree species;

(b) **Middle Layer.** The middle layer is dominated by *Mallotus apelta* but a number of other species are also present. Both the height and diameter of trees in this layer vary greatly;

(c) **Shrub Layer.** Shrubs and palms, such as *Livistona saribus*, constitute this layer; and

(d) **Herb Layer.** The herb layer is mainly comprised of *Adiantum caudatum, Dracaena gracilis* and members of the Acanthaceae.

Heavily Disturbed Broadleaf Evergreen Forest
The majority of the forest in the proposed nature reserve has been greatly affected by human activities. This area consists of heavily degraded primary forest and, in areas which have previously been cleared, secondary forest. Both the forest structure and the species composition have been altered considerably. The canopy layer has been largely destroyed and the middle layer is not clearly defined. The shrub layer is dominated by the palm, *Livistona saribus.*

Below 300 m, the canopy is dominated by *Erythrophleum fordii, Sindora tonkinensis, Madhuca pasquieri, Michelia* spp. and *Cinnamomum* spp. However, the abundances of these species have been greatly reduced. Other common trees in this forest type are *Alangium ridleyi, Polyalthia nemoralis, Nephelium cuspidatum* var. *bassacensis, Dacryodes dungii, Baccaurea silvestris, Gironniera subaequalis, Paranephelium spirei* and *Syzygium* spp.

Plantation Forest
Plantation forest covers 1.7% of the proposed nature reserve and is mainly distributed around Ke Go reservoir. The commonest tree species in plantation forest is *Acacia auriculaeformis.*

Scrub and Grassland
Scrub and grassland cover only 93 ha or 0.4% of the proposed nature reserve. At present, these areas are dominated by the grass, *Imperata cylindrica*.

2.8 Fauna Overview

Ke Go proposed nature reserve supports at least 363 species of vertebrates, including 46 species of mammal; 270 species of bird, 30 species of reptile and 17 species of amphibian (Table 6). Ten mammal species and 10 bird species are listed as globally threatened in the 1996 IUCN Red List of Threatened Animals.

Table 6: Vertebrates Recorded in Ke Go Proposed Nature Reserve

Class	Species	Families	Orders
Mammals	46	21	8
Birds	270	47	16
Reptiles	30	12	2
Amphibians	17	5	1
Total	363	85	27

2.9 Mammals

Forty six mammals species have been recorded in Ke Go proposed nature reserve. Little is currently known about the status of bats (Chiroptera) or rats and mice (Muridae) since no research has been carried out on these groups. Ten of the 46 mammal species recorded in Ke Go are considered to be globally threatened (IUCN 1996) (Table 7).

Mammal Records

Asian Elephant *Elephas maximus.* According to local hunters interviewed, the area surrounding Ke Go reservoir once supported elephants. The population has decreased steadily, mainly because of hunting. In 1975, at the beginning of the construction of Ke Go reservoir, many elephants were observed in the area. In 1993, it was estimated by a Dansk Ornitologisk Forening (DOF) and Sveriges Ornithologiska Forening (SOF) survey that the number of elephants living in the area was 7 to 10 (DOF and SOF unpublished). Local hunters reported seeing a herd of elephants in 1994 in the area around Ha Dong and Tuyen Hoa Forest Enterprises, in Ha Tinh and Quang Binh provinces respectively. Except for two elephant teeth, no signs or evidence demonstrating the continued presence of Asian Elephant in Ke Go proposed nature reserve were recorded. We believe the species to be extinct in the proposed nature reserve.

Gaur *Bos gaurus.* Gaur face a similar situation to Asian Elephant. Years of hunting and degradation of forest habitats have led to a severe decline in population size. In 1993, the footprint of a Gaur was identified along the Rao Con stream by DOF and SOF (unpublished). In May 1995, a herd of three Gaur was seen in the Mui Nhui stream area by a group of woodcutters, and, at the same time, a single animal was identified near Bac Toc mountain. The maximum number of Gaur living in the entire area is estimated to be five or six.

Tiger *Panthera tigris.* Local people frequently reported finding Tiger footprints in the Rao Mon, Rao Buoi and Rao Len stream areas. In June 1995, a group of woodcutters reportedly observed one adult Tiger at the foot of Bac Toc mountain.

Giant Muntjac *Megamuntiacus vuquangensis.* Giant Muntjac was only discovered in 1993 (Do Tuoc *et al.* 1994). In Ke Go, two large specimens were trapped and killed in November 1994 in the Rao Mon

Table 7: Globally Threatened Mammals Recorded in Ke Go Proposed Nature Reserve

Species	Scientific Name	IUCN (1996)
Primates:	**Primates:**	
Old-World Monkeys	**Cercopithecidae**	
1. Pig-tailed Macaque	*Macaca nemestrina*	VU
2. Assamese Macaque	*M. assamensis*	VU
3. Bear Macaque	*M. arctoides*	VU
4. Red-shanked Douc Langur	*Pygathrix nemaeus nemaeus*	EN
Carnivores:	**Carnivora:**	
Bears	**Ursidae**	
5. Asiatic Black Bear	*Ursus thibetanus*	VU
Cats	**Felidae**	
6. Tiger	*Panthera tigris*	EN
Elephants:	**Proboscidea**	
Elephants	**Elephantidae**	
7. Asian Elephant	*Elephas maximus*	EN
Even-toed Ungulates:	**Artiodactyla:**	
Cattle, Antelopes, etc.	**Bovidae**	
8. Gaur	*Bos gaurus*	VU
9. Southern Serow	*Naemorhedus sumatraensis*	VU
Rodents:	**Rodentia**	
Old-World Porcupines	**Hystricidae**	
10. Malayan Porcupine	*Hystrix brachyura*	VU

Follows Corbet and Hill (1992)
Notes: EN = Endangered; VU = Vulnerable as per IUCN (1996)

area in a patch of primary forest between 200 and 300 m. Their horns were kept by the hunter in his home in Ky Phuc village, Ky Thuong commune.

Buff-cheeked Gibbon *Hylobates gabriellae.* Buff-cheeked Gibbon is extremely rare in the area. The population has been severely affected by unrestricted hunting and exploitation of the forest. Despite a number of surveys of the area, gibbon song has only been heard on two occasions, both in the southern parts of Ke Go proposed nature reserve.

2.10 Birds

Ke Go proposed nature reserve supports 270 species of bird. This figure represents about 76% of the total number of bird species known from northern-central Vietnam and about 34% of the total number known from Vietnam (Vo Quy and Nguyen Cu 1995). Ten globally threatened bird species were recorded in Ke Go proposed nature reserve (Collar *et al.* 1994), including two endemic species of *Lophura* pheasant: Vietnamese Pheasant *L. hatinhensis* and Imperial Pheasant *L. imperialis* (Table 8).

Table 8: Globally Threatened and Restricted-range Birds Recorded in Ke Go Proposed Nature Reserve

Species	Scientific Name	Restricted-range Species	Collar *et al.* (1994)
	Galliformes:		
	Phasianidae		
1. Chestnut-necklaced Partridge	*Arborophila charltonii*		VU
2. Imperial Pheasant	*Lophura imperialis*	RRS	CR
3. Vietnamese Pheasant	*L. hatinhensis*	RRS	EN
4. Siamese Fireback	*L. diardi*		VU
5. Crested Argus	*Rheinardia ocellata*	RRS	VU
	Anseriformes:		
	Anatidae		
6. White-winged Wood Duck	*Cairina scutulata*		EN
	Piciformes:		
	Picidae		
7. Red-collared Woodpecker	*Picus rabieri*		VU
	Coraciiformes:		
	Alcedinidae		
8. Blyth's Kingfisher	*Alcedo hercules*		VU
	Passeriformes:		
	Sylviidae		
9. Short-tailed Scimitar Babbler	*Jabouilleia danjoui*	RRS	VU
10. Grey-faced Tit Babbler	*Macronous kelleyi*	RRS	NT
11. Short-tailed Parrotbill	*Paradoxornis davidianus*		VU

Follows Inskipp *et al.* (1996)
Notes: CR = Critical; EN = Endangered; VU = Vulnerable; NT = Near Threatened as per Collar *et al.* (1994)
RRS = Restricted-range Species

Bird Records

White-winged Wood Duck *Cairina scutulata.* A pair and a single individual were recorded over Ke Go proposed nature reserve in May or June 1993 (Robson *et al.* 1993).

Crested Argus *Rheinardia ocellata.* Crested Argus was mainly recorded in the Rao Mon and Rao Buoi stream areas (Nguyen Cu *et al.* 1992).

Vietnamese Pheasant. This species is restricted to a small area of lowland forest in central Vietnam. Records for the whole of Vietnam, arranged from north to south, are as follows: Son Tung, Ky Anh district, Ha Tinh province, 1964 (1♂ in IEBR collection, Vo Quy 1975), two males identified from remains presented by hunters had been caught immediately to the north-west of Son Tung, December 1987 (Robson *et al.* 1991); Ky Thuong commune, Ky Anh district, second male specimen collected, April 1974 (Dang Huy Huynh *et al.* 1974), remains of male identified, December 1987 (Robson *et al.* 1991, Nguyen Cu and Eames 1993); Bau Mon, Ky Thuong district, one female and chick reportedly caught, April 1992 (Nguyen Cu and Eames 1993); Gat Che Me valley, one male trapped and photographed on the valley floor, May 1992 (Nguyen Cu *et al.* 1992, Nguyen Cu and Eames 1993), though not recorded here during subsequent surveys (Nguyen Cu *in litt.* 1997); Ke Go proposed nature reserve, at Rao Cai, one male trapped by rattan collectors, January 1997 (Le Sau *in litt.* 1997), and Cat Bin, one male trapped immediately to the north-west, early 1990 (Robson *et al.* 1991), also 11 males and two females trapped in forest up to 12 km west of the town during one month, late January to late February 1990 (Robson *et al.* 1991, 1993); Khe Net watershed, Quang Binh province, at least eight birds (and possibly more than 10) observed in seven days, 200 to 300 m, June and July 1994, including four or five recently fledged juveniles, one of which (a male) was caught and blood samples taken (Lambert *et al.* 1994); Tuyen Hoa and Minh Hoa districts, species provisionally reported from here (individuals in Hanoi zoo) with no dates or localities specified (Rozendaal *et al.* 1991, Lambert *et al.* 1994).

Imperial Pheasant Imperial Pheasant is another species endemic to the Annamese Lowlands EBA. It is one of the least-known *Lophura* species in the world. Only three specimens are known, all from the low mountains of central Vietnam. Imperial Pheasant was recorded for the first time in 1923 in forest in Quang Binh province (Delacour and Jabouille 1931). In February 1990, an immature male was trapped by rattan collectors 12 km west of Cat Bin in Ke Go proposed nature reserve, near the border between Ha Tinh and Quang Binh provinces (Nguyen Cu *et al.* 1992). The specimen is retained in the collection at IEBR. According to local hunters interviewed during the BirdLife/FIPI survey, Imperial Pheasant is still present in Ke Go proposed nature reserve.

2.11 Reptiles and Amphibians

Thirty species of reptiles belonging to two orders and 12 families have been recorded in Ke Go proposed nature reserve. This accounts for 65% of reptile species recorded in Ha Tinh province. Similarly, 17 species of amphibians belonging to one order and five families have been recorded in Ke Go proposed nature reserve. Therefore, Ke Go proposed nature reserve contains more than 77% of the total number of amphibian species identified in the province.

2.12 Socio-economic Features[1]

Demographics

The population of the proposed buffer zone numbers 39,917 people, distributed between seven communes in three districts. This represents 9.3% of the population of the three districts. There are a total of 74 villages in the buffer zone (Table 9 and Map 8).

The four communes in Cam Xuyen district (Cam My, Cam Thinh, Cam Son and Cam Lac) have a total population of 23,409 people; the two communes in Ky Anh district (Ky Thuong and Ky Tay) have a total population of 10,269 people; and the single commune in Huong Khe district (Huong Trach) has a population of 6,239 people (Table 10).

[1] Ke Go proposed nature reserve is located in Cam Xuyen, Ky Anh and Huong Khe districts. The total area of these three districts is 353,098 ha. When this report was written, the proposed buffer zone covered 21,485 ha in seven communes, accounting for only 6% of the total area of the three districts. Hence, this section summarises data collected from the seven communes originally proposed for inclusion in the buffer zone. After the completion of the field survey, it was decided at a provincial workshop that two additional communes should be included in the buffer zone: Phuc Trach and Huong Gianh in Huong Khe district. No data was collected about these two communes.

The majority of the population (99%) belong to the Kinh ethnic group, while the remainder (1%) belong to the Muong. Women outnumber men 53 to 47%. There are usually two generations living together in a typical household, with an average of five to six children per family. The population growth rate is high in all communes, ranging from 2.2 to 2.6% per annum (Table 9).

Table 9: Number of Villages, Area and Population Growth Rate of Buffer Zone Communes

Commune	No. of Villages	Area (ha)	Population Growth Rate (% per annum)
Cam My	11	1,786	+ 2.3
Cam Thinh	15	2,150	+ 2.2
Cam Son	10	1,887	+ 2.4
Cam Lac	12	1,254	+ 2.4
Ky Thuong	10	4,848	+ 2.4
Ky Tay	8	7,055	+ 2.6
Huong Trach	8	2,505	+ 2.3
Total	74	21,485	-

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Population density varies greatly within the buffer zone. Cam Lac commune in Cam Xuyen district has the highest density, with 461 people per km^2. Ky Tay commune in Ky Anh district has the lowest density, with 75 people per km^2. The population inhabiting the buffer zone is mainly located around the northern and eastern boundaries of the proposed nature reserve.

Table 10: Demographic Information for the Buffer Zone

Commune	Total Popn.	Male	Female	Labour Force	No. of H'holds	Ethnic Group		Density (pers/km^2)
						Kinh	Muong	
Cam My	6,833	3,012	3,691	3,208	1,433	6,833	0	382
Cam Thinh	6,126	3,012	3,114	3,408	1,318	6,126	0	284
Cam Son	4,663	2,280	2,383	2,071	1,069	4,663	0	247
Cam Lac	5,787	2,829	2,958	2,088	1,360	5,787	0	461
Ky Thuong	4,953	2,462	2,491	1,671	1,157	4,963	0	102
Ky Tay	5,316	2,179	3,137	2,431	1,214	5,316	0	75
Huong Trach	6,239	2,969	3,272	1,950	1,312	5,874	355	249
Total	39,917	18,873	21,044	16,827	8,873	39,562	355	-

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Resettlement. In order to promote sustainable agriculture, the authorities of Ky Tay, Ky Thuong and Cam Son communes decided to move certain households to areas with potentially more productive arable land. These areas were usually located near the foothills and had very poor access. Fifty households living in Ky Tay commune were resettled in 1994. In the other communes, resettlement was not as successful because there was no adequate road system, health stations, access to markets or suitable water sources in the new areas; and only a few households moved.

Economic Activities

Most of the communes in the buffer zone have a relatively large land area but the majority of this is non-agricultural land. The annual incomes of farmers are very low and are derived mainly from agriculture, exploitation of forest resources and animal husbandry. Whilst the primary staple food is rice, paddy fields are small, with only 0.7 to 1.0 sao (250 to 360 m^2) per person.

Table 11: Food Security of Households in the Buffer Zone

Commune	No. of House-holds	Households with Surplus Food	Households with Sufficient Food	Households with Food Shortages			
				1 to 2 months	3 to 4 months	5 to 6 months	Total
Cam My	1,433	143	520	270	120	380	770
Cam Thinh	1,318	9	1,163	78	50	18	146
Cam Son	1,069	10	364	320	210	165	695
Cam Lac	1,360	108	1,021	46	59	126	231
Ky Thuong	1,157	0	582	143	144	288	575
Ky Tay	1,214	243	546	200	212	13	425
Huong Trach	1,322	0	1,018	160	135	9	304
Total	8,873	513	5,214	1,217	930	999	3,146

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Food Security. Many families do not have enough food to meet their daily nutritional requirements. The problem appears to be particularly evident in Cam My and Cam Son communes, Cam Xuyen district and in Ky Thuong commune, Ky Anh district (Table 11). There are 3,146 households in the buffer zone that suffer from food shortages, accounting for 35% of the total number of households.

Agriculture. Rice cultivation is the main income-generating activity in the buffer zone. Other staples such as cassava, potato, maize, beans and peanuts are also cultivated (Table 12).

Table 12: Agricultural Production in the Buffer Zone

Commune	Total Area (ha)	Rice 2 Crops (ha)	Rice 1 Crop (ha)	Other Crops				
				Cassava (ha)	Maize (ha)	Potato (ha)	Beans (ha)	Peanuts (ha)
Cam My	750	355	65	60	0	80	110	80
Cam Thinh	508	330	9	15	0	51	15	0
Cam Son	770	430	130	50	30	80	30	20
Cam Lac	523	270	105	42	0	75	14	17
Ky Thuong	300	100	50	80	0	20	40	10
Ky Tay	416	174	86	68	0	39	43	6
Huong Trach	444	130	100	0	60	4	50	100
Total	3711	1789	633	315	90	349	302	233

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Rice is the main crop of the region but productivity is generally low (Table 13). It is cultivated in all communes but both the total area of cultivated land and the area of irrigated land vary widely between communes. Irrigation is practised on about half to two-thirds of the cultivated land in the buffer zone. The remaining cultivated land depends on rainwater. Cam Xuyen district has three major irrigation systems, which distribute the water of Rong Rac and Tuong Tuy lakes and Ke Go reservoir. Ky Thuong, Huong Trach and Ky Tay communes have the smallest area of cultivated land per inhabitant, with an average of 0.6 to 0.7 sao (215 to 250 m^2) per person. Rice production is extremely low, which explains the high level of forest resource exploitation within the area.

Table 13: Rice Productivity in the Buffer Zone

Commune	Productivity (kg/ha/year)
Cam My	4,000
Cam Thinh	6,000
Cam Son	4,000
Cam Lac	5,600
Ky Thuong	4,000
Ky Tay	3,700
Huong Trach	3,000

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Fruit Tree Cultivation. Fruit tree cultivation is a relatively important source of income. The inhabitants of the buffer zone cultivate a number of fruit trees, such as orange, mandarin, pomelo, jackfruit, lemon, betel nut, sapodilla, longan and litchi.

Pomelo is an important source of revenue for Huong Trach commune, whilst, in Ky Thuong commune, local people cultivate mandarins to supplement their incomes. As with rice, fruit production is low. Most fruit tree plantations have no irrigation scheme and the main source of water remains rainfall. Long-lasting droughts have continuously affected the growth and productivity of fruit trees.

Home Gardens. Most of the families who live in rural areas, including both Kinh and Muong people, have home gardens where they cultivate fast-growing vegetables and fruit. The range of species cultivated varies according to available area, slope, soil type and personal preference. Productivity is low due to lack of seedlings, agricultural knowledge and capital.

Social Forestry. Over 95% of the land in the buffer zone designated as forest land is currently bare or covered by scrub or grassland. Less than 2% of the total area still supports natural forest, whilst another 3% is covered by plantation forest (Table 14).

Table 14: Vegetation Cover on Forest Land

Commune	Forest Land (ha)	Medium Forest (ha)	Poor Forest (ha)	Plantation Forest (ha)	Scrub, Grassland and Bare Land (ha)
Cam My	826	0	0	62	764
Cam Thinh	1,160	0	0	70	1,090
Cam Son	618	0	0	80	538
Cam Lac	482	0	0	32	450
Ky Thuong	4,013	0	0	20	3,993
Ky Tay	3,015	0	0	47	2,968
Huong Trach	1,816	96	126	0	1,594
Total	11,930	96	126	311	11,397

Source: Ha Tinh Provincial Department of Agriculture and Rural Development

To increase tree plantation and to diversify and increase household income, a number of households in each commune have been allocated land to plant commercial tree species (Table 15). In addition, 21 households in Ky Thuong commune have been allocated land on short-term forest protection contracts. A centrally funded, income-generating initiative (Programme 327) has been launched in Cam Xuyen, Ky Anh and Huong Khe districts, with the collaboration of the local forest enterprises[2] . Under Programme 327, part of the forest land managed by the forest enterprises has been allocated to individual households for replantation or protection. The main trees planted are *Eucalyptus*, *Canarium*, *Acacia*, *Cassia*, *Cinnamomum* and some fruit trees, such as orange, mandarin, pomelo and apricot. Overall, however, only a limited number of local residents have benefited from such activity.

[2] Cam Xuyen and Ke Go Reservoir WPF Forest Enterprises are responsible for the implementation of Programme 327 in Cam Xuyen district; Ky Anh Forest Enterprise for Ky Anh district; and Huong Khe Forest Enterprise for Huong Khe district.

Table 15: Social Forestry Activities in the Buffer Zone

Commune	Total Area (ha)	Land Allocated to Households for Replantation		Land Allocated to Households on Forest Protection Contracts	
		Area (ha)	No. of H'holds	Area (ha)	No. of H'holds
Cam My	40	40	12	0	0
Cam Thinh	30	30	18	0	0
Cam Son	200	200	21	0	0
Cam Lac	14	14	7	0	0
Ky Thuong	1,020	20	8	1,000	21
Ky Tay	315	315	150	0	0
Huong Trach	618	618	146	0	0
Total	2,237	1,237	362	1,000	21

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Animal Husbandry. A large number of households raise livestock (Table 16). In certain communes, extensive areas of grassland provide favourable conditions for animal husbandry.

Table 16: Livestock Ownership in the Buffer Zone

Commune	Number				% Grazing in Proposed NR
	Buffalo and Cattle	Goats	Pigs	Deer	
Cam My	3,200	120	2,800	0	60
Cam Thinh	2,200	25	1,500	0	10
Cam Son	1,600	300	1,500	0	0
Cam Lac	1,610	120	1,440	0	65
Ky Thuong	2,450	0	950	0	0
Ky Tay	6,070	0	3,900	0	0
Huong Trach	1,698	0	1,604	45	70
Total	18,828	565	13,694	45	-

Natural Resource Use. A large proportion of households in the buffer zone extract natural resources from within the proposed nature reserve. These households supplement their incomes through the exploitation of forest resources such as firewood, charcoal, palm leaves, rattans and honey (Table 18). Table 17 shows the estimated percentage of households that exploit forest resources and the estimated percentage of household income that is accounted for by these activities.

Table 17: Estimated Dependence on Forest Resources

Commune	Households (%)	Income (%)
Cam My	55	33
Cam Thinh	45	30
Cam Son	60	43
Cam Lac	60	39
Ky Thuong	56	50
Ky Tay	60	35
Huong Trach	50	30

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Fragrant oil distillation is widely practised and has significantly contributed to the degradation of the forest in Ke Go proposed nature reserve. It is estimated that, for each tree fragrant oil is distilled from, 1 km^2 of forest is negatively affected. Fragrant oil is usually collected from *Cinnamomum parthenoxylum*, although other members of the Lauraceae can also be used. After the trees are felled, the oil is distilled in situ, which requires large quantities of firewood. Apart from the damage caused to the forest, fragrant oil distillation also pollutes surrounding water sources.

Ha Tinh Provincial Forest Development (FDD) and Forest Protection Departments (FPD) have attempted to implement a number of restrictive measures on fragrant oil distillation in order to protect

the forest. To date, however, none have been particularly effective. Interviews with informed villagers indicate that the financial benefits from the illegal export of fragrant oil abroad are experienced by only a small number of people.

Timber is extracted for use locally in construction but is also illegally exported abroad. The tree species favoured for timber are *Hopea* spp., although other species of lower quality are also exploited.

Table 18: Estimated Quantity of Selected Forest Products Extracted Annually from Ke Go Proposed Nature Reserve by Local People

Commune	Timber (m^3)	Firewood (stere)	Rattans (tonnes)	Palm Leaves (tonnes)
Cam My	1,000	10,000	-	0
Cam Thinh	100	2,000	-	0
Cam Son	250	2,000	-	0
Cam Lac	815	1,800	35	0
Ky Thuong	100	13,200	30	60
Ky Tay	200	1,200	25	60
Huong Trach	100	79,320	110	0
Total	2,565	109,520	200	120

Source: Ha Tinh Provincial Department of Agriculture and Rural Development

Hunting. Hunting plays an important role in the local economy. Prior to the opening of Vietnam's economy, animals were hunted principally for local consumption. However, the opening of Vietnam's economy has changed this pattern significantly: foreign demand for wild animals has broadened the range of species subject to hunting and increased overall hunting pressure. Populations of large and medium-sized mammals suffer from constant hunting pressure. The use of non-specific hunting methods, such as traps and snares, threatens globally threatened bird species, including Vietnamese Pheasant.

A large proportion of hunted wildlife is sold locally; there are at least two wildlife trading posts in the surrounding area of the nature reserve. A number of traders have acquired the rights to buy wildlife from local hunters and to sell derived products abroad. This occurs despite the fact that the traded animals are often globally threatened (IUCN 1996) and/or CITES listed (CITES 1994). For instance, at a trader's house in a trading post in Huong Khe district, 500 kg of live turtles were displayed, including Big-headed Turtle *Platysternum megacephalum* and Elongated Tortoise *Indotestudo elongata.*

Infrastructure

Roads. The villages in each commune are linked with each other and the commune centres with the district towns by both surfaced and unsurfaced roads. These roads are old and poorly maintained due to a shortage of funds. This problem is particularly severe in Cam Thinh, Ky Thuong and Ky Tay communes, where bridges and fords are in a state of disrepair. Many roads become flooded during the rainy season, which severely impedes travel. Furthermore, there is no proper road system in the areas that contain new settlements.

Health Care. In each commune, there are one or two health stations, with at least one assistant doctor and one or two nurses (Table 19). Additionally, Huong Khe hospital has a sub-station in Huong Trach commune. However, all health stations lack basic medical equipment and medicines.

The commonest diseases reported in the area are malaria and goitre. On average, 5 to 10% of the population is estimated to contract malaria every year. A programme has been launched to reduce the occurrence of the disease, and a few communes, such as Huong Trach, are periodically supplied with

anti-malarial drugs. However, despite these efforts, numerous cases are still recorded.

Table 19: Health Care in the Buffer Zone

Commune	No. of Health Stations	Number of Health Care Staff				% H'holds with Wells	% H'holds with Malaria
		Doctors	Assistant Doctors	Nurses	Assistant Nurses		
Cam My	1	0	3	11	3	100	6
Cam Thinh	2	0	2	14	2	80	10
Cam Son	1	0	1	10	2	70	8
Cam Lac	1	0	2	5	1	40	9
Ky Thuong	2	0	2	1	2	100	15
Ky Tay	1	0	2	8	1	100	12
Huong Trach	1	1	3	8	0	80	15

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

A family planning programme is implemented by the women's union in every commune, although only 20 to 25% of the population participate. There is a lack of understanding about the benefits of family planning as there has been little education about this subject. Most couples want to have many children and at least one son. Another important factor is that men rarely participate in family planning programmes.

Education. The education system in the buffer zone communes encompasses kindergarten to secondary school levels. About 92% of children living in the seven communes attend school. The lowest rate of school attendance is found in Cam Lac and Ky Tay communes, where only 85% of children attend school (Table 20). In these communes, household sizes are larger and parents do not have the money to send their children to school. Another factor contributing to low attendances is the distances many children must travel to school. The number of pupils attending secondary school is much lower than for primary school because children of richer families transfer to schools in the district towns, whilst children of poorer families have to stop going to school to earn money.

Usually, there are 30 to 35 pupils to every teacher but this ratio is often higher. The shortage of teachers is particularly acute in Huong Trach commune. Bad road conditions, poor infrastructure and lack of educational materials discourage teachers, who prefer to work in less remote areas. Policies and salary incentives to work in mountainous areas are insufficient to counteract these disincentives. In general, school buildings are in a poor state of repair and there are shortages of books and other teaching materials.

Table 20: Education Provision and Attendance in the Buffer Zone

Commune	Kindergarten		Primary School		Secondary School		Attendance
	Classes	Pupils	Classes	Pupils	Classes	Pupils	(%)
Cam My	19	467	30	1,100	8	320	100
Cam Thinh	14	445	32	1,075	9	332	97
Cam Son	6	200	22	900	7	260	97
Cam Lac	12	326	25	840	6	246	85
Ky Thuong	8	210	30	980	3	81	93
Ky Tay	7	280	28	870	6	189	85
Huong Trach	10	310	51	1,189	11	287	90
Total	76	2,238	218	6,954	50	1,715	-

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Forest Enterprises

Large areas of Ke Go proposed nature reserve have been logged for many years by state-owned forest enterprises. Timber extraction has been intensive, particularly in lowland areas. Only in 1990 was Ke Go Reservoir WPF officially established.

Four forest enterprises are currently extracting timber from the proposed nature reserve and/or the buffer zone: Cam Xuyen, Ky Anh II, Ha Dong and Tuyen Hoa (Table 21). The first three forest enterprises are under the jurisdiction of the Ha Tinh Provincial FDD, whilst Tuyen Hoa Forest Enterprise is under the jurisdiction of the Quang Binh Provincial FDD. A fifth forest enterprise is responsible for planting trees in Ke Go Reservoir WPF.

Table 21: Forest Cover under the Management of Four Forest Enterprises and Ke Go Reservoir WPF

Forest Enterprise/ WPF	Total Area (ha)	Rich Forest (ha)	Medium Forest (ha)	Poor Forest (ha)	Plantation Forest (ha)	Bare Land (ha)	Cultivated Land (ha)
Cam Xuyen	5,800	0	403	1,553	1,150	2,694	0
Ky Anh II	24,000	1044	2,528	3,134	2,200	11,209	3,885
Ha Dong	24,591	1304	5,312	7,934	184	9,457	400
Tuyen Hoa	20,282	-	-	-	-	-	-
Ke Go Reservoir WPF	22,354	1,322	4,252	7,046	147	9,587	0
Total	97,027	3,670	12,495	19,667	3,681	32,947	4,285

The main duties of Cam Xuyen and Ke Go Reservoir WPF Forest Enterprises are reforestation and forest protection. Cam Xuyen Forest Enterprise also conducts selective extraction of conifers. Ha Dong and Ky Anh II Forest Enterprises are involved in reforestation activities as well as timber extraction. The aim of these two forest enterprises is to ensure that provincial demands for timber are met each year. Ha Dong Forest Enterprise exploits an average of 300 m^3 of timber per annum, whilst Ky Anh II Forest Enterprise extracts 1,000 m^3. Most timber is extracted from the area of the proposed nature reserve, as these two enterprises currently manage lands located within the proposed boundary. Tuyen Hoa Forest Enterprise extracts an average of 3,300 m^3 of timber per year but none of this timber comes from the proposed nature reserve. Nevertheless, Tuyen Hoa Forest Enterprise has an indirect impact on the ecosystem of the proposed nature reserve because it extracts timber from the buffer zone.

Rural Development Projects

A number of rural development projects have been implemented in the buffer zone area, including the following:

- a governmental initiative (Programme 327) managed by the forest enterprises. It aims to involve local people in replantation and forest protection;
- a rural development project in Ky Thuong commune financed and implemented by the Centre for Natural Resources and Environmental Studies (CRES) in collaboration with the provincial department of science, technology and the environment. This innovative programme has introduced higher-yielding rice varieties, provided extension for apiarists, and installed small hydro-electricity generators;
- a fruit farming project in Huong Trach commune has provided funds to farmers to plant orange trees; and
- an Oxfam Great Britain initiative in Ky Anh district, entitled the "Schools and Trees Programme" aims to plant fruit orchards on land allocated to secondary schools. The programme provides extension training in forestry and resource management.

3. Evaluation

3.1 Evaluation of Biological Factors

The following criteria are based upon Ratcliffe (1977) and allow the conservation value of a protected area to be assessed.

Size
Ke Go proposed nature reserve covers 24,801 ha. It is smaller than several decreed protected areas in central Vietnam, including Pu Mat (91,213 ha), Vu Quang (65,000 ha) and Phong Nha Nature Reserves (41,000 ha).

Biodiversity
Despite its relatively small size, the diversity of species recorded in Ke Go proposed nature reserve is high. To date, 562 plant and 363 vertebrate species have been recorded in Ke Go proposed nature reserve. These figures compare favourably with other, larger, protected areas in the same EBA, such as Pu Mat Nature Reserve (936 plant and 284 vertebrate species), Vu Quang Nature Reserve (508 plant and 326 vertebrate species), Bach Ma National Park (501 plant and 341 vertebrate species) and Phong Nha Nature Reserve (751 plant and 158 vertebrate species).

Rarity
Habitats. Primary forest is scarce in central Vietnam and lowland primary forest is even scarcer. Primary forest is largely confined to protected areas, such as Pu Mat, Vu Quang and Phong Nha Nature Reserves, and Bach Ma and Cuc Phuong National Parks. Most of the primary forest protected in these protected areas is either on hill sides or on mountains. As yet, there is no protected area located in the lowlands of central Vietnam. Ke Go proposed nature reserve is located in one of the largest remaining blocks of broadleaf evergreen forest in the level lowlands of central Vietnam, representing the habitat type which once covered most of the Annamese Lowlands EBA.

Endangered Species. Ten bird species present in Ke Go proposed nature reserve, including Vietnamese Pheasant, are listed as globally threatened (Collar *et al.* 1994). Vietnamese Pheasant is only known in the world from nine sites, all of which are in the vicinity of Ke Go and four of which are located within the boundary of the proposed nature reserve (Map 6). Ke Go proposed nature reserve is believed to provide optimum habitat for this species, since its habitat requirements are believed to be broadleaf evergreen forest below 300 m.

Endemic Species. Ke Go proposed nature reserve supports five restricted-range bird species, as well as three mammal species (Buff-cheeked Gibbon, Douc Langur *Pygathrix nemaeus* and Giant Muntjac) that are endemic to Indochina (Vietnam, Laos and Cambodia) (Corbet and Hill 1992). Two bird species, Vietnamese Pheasant and Imperial Pheasant, are endemic to the Annamese Lowlands EBA and are known from no other protected areas in the world. Other bird species, such as Siamese Fireback *Lophura diardi* and Crested Argus, are regionally endemic and confined to mainland South-East Asia.

Forest-restricted Species. Almost all species recorded in the proposed nature reserve are largely or completely restricted to broadleaf evergreen forest. The habitat preferences of the two endemic species of *Lophura* pheasant are broadleaf evergreen forest below 300 m.

Naturalness
The commonest vegetation type in the proposed nature reserve is heavily disturbed broadleaf evergreen forest, which varies between selectively and completely logged. Most of the forest has been exploited for

timber but a few patches of undisturbed forest remain on the slopes of high mountains and near the border between Ha Tinh and Quang Binh provinces. The forest in the eastern part of the reserve is the most heavily degraded, and the vegetation in this area is dominated by bamboo, scrub and abandoned cultivation (Map 5). The degraded nature of much of Ke Go proposed nature reserve should not compromise the conservation effort to protect it, since it represents one of the largest remaining areas of lowland forest within the Annamese Lowlands EBA.

Fragility

Fragility is a measure of the susceptibility of an ecosystem to change, either as a result natural or anthropogenic causes.

In Ke Go proposed nature reserve, the abundance of valuable tree species has been reduced due to long periods of commercial exploitation. The process of natural forest regeneration is slow and, because the relative abundances of different tree species have changed, the species composition of the regenerated forest is likely to be significantly altered. This will affect the overall ecology of the forest and influence the relative abundances and distribution of other species of plants and animals. The forested areas that have been cleared and are now covered in scrub, grassland and abandoned cultivation, will need long periods of time to fully recover, if recovery is even possible. The vegetation in these areas is currently dominated by scrub and pioneer plants, and trees of low economic value, such as *Aporusa dioica, Syzygium* sp. and *Vitex trifolia.*

In less heavily degraded forests, forest regeneration will take an estimated 20 to 50 years. This calculation was based on the abundance of canopy species amongst saplings and immature trees. The abundance of saplings or immature trees was estimated to be 3,000 to 6,000 trees/ha, depending on the quality of the forest. On average, 66% of saplings and immature trees measured less than 1 m, 22% measured between 1 and 3 m, and 12% measured over 3 m. Saplings of species with high economic value, such as *Erythrophleum fordii, Cinnamomum parthenoxylum* and *Madhuca pasquieri*, were notably scarce (Table 22). Nonetheless, regeneration can occur naturally if the forest is effectively protected and timber extraction ceases.

Table 22: Frequency of Selected Rare and Economically Valuable Tree Species

Species	Frequency (%)
Michelia mediocris	12.03
Sindora tonkinensis	10.78
Manglietia fordiana	4.43
Madhuca pasquieri	2.56
Cinnamomum parthenoxylum	1.90
Erythrophleum fordii	0.63

Results based on a survey of 158 plots located at 100 to 150 m intervals, BirdLife-FIPI, 1995

Typicalness

The proposed nature reserve supports a representative example of the formerly extensive broadleaf evergreen forest that once covered most of the level lowlands (between 30 and 500 m) of central Vietnam. The forest block containing Ke Go proposed nature reserve is one of the largest remaining examples of this forest type in the Annamese Lowlands EBA. It supports populations of two of the five bird species that are distributed globally only in this EBA.

Position as an Ecological Unit

Tuyen Hoa Forest Enterprise, covering 20,282 ha, is contiguous with Ke Go proposed nature reserve to the south. Although hydrology and topography vary between these two areas, they can be considered part of the same ecological unit.

3.2 Evaluation of Economic Factors

Watershed Protection
A number of rivers (such as the Rao Con, Rao Mon, Rao Cat and Rao Len) that feed Ke Go reservoir originate within and/or flow through Ke Go proposed nature reserve. Ke Go reservoir has high economic importance, since it supplies domestic water for Ha Tinh town and irrigates 22,000 ha of agricultural land. Similarly, a number of the streams that flow into the Gianh River originate within the boundaries of the proposed nature reserve. The Gianh River is a particularly important source of water for irrigation in Quang Binh province.

In both cases, Ke Go proposed nature reserve plays an important role in maintaining a regular high level of water flow and reducing the impacts of drought or prolonged dry periods for communities in surrounding communes. Severe reduction of forest cover would adversely affect both the quantity and quality of water available for irrigation, which would have severe negative economic impacts on the surrounding agricultural communities.

Wildlife
A large proportion (115 out of 363) of vertebrate species recorded in Ke Go proposed nature reserve have economic value for local people. These species are hunted for their meat and skin, and to produce traditional medicine. Certain species of birds, particularly *Garrulax* spp., are captured and sold as songbirds. Animals of high economic importance include bears, pangolins, tortoises and snakes. The human pressure on many species is judged to be excessive and non-sustainable, and has led to a severe decline in the populations of many species and the local extinction of Asian Elephant and Green Peafowl *Pavo muticus*. Strict protection measures are required to safeguard the survival of populations of economically valuable species within Ke Go proposed nature reserve.

Potential Conservation Value
Ke Go proposed nature reserve has significant conservation value as it encompasses some of the few remaining patches of primary and secondary broadleaf evergreen lowland forest in central Vietnam. Overall levels of biodiversity are impressive but most significant is the fact that Ke Go proposed nature reserve supports the only known population of Vietnamese Pheasant in the world. Furthermore, the conservation value of the area is likely to increase as the forest regenerates and wildlife populations expand. This will, however, only be possible if adequate protection measures are taken, and if Ke Go is officially granted nature reserve status.

The conservation value of Ke Go proposed nature reserve will increase further as remaining forest areas elsewhere in the Annamese Lowlands EBA are further degraded, destroyed or converted to agriculture.

Potential Economic Value
Commercial Forestry. Cam Ky Forest Enterprise logged Ke Go proposed nature reserve for a number of years prior to Ky Anh II and Ha Dong Forest Enterprises beginning their operations. Due to the long periods involved and the intensity of commercial logging, the commercial timber value has declined significantly, to the extent that these forest enterprises are of dubious economic viability. A change in management focus from exploitation to conservation represents the best long-term option for these forest enterprises.

Tourism. The presence of numerous globally threatened and restricted-range bird species could attract a small number of specialised eco-tourists, particularly overseas bird watchers. Overall, however, the proposed nature reserve can be considered to have low potential for general eco-tourism because wildlife populations have been seriously depressed by hunting, to the point at which most mammals and large

birds are impossible to observe. In addition, Ke Go is a lowland area and lacks any major landscape features. Furthermore, Ke Go proposed nature reserve currently has no facilities to accommodate tourists. However, the government plans to develop a tourist site as well as some tourist facilities in the vicinity of Ke Go reservoir. This site could be a starting point to promote visits to Ke Go Nature Reserve by tourists in the interim before the development of tourism facilities in the nature reserve.

Potential Educational Value

Ke Go Nature Reserve could have a role in helping local people to better understand the importance of conservation and the sustainable use of natural resources.

Potential Role of NGOs in Nature Reserve Development

For the management of Ke Go Nature Reserve to be successful, it is essential to involve local communities in management decisions concerning resource use. Whilst the government of Vietnam is responsible for managing, financing and providing the human resources required for the nature reserve, the involvement of NGOs in rural development projects in the nature reserve buffer zone will be essential for the overall success of the protected area. NGOs could assist in providing financial and technical support for environmental education, staff training, rural development activities and the monitoring of wildlife populations. In addition, these organisations could help to resolve problems arising between the nature reserve staff and local communities. At present, NGO-run rural development activities constitute only a small part of the socio-economic development taking place within the buffer zone.

3.3 Rationale for the Establishment of Ke Go Nature Reserve

When established, Ke Go Nature Reserve will:

- protect part of one of the largest remaining blocks of broadleaf evergreen forest in the level lowlands of central Vietnam. This forest type is currently under-represented in the protected areas system;
- conserve a rich ecosystem that is subject to severe human pressure, which endangers the survival of a number of plant and animal species. Protection measures are required in order to conserve this habitat and its associated wildlife;
- provide an ideal site for scientific research to better understand the species composition of lowland evergreen forests, as well as for piloting the implementation of a management plan that takes into consideration the human population and current forest exploitation;
- conserve a representative area of the Annamese Lowlands EBA;
- protect the only known populations of Vietnamese Pheasant and Imperial Pheasant in the world, and provide habitat for five restricted-range and 10 globally threatened bird species;
- protect the watershed of Ke Go reservoir, which irrigates 22,000 ha of agricultural land. Ke Go reservoir is also the main source of domestic water for Ha Tinh town and neighbouring communities; and
- help to protect the quality and quantity of water in the Rao Boi, Chin Xai and Cat Bin streams which are major tributaries of the Ngan Sau River in Ha Tinh province. Similarly, the nature reserve will contribute to the protection of the watershed of the Khe Canh River, which is an important tributary of the Gianh River in Quang Binh province.

4. Constraints on Management

Various factors will have an impact on the management and development of Ke Go Nature Reserve. It is necessary to take them into consideration to mitigate their effects and to formulate actions that will enable the achievement of the stated management objectives.

4.1 Physical Factors

Topography. The low hills and valleys of the nature reserve and the abundance of streams and rivers make the land suitable and attractive for agriculture. Land encroachment for cultivation has already started along Road 22 and is likely to increase if no measures are rapidly put into place. The demarcation of the nature reserve boundary is considered a priority in order to prevent land encroachment and future disputes between the nature reserve staff and local people. Furthermore, it would be advisable to ensure that local communities are aware of both the location of the boundary and the regulations regarding encroachment. Local involvement in decision making, linked with surveillance and enforcement from the start, would certainly mitigate this potential problem.

Climate. The climate is extremely humid with high levels of precipitation all year round and a three-month rainy season from August to October. This exceptionally high level of humidity must be taken into consideration when designing and constructing the nature reserve's infrastructure. The materials used must be high quality, durable and resistant to humidity.

4.2 Biological Factors

Vietnamese Pheasant and Imperial Pheasant Populations. The main conservation objective of the nature reserve is to protect its populations of Vietnamese Pheasant and Imperial Pheasant. Hence, management should focus on these species to ensure that their populations and habitat are adequately protected. It is absolutely crucial that the following issues be considered, as they are known to affect both species.

As with many species, Vietnamese Pheasant and Imperial Pheasant may be very sensitive to human disturbance, especially during the breeding season. All potentially disruptive activities should cease during the breeding season, i.e. the period from February until July. Activities which may affect the pheasant populations are the extraction of rattans and palm leaves, during which activities eggs and chicks can be easily harmed or killed.

No field research has been conducted on either species. Research should focus on identifying the ecological requirements of these species, and modifying management prescriptions accordingly. More data is needed on species distribution, population size and ecology.

Other Forest-dependent Species. Ke Go is one of the few remaining areas in central Vietnam where there are still patches of broadleaf evergreen forest below 300 m, and, as mentioned previously, almost all wildlife living in the area depend upon this habitat. Therefore, it is essential that forest clearance be stopped in order to maintain the richness of the diversity of Ke Go Nature Reserve.

Viability of Animal and Plant Populations. The viability of the populations of a number of animal and plant species in the nature reserve is threatened by the current absence of protection measures within and beyond the boundary of the nature reserve core zone. Many animals (Gaur for example) have large home ranges that extend beyond the boundary of the core zone. Similarly, several globally threatened species, such as Buff-cheeked Gibbon and Vietnamese Pheasant, also have populations in the buffer

zone area. Therefore, the loss of forest surrounding the nature reserve is likely to have significant negative impacts on the nature reserve's wildlife and could lead to the local extinction of certain species. A buffer zone management strategy to protect those species with significant populations outside of the core zone of the nature reserve is thus considered essential.

4.3 Socio-economic Factors

Destruction of Habitat. The existence of many of the plant and animal species of Ke Go Nature Reserve is entirely dependent on the presence of lowland broadleaf evergreen forest. The decline in populations of these species is a direct outcome of the disappearance of their lowland broadleaf evergreen forest habitat. For these species to survive, their habitat must be protected. The exploitation of natural resources must be reduced to sustainable levels in order to preserve the integrity of what is left of the broadleaf evergreen forest in the nature reserve. The first step to preserve the natural habitat of these species should be to forbid timber extraction and fragrant oil distillation within Ke Go Nature Reserve.

Hunting and other Illegal Activities. A number of local people are currently involved in illegal activities such as hunting and rattan collection, which have negative impacts on animal and plant populations. These illegal activities should be halted through strict enforcement. Drafting and developing detailed regulations in collaboration with stakeholders to manage hunting and resource exploitation is critical.

Tuyen Hoa and Ha Dong Forest Enterprises. Most of the animal and plant species within Ke Go Nature Reserve also occur in adjacent forested areas managed by Tuyen Hoa and Ha Dong Forest Enterprises. Exploitation of timber and other forest products within these adjacent forests will, directly or indirectly, affect the fauna of Ke Go Nature Reserve to different degrees, depending on the species involved.

Most of the forest land managed by Tuyen Hoa and Ha Dong Forest Enterprises has been logged at least once. Undisturbed primary forest can only be found on the steep slopes of higher mountains and hills. Nevertheless, this forest, if managed in collaboration with the nature reserve, could act as a natural buffer zone area that could further increase the conservation potential of the nature reserve.

Ke Go Reservoir WPF. Replantation and watershed protection are the main activities of Ke Go Reservoir WPF. In addition, Ke Go Reservoir WPF provides a natural buffer between the nature reserve and human settlement. The existance of this buffer is a definite advantage for the protection of Ke Go Nature Reserve. However, at the moment, most of the trees planted in Ke Go Reservoir WPF are exotic commercial species. It is hoped that an agreement can be reached between the management boards of the WPF and the nature reserve to plant indigenous tree species instead.

Non-compatible Uses of the Nature Reserve. Based on the aim and objectives of Ke Go Nature Reserve, the following activities should be prohibited at the site:

- the extraction of timber, the distillation of fragrant oil, and the collection of firewood;
- the construction of human habitation, with the exception of the infrastructure developments outlined in the management plan;
- the construction of new roads and railways, except those considered necessary for the management of the nature reserve;
- the cultivation of land, the grazing of livestock, slash-and-burn cultivation, and the application of pesticides, insecticides or any chemical fertiliser;
- the extraction of minerals, including topsoil and subsoil;
- the modification of the direction or structures of waterbodies, including their banks and

beds by dredging and/or realignment;
- the undertaking of any activities that result in the pollution of water bodies or forest areas;
- the hunting, chasing, molesting, harassing and/or capturing of wildlife;
- the possession or use of weapons, explosives, traps, nets or poisonous substances; and
- the use of vehicles with the exception of nature reserve vehicles reserved for management and protection purposes.

4.4 Infrastructural and Administrative Constraints

Access and Roads. Six roads enter the proposed nature reserve, including Roads 21 and 22. Most of the roads are in bad condition. Road 22, which links Ky Anh town with Ky Thuong and Ky Tay communes, will be used as the nature reserve's entry point. Another existing road will be used to link two guard stations: Rao Boi 1 and Rao Boi 2. For the other guard stations, former forest enterprise roads will need to be repaired or new roads will need to be built.

Advisory Nature Reserve Management Committee. To be successful, the nature reserve management plan needs the input of local communities and NGOs working in the area. Currently, there is neither an official committee nor a consultative process whereby these groups can influence decision making related to management of the nature reserve. The establishment of such a committee or process is strongly recommended.

5. Management Recommendations

5.1 Protected Area Name

"Ke Go" in Vietnamese means an area covered by wood. Because a large proportion of the nature reserve lies within Ke Go Reservoir WPF, Ke Go was proposed as the nature reserve's name.

5.2 Protected Area Category

It is proposed to include Ke Go in Vietnam's system of Special-use Forests as a nature reserve. This category reflects the importance of the area for the conservation of biodiversity and habitats, and its lack of potential for tourism development.

5.3 Management Unit

Ke Go Nature Reserve should fall under the jurisdiction of Ha Tinh Provincial People's Committee, via the provincial FPD and FDD. These two departments should, on behalf of the government, be in charge of staffing and expenditure, as well as seeking potential sources of funding. They should also be responsible for the completion of the economic and technical feasibility studies for the nature reserve.

5.4 Nature Reserve Zoning

Ke Go Nature Reserve Boundary
The nature reserve will cover 24,801 ha in Cam Xuyen, Ky Anh and Huong Khe districts, Ha Tinh province. The boundary has been defined so as to follow, where possible, natural features, such as streams, rivers and mountain ranges, so that it can be easily recognised by local people. The boundary also takes into consideration the remaining natural habitat and ecological requirements of Vietnamese Pheasant. The northern boundary follows the Rao Cat stream, crosses Ke Go reservoir, and then follows the Rao Con stream to Dong Dun peak (215 m). From there, the western boundary follows the mountain ridge between the Rao Boi and Rao Rong valleys to the south, until it reaches the border between Ha Tinh and Quang Binh provinces, which forms the southern boundary of the nature reserve. The eastern boundary heads north to the Khe Canh River, and, continuing north, includes the Cat Bin watershed.

Strict Protection and Forest Rehabilitation Areas
The nature reserve should be divided into two areas: a strict protection area and a forest rehabilitation area (Map 7). The strict protection area, which should cover 20,537 ha, will account for most of the nature reserve's area, whilst the forest rehabilitation area will cover only 4,264 ha (Table 23).

Table 23: Strict Protection and Forest Rehabilitation Areas

Forest Type	Strict Protection Area (ha)	Forest Rehabilitation Area (ha)
Rich Forest	3,245	0
Medium Forest	3,182	2,246
Poor Forest	4,372	32
Regenerating Forest	9,511	1,971
Plantation Forest	149	0
Non-forest	78	15
Total	20,537	4,264

Strict Protection Area

The purpose of the strict protection area is to provide maximum protection to natural habitats and wildlife, with a special emphasis on the population of Vietnamese Pheasant occurring within the nature reserve. In this area, all disruptive human activities are completely forbidden. The management regime for the strict protection area is presented in Table 24. The strict protection area should be divided into three sub-areas:

(a) **Rao Boi Sub-area.** The Rao Boi sub-area covers 5,905 ha in the south-west of the nature reserve. The sub-area is currently under the management of Ha Dong Forest Enterprise. There are some remaining patches of lightly disturbed primary forest above 300 m. However, all the forest below 300 m has been exploited.

(b) **Ke Go Reservoir WPF Sub-area.** The Ke Go Reservoir WPF sub-area covers 7,121 ha and is comprised of plantation forest, primary forest with varying degrees of disturbance and regenerating secondary forest following long-term timber exploitation. Sambar *Cervus unicolor*, Barking Deer *Muntiacus muntjak*, Wild Boar *Sus scrofa*, macaques *Macaca* spp. and, even, Vietnamese Pheasant are reported from this area by local people. Indeed, this sub-area has some of the highest levels of biodiversity in the nature reserve, and the management board should, therefore, focus on establishing effective control and protection measures to conserve its intrinsic richness.

(c) **Bac Toc Mountain/Gat Che Me Valley Sub-area.** The Bac Toc mountain/Gat Che Me valley sub-area covers 7,511 ha and is currently managed by Ky Anh II Forest Enterprise. This area supports a high biodiversity of plants and wildlife, including Vietnamese Pheasant.

Table 24: Management Regime for the Strict Protection Area

Activity	Impact on Ecosystem	Impact on Vietnamese Pheasant	Management Status
Logging	Change in species composition; habitat loss	High	Strictly prohibited
Firewood collecting	Retarded natural regeneration	High	Strictly prohibited
Fragrant oil distilling	Forest degradation; pollution of waterbodies	High	Strictly prohibited
Hunting	Decline in animal populations; loss of species	Medium / high	Strictly prohibited
Livestock grazing	Retarded natural regeneration	Medium	Strictly prohibited
Rattan collecting	Disturbance to forest understorey	High, mainly in breeding season (February to July)	Permitted except during the breeding season
Palm leaf harvesting	Unknown	Low / medium	Sustainable exploitation permitted
Medicinal plant collecting	Unclear; potential loss of plant species	Low / medium permitted	Sustainable exploitation
Orchid collecting	Unclear; potential loss of orchid species	Medium	Sustainable exploitation permitted
Fishing (without explosives)	Unknown	Low	Sustainable exploitation permitted
Honey collecting	Unknown	Low	Sustainable exploitation permitted

Forest Rehabilitation Area. The forest rehabilitation area covers 4,264 ha of forests that have suffered from high levels of exploitation and where levels of biodiversity are generally low. Natural regeneration could be possible but the process will be extremely slow. To accelerate the natural regeneration process, active rehabilitation activities should be conducted.

Rehabilitation activities should aim to increase forest cover as well as to expand the area of suitable habitat for a number of species inhabiting Ke Go Nature Reserve. The first step should be to distinguish those areas with the capacity for natural forest regeneration from those where there is a need for active regeneration, involving the planting of indigenous tree species. Protection measures in the forest rehabilitation area should include control of the expansion of grazing land and cultivation and active prevention of forest fires. Since the forest rehabilitation area is located near densely populated areas, rehabilitation activities will need collaboration with and the involvement of local residents to be successful. Clear enforcement procedures also need to be established and acknowledged by local people.

Buffer Zone

A buffer zone is usually "*the zone outside of a national park or corresponding reserve where the use of natural resources is limited and/or where special development measures are encouraged to increase the reserve or park's value to the region."* (Sayer 1991).

In Vietnam, however, buffer zones are rarely areas where the use of natural resources is limited. Instead, buffer zones usually include land that is used and exploited by local communities and forest enterprises. Hence, the proposed buffer zone of Ke Go Nature Reserve comprises agricultural land, scrub, abandoned cultivation and land managed by forest enterprises. The proposed buffer zone comprises seven communes and includes land managed by four forest enterprises in Ha Tinh province (Ha Dong, Cam Xuyen, Ky Anh II and Ke Go Reservoir WPF) and one in Quang Binh province (Tuyen Hoa) (Tables 25 and 26). In some respects, the presence of these forest enterprises can be considered an advantage since they have already developed management plans for replantation and forest protection on their land. For instance, Ke Go Reservoir WPF Forest Enterprise is already involved in planting trees around Ke Go reservoir. Such initiatives can provide a larger area of habitat for wildlife than the nature reserve alone.

Table 25: Total Area and Forest Cover in the Buffer Zone Communes

Commune	Total Area (ha)	Forest Land (ha)	Forest Land with Forest (ha)	Bare Land (ha)
Cam My	1,786	826	62	764
Cam Thinh	2,150	1,160	70	1,090
Cam Son	1,887	618	80	538
Cam Lac	1,254	482	32	450
Ky Tay	7,055	3,015	47	2,968
Ky Thuong	4,848	4,013	20	3,993
Huong Trach	2,505	1,816	222	1,594

Source: Cam Xuyen, Ky Anh and Huong Khe District Statistics

Table 26: Total Area and Forest Cover in the Forest Enterprises and WPF in the Buffer Zone

Forest Enterprise/WPF	Total Area (ha)	Forest Land (ha)	Forest Land with Forest (ha)	Bare Land (ha)
Ky Anh II Forest Enterprise	24,000	20,115	8,906	11,209
Ha Dong Forest Enterprise	24,591	14,374	24,191	9,457
Cam Xuyen Forest Enterprise	5,800	-	-	2,694
Tuyen Hoa Forest Enterprise	20,282	20,182	19,846	100
Ke Go Reservoir WPF	22,354	12,767	12,767	9,587

Currently, the level of exploitation of natural resources by surrounding communities is high. Despite the fact that the majority of people inhabiting the buffer zone live relatively far from the nature reserve (only in Ky Thuong commune do people cultivate land adjacent to the nature reserve), they often journey to the nature reserve to collect forest products.

The purpose of the buffer zone is thus to create a transitional area between the strictly protected nature reserve and the intensively used land near inhabited areas. The management board must manage the nature reserve in a way that takes the activities of local people into consideration, and involves local communities in the establishment and management of the nature reserve and the implementation of the buffer zone development programme. The latter will require reciprocal agreements and commitments between the nature reserve management board and local communities, with respect to both conservation initiatives and socio-economic development programmes. This approach will, hopefully, foster acceptance of the nature reserve.

The buffer zone programme should aim to enhance the socio-economic conditions of local people in order to gradually reduce their dependence on natural resources. It should deal with both environmental and socio-economic issues, such as water supply, roads, education, health and credit schemes. Moreover, social forestry activities, including reforestation, forest protection and development of a sustainable forest economy should be promoted as a way to fulfil both conservation and socio-economic objectives.

5.5 Management Aim and Objectives

The aim of Ke Go Nature Reserve is to protect animal populations and their habitats, especially Vietnamese Pheasant. In order to succeed, destructive activities such as hunting and over-exploitation of natural resources should be curtailed. Currently, many local residents depend upon exploitation of natural resources for a large proportion of their income. Alternative sources of income need to be developed in order to stop these incompatible activities. Therefore, for the project to be effective, it is essential that local communities be involved in the implementation of the Ke Go Nature Reserve Management Plan.

Specific management objectives should be to:

- protect and maintain the biodiversity and natural resources of Ke Go Nature Reserve;
- protect the populations of globally threatened and endemic plant and animal species occurring within the boundary of the nature reserve, especially Vietnamese Pheasant;
- protect the watersheds of Ke Go reservoir and the Rao Net River;
- increase forest cover and reduce soil erosion through appropriate forestry programmes within the forest rehabilitation area;
- work together with the community to build awareness and improve knowledge of conservation issues, with regard to the short and long-term benefits of conservation. With some restrictions, local people should be allowed to harvest natural resources in certain zones; and
- take the necessary steps to ensure that local communities are involved in the development of the nature reserve and to facilitate their active contribution to its protection.

5.6 Management Plan and Prescriptions

The Management Plan for Ke Go Nature Reserve encompasses six main programmes:

(a) infrastructure development programme;
  (i) boundary demarcation

(ii) headquarters and guard station construction
(iii) road and trail upgrading

(b) conservation and protection programme;
(i) globally threatened and endemic species
(ii) forest rehabilitation

(c) buffer zone development programme;
(i) forestry
(ii) agriculture
(iii) infrastructure
(iv) education
(v) public health

(d) scientific research and monitoring programme;
(e) education and awareness programme; and
(f) administrative management programme
(i) directorate
(ii) protection department
(iii) technical and financial department
(iv) administration department
(v) staff training
(vi) facilities and equipment
(vii) framework for management and development of the nature reserve.

Infrastructure Development Programme
This programme deals with meeting the minimum infrastructure requirements of the nature reserve. This programme must be completed during the initial phases of the management plan's implementation.

(a) Boundary Demarcation

The proposed boundary of Ke Go Nature Reserve is defined in Section 5.4. However, this proposal should be submitted to local communities and relevant local authorities in order to involve them in reaching a final decision. The management board, together with the leaders of the relevant districts and communes, should organise a workshop where all relevant parties, from local people to provincial authorities, would be given a chance to discuss the proposed zoning and management regulations. The purpose of this workshop should be to reach a consensus about the boundary, zoning and management regulations of the nature reserve, and to formalise this consensus through written agreements.

Objectives. To organise and carry out a workshop to agree upon the boundary and zoning of the nature reserve. To demarcate the boundary of the nature reserve on the ground. To install signboards displaying the management regulations of the nature reserve.

Management Considerations. It is important that the boundary of the nature reserve be clearly marked, especially in areas where the population density is high (e.g. Ky Thuong commune). This will ensure that everyone easily recognises the boundary of the nature reserve. The boundary pillars should be made of concrete and set at a spacing of 100 to 150 m. A five-metre-wide belt of trees, should be planted along the boundary, especially where there are no natural demarcations, such as hills or rivers.

Signboards displaying the nature reserve's regulations should be positioned near the headquarters and guard stations. Signboards should also be placed in areas adjacent to densely populated communes, where villagers have easy access to the nature reserve.

Activities
- survey of the boundary of the nature reserve;
- workshop to discuss the proposed boundary with relevant parties;
- setting of boundary pillars; and
- construction of signboards, particularly in the south-east of the nature reserve.

Responsibility for Implementation. The nature reserve management board and the senior guards of the guard stations.

(b) Headquarters and Guard Station Construction

Objective. To provide adequate living and working conditions for the staff to carry out their administrative, management, conservation and patrol duties, especially in the strict protection area.

Management Considerations. The nature reserve headquarters should be situated in Ky Thuong commune where Road 22 enters the nature reserve (Map 7). The advantages of this location are that it is relatively close to Ky Anh town (28 km by road), adjacent to two roads entering the nature reserve, and within relatively easy to reach of all the guard stations.

Activities
- preparation of architectural plans with costing for each building;
- formulation of construction schedule, purchase of materials and preparation of construction sites;
- construction of nature reserve headquarters;
- installation necessary utilities, such as electricity and water; and
- repair and upgrading of old guard stations, and construction of new guard stations:

  (i) *Rao Boi Guard Station I.* Location: near Road 21 and the border between Ha Tinh and Quang Binh provinces
  (ii) *Rao Boi Guard Station II*: Location: at the foot of Dong Dun mountain (215 m), where Road 21 crosses the border between Cam Xuyen and Huong Khe districts
  (iii) *Ke Go Reservoir Guard Station:* Location: to the north-east of Ke Go reservoir, at the site of the existing FPD guard station for Ke Go Reservoir WPF
  (iv) *Rao Cai Guard Station:* Location: in the centre of the northern boundary of Ke Go Nature Reserve, where the Rao Cai stream crosses the road to Cam Thinh commune
  (v) *Cay Tram Junction Guard Station:* Location: where Road 22 meets the timber road from the Bac Toc-Gat Che Me area
  (vi) *Cam Thinh Guard Station:* Location: in the north of the nature reserve, near a former timber road from the Rao Cai area
  (vii) *Ky Tay Guard Station*: Location: near a former timber road from Ky Tay commune to the nature reserve boundary.

Responsibility for Implementation. The nature reserve management board with the collaboration of the provincial authorities.

(c) Road and Trail Upgrading

Objectives. To renovate, restore and upgrade Road 22, which leads to the nature reserve headquarters. To renovate, restore and upgrade the roads connecting the guard stations, including

the ones that link the guard stations with the headquarters.

Management Considerations. The nature reserve headquarters is 28 km from Ky Anh town along Road 22, which is a route frequently used by people from Ky Thuong and Ky Tay communes. Road conditions are poor, and the road is practically impassable during the rainy season. Currently, few people use the section of Road 22 which lies within the nature reserve because of its poor condition but, if it is upgraded, the number of patrols to control illegal activities will need to be increased. It will also be necessary to upgrade Road 21, and to repair a number of bridges and fords along the route, particularly along the section within the nature reserve, since this will be used for patrols.

Activities
- upgrading of Road 22 from Ky Anh town to the nature reserve headquarters;
- repair and upgrading of roads and trails within the nature reserve boundary; and
- assessment of the potential environmental and social impacts of upgrading roads in and around the nature reserve, and identification of appropriate mitigation measures to be included in the management plan.

Responsibility for Implementation. The nature reserve management board and the provincial and district people's committees.

Conservation and Protection Programme

This programme aims to foster adequate measures to safeguard the wildlife and habitats of the nature reserve, and to prevent any detrimental impacts, mostly of human origin, on the forest ecosystem and wildlife.

(a) Globally Threatened and Endemic Species

A number of species living in the proposed nature reserve require special attention because of their globally threatened status. Of particular concern is the globally threatened and endemic Vietnamese Pheasant, whose protection is the primary objective of the nature reserve.

Objectives. To ensure adequate protection of globally threatened and endemic species of plants and animals, with the aim of maintaining and, if possible, increasing their population sizes. Special emphasis should be placed on increasing the population size of Vietnamese Pheasant. To limit the negative environmental impacts of human activities in and around Ke Go Nature Reserve.

Management Considerations. Protecting wildlife together with the conservation of all important ecosystem functions is the aim of the nature reserve. Regular patrols, particularly around the periphery of the nature reserve, can prevent encroachment, and control hunting and other illegal exploitation of natural resources within the nature reserve.

Activities
- preparation of weekly, monthly and annual work schedules for the forest guards. Special attention must be given to ensuring that an adequate number of guards patrol areas along the boundary and along the roads leading into the nature reserve as human impact is likely to occur in these areas;
- strict control of hunting and other illegal activities within the nature reserve boundary (Table 24); and
- enforcement of all regulations regarding the use of natural resources in the nature reserve.

Responsibility for Implementation. The nature reserve protection department heads and the senior guards, under the guidance of the nature reserve management board.

(b) Forest Rehabilitation

Objectives. To strive, through appropriate measures, to rehabilitate the forest ecosystem in areas where there have been severe human impacts, in order to increase the availability of potential habitats for wildlife, with particular emphasis on Vietnamese Pheasant.

Management Considerations. The management board should define a nursery area for the cultivation of tree saplings. Precaution should be taken to prevent fire within the nursery area as well as in the strict protection area. The selection of tree species should reflect the natural composition of the forest in the nature reserve.

It has been suggested that various kinds of valuable indigenous trees such as *Erythrophleum fordii, Michelia mediocris, Sindora tonkinensis, Manglietia fordiana, Madhuca pasquieri* and *Aquilaria crassna* be grown. Saplings should be planted so as to create a mixed forest similar to the former natural forest. Tree planting should be carried out in the most severely degraded parts of the forest rehabilitation area.

Activities
- scientific research to identify the course of action necessary to foster the rehabilitation of degraded and denuded forest areas;
- selection of suitable species and high-quality strains of saplings;
- cultivation of tree saplings; and
- replantation of forest.

Responsibility for Implementation. The technical experts, the forest guards and the relevant forest enterprises.

Buffer Zone Development Programme

The socio-economic development of communities in the buffer zone is essential if the objectives of Ke Go Nature Reserve are to be met. This programme will concentrate its activities in the seven communes in the buffer zone.

Objective. To identify and implement socio-economic development projects that will provide direct assistance to local communities and promote the sustainable use of natural resources within the buffer zone and the nature reserve.

Management Considerations. The buffer zone development programme mainly concerns economic issues linked to timber harvesting by forest enterprises and the socio-economic development of local communities.

Since the buffer zone lies outside the nature reserve, most activities are the responsibility of the relevant authorities at commune, district and provincial level or the forest enterprises. Therefore, the nature reserve management board must co-ordinate with these organisations when designing, developing and implementing the buffer zone development programme. Activities in the buffer zone should, nevertheless, comply with management regulations concerning the prohibition of wildlife hunting and timber extraction.

The estimates of expenditure for activities in the buffer zone have not yet been completed. It is hoped

that private organisations and international NGOs will become involved in the socio-economic development of the seven communes in the buffer zone.

Responsibility for Implementation. Responsibility for implementing the buffer zone development programme will be shared between the following organisations in Ha Tinh and Quang Binh provinces:

- the provincial and district peoples' committees;
- the provincial, district and commune women's unions;
- the provincial FDDs;
- the provincial FPDs;
- the provincial departments of agriculture and rural development;
- Ky Anh II, Ha Dong, Cam Xuyen and Tuyen Hoa Forest Enterprises and Ke Go Reservoir WPF; and
- NGOs involved in rural development.

(a) Forestry

Activities.

- creation of suitable conditions for forest enterprises and local people to actively participate in reforestation;
- cessation of timber extraction within Ke Go Nature Reserve and near the boundary;
- proposal for a new development strategy for local communities to reduce the use of the forest's natural resources and its derived products;
- modification of the forest enterprises' objectives, strategy and management plans to comply with the objectives of the nature reserve;
- cessation of planting exotic tree species, especially within the nature reserve; and
- prevention of grazing of domestic animals within Ke Go Nature Reserve and the lands managed by the forest enterprises.

(b) Agriculture

Activities

- involvement of local communities in planning and implementing the buffer zone development programme;
- allocation of bare forest land outside of the forest enterprises to households, for agriculture or replanting with appropriate native tree species;
- identification of appropriate native tree species that can meet the requirements of local communities for fruit, firewood, oil, etc.;
- cultivation of economically valuable tree and plant species;
- introduction of high-yielding strains of rice, upgrading of the irrigation system, and promotion of efficient use of water, in order to increase rice production;
- development of animal husbandry;
- creation of suitable conditions for expanding household cultivation of tree species and, possibly, provision of subsidised tree seedlings;
- initiation of credit schemes for poor households through the district women's unions; and
- monitoring of development projects initiated.

(c) Infrastructure

Activities

- construction, upgrading and repair of roads, bridges and drains within the buffer zone.

(d) Education

Activities

- construction of sufficient classrooms for pupils and improvement of teachers' living and working conditions.

(e) Public Health

Activities

- repair and upgrading of current public health facilities as necessary;
- implementation of a family planning programme; and
- provision of safe drinking water to all households.

Scientific Research and Monitoring Programme

In order to develop a comprehensive conservation strategy to protect Vietnamese Pheasant and other globally threatened species, it is necessary to have up-to-date information on the status and distribution of plant and animal populations in the nature reserve. In particular, research should focus on understanding the biology and ecology of Vietnamese Pheasant. The scientific research and monitoring programme will help to ensure that the management plan is based on sound information.

Objective. To improve knowledge on the flora and fauna of the nature reserve, in particular Vietnamese Pheasant and its habitat.

Management Considerations. One primary objective of Ke Go Nature Reserve is to protect Vietnamese Pheasant and, if possible, to increase the size of its current population, as it is the only known population in the world. Hence, the 5 to 10 year programme should focus on better understanding the status, distribution, biology and ecology of this species.

Activities

- research on the biology and ecology of Vietnamese Pheasant, including its distribution, home range, habitat requirements, population size, natural predators and competitors, and sensitivity to environmental change;
- identification of the key factors threatening the species' continued survival, in order to design the most appropriate conservation measures;
- baseline surveys on the fauna and flora of the nature reserve as required;
- monitoring of forest regeneration and rehabilitation processes;
- training of technical experts and management board members in order for them to be able to evaluate the development of the scientific research and monitoring programme; and
- formation of a consultative body of scientific advisors and promotion of collaboration with international scientists.

Responsibility for Implementation. The directors and technical staff of the nature reserve are responsible for co-ordinating the research programme, in collaboration with scientists from BirdLife International and FIPI.

Education and Awareness Programme

Objective. To increase the awareness of environmental and conservation issues amongst local communities and leaders.

Management Considerations. In order to decrease the human pressure on the nature reserve and to protect its flora and fauna, it is necessary to raise people's awareness and understanding of the importance

of the nature reserve, particularly the economic benefits to their communities. For example, a project implemented by Oxfam Great Britain has been successful in raising teacher and student awareness about sustainable natural resource management and the value of forest plantation and protection. This international NGO has financed a project that encourages secondary schools in Ky Anh district to plant forest around their schools.

Activities

- establishment of a network of nature reserve staff, teachers in the buffer zone and staff from Oxfam Great Britain;
- design of appropriate education and conservation awareness programmes for school children and adults;
- design and production of educational materials, such as books, magazines and posters, to implement the programme; and
- implementation of the approved programme.

Responsibility for Implementation. The management board of the nature reserve.

Administrative Management Programme

Objective. To ensure that there are sufficient professional and technical staff to fulfil all required functions, including the implementation of protection and rehabilitation activities.

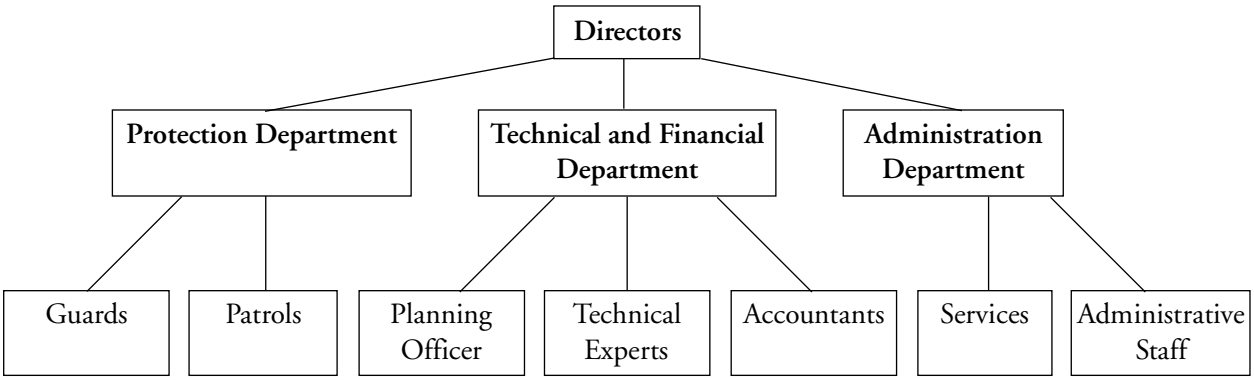

Figure 1: Schematic Diagram of Nature Reserve Staff Hierarchy

Management Considerations. The establishment and management of Ke Go Nature Reserve are diverse and complex activities. They require understandings of forest ecosystem functions and management procedures, as well as skills in both participatory management and enforcement techniques. A positive attitude toward conservation work and flexibility regarding working hours are also essential. All staff must receive salaries and benefits that reflect their responsibilities and functions, and that are in accordance with similar public sector positions in Vietnam.

Activities

- development of terms of reference and job specifications for all nature reserve staff;
- recruitment and training of staff; and
- provision of necessary equipment.

Responsibility for Implementation. The directors of the nature reserve

(a) Directorate

Personnel. One director and two vice-directors

Functions. The director is the highest authority in regard to the management of the nature reserve. This individual must possess strong leadership and management skills as well as an appropriate professional and academic background.

The principal task of the director is to organise, direct and supervise the work of the management board. The director is responsible for the elaboration and implementation of the nature reserve management plan, as outlined in the feasibility study. The director must also ensure that all relevant government policies and regulations are complied with. The director must coordinate with local authorities and communities during all stages of the establishment and management of the nature reserve.

The vice-directors assist the director and, in the absence of the director, are responsible for all activities in the nature reserve.

(b) Protection Department

Personnel. One department head, one deputy head, one legislative officer, one senior guard for each of the seven guard stations and the mobile unit, and 25 to 30 forest guards.

Functions. The protection department is responsible for the protection and conservation of the forest and its flora and fauna in accordance with the regulations related to Special-use Forests. Under the guidance of the director and vice-directors, the protection department is responsible for coordinating with Ha Tinh and Quang Binh Provincial FDDs and the protection departments of other Special-use Forests, as well as with local authorities and the police.

The strict enforcement of all nature reserve regulations is this department's main responsibility. The department's principal daily tasks are to patrol the nature reserve, prevent violations of regulations and stop all illegal activities. Of special concern are illegal hunting, timber extraction, fires and fragrant oil distillation. The department should also participate in community conservation activities to raise local people's awareness about natural resources, to mobilise local people to take an active role in conservation, and to foster a change in behaviour towards sustainable use of natural resources.

The legislative officer must be thoroughly knowledgeable about government regulations related to forest protection and Special-use Forests. The legislative officer should be involved in raising the awareness of all important regulations and laws among the nature reserve staff and local communities.

The senior guards are responsible for the implementation of protection activities in the nature reserve under the guidance of the head of the protection department and the nature reserve directors. The senior guards are responsible for recording and reporting all violations of nature reserve regulations to their superiors.

The forest guards must be prepared to work in remote areas under basic living conditions. They must strictly follow the laws and regulations of the nature reserve and obey the orders of their superiors. Furthermore, they must have strong interpersonal skills as they will have to establish and maintain excellent relations with local communities.

(c) Technical and Financial Department

Personnel. Two technical experts, one planning officer and two accountants.

Functions. The technical and financial department should assist the director in monitoring construction work and the implementation of the short and long-term activities detailed in the nature reserve management plan.

The two technical experts should be responsible for identifying appropriate courses of action for habitat rehabilitation. They should also conduct scientific research in collaboration with national and international organisations.

This department is also in charge of preparing the nature reserve budget, and monthly, quarterly and annual financial reports. The staff of the technical and financial department should be under the direct supervision of the nature reserve directorate.

(d) Administration Department

Personnel. One human resources officer, one administrative clerk, one nurse and two drivers.

Functions. This department deals with the additional services required for the nature reserve to function adequately. It includes a human resources officer responsible for hiring staff, an administrative clerk responsible for basic administrative duties, a nurse responsible for the health of staff members and two drivers for the nature reserve's vehicles.

(e) Staff Training

Objectives. To ensure that all staff possess the requisite knowledge and skills to enable them to carry out their duties.

Management Considerations. Most staff working in protected areas in Vietnam understand little about conservation and protection issues. It is, therefore, essential to provide them with at least a minimal understanding of the management of protected areas. Staff could be trained on site or at the training centre at Cuc Phuong National Park. The directors and heads of the protection department should participate in training courses offered by the Global Environmental Facility, an international programme that provides training in the field of conservation and the environment in Vietnam.

It is hoped that, through international financial assistance, it will be possible to send nature reserve staff abroad for advanced training in protected area management, with the objective of strengthening their managerial and research capabilities. For training to be appropriate, the management board, together with the staff, should identify those study areas where further learning is most needed.

Activities
- identification of appropriate training courses for different nature reserve staff;
- enhancement of staff knowledge of protected area management and conservation issues through training, research and studies to the level necessary to carry out their jobs; and
- provision of on-going training for all staff.

Responsibility for Implementation. The directors of the nature reserve.

(f) Facilities and Equipment

Objectives. To provide the necessary documents and information to the management board. To

supply the necessary tools, equipment and facilities to the nature reserve staff so that they are able to fulfil their daily duties.

Management Considerations. Establish regulations for the supply and distribution of equipment in order to minimise misuse and ensure good maintenance of all facilities and equipment.

Activities
- purchase of materials and equipment required to erect and repair boundary pillars;
- purchase of tools and materials required to build and repair the roads within the nature reserve;
- purchase of necessary supplies and equipment for the management board and nature reserve staff so that they are able to carry out their duties;
- purchase of educational materials and supplies for the education and awareness programme; and
- purchase of equipment for the scientific research and monitoring programme.

Responsibility for Implementation. The provincial FDD and the nature reserve management board.

(g) Framework for Management and Development of the Nature Reserve

The degree of dependence of local people on the natural resources of Ke Go Nature Reserve is high, and this often results in their overexploitation. Many local people will experience strong negative impacts following the establishment of the nature reserve, as many income-generating activities will be controlled or prohibited. It is, therefore, essential to involve local people from the beginning in developing a strategy to both protect the nature reserve and enhance the benefits to local communities of its establishment. If local people actually benefited through increased employment opportunities and improved social facilities, they would be more likely to support the establishment of the nature reserve and take some responsibility with regard to conservation issues.

The participation of local communities should be formalised through the creation of an advisory committee, and through public meetings and workshops in order to provide a forum for local people to express their concerns and to formulate solutions.

Objective. To improve the participation of local community members and leaders in the development and implementation of management and protection activities in Ke Go Nature Reserve.

Management Considerations. An management advisory committee for the nature reserve, including representatives of Tuyen Hoa, Ha Dong and Ky Anh II Forest Enterprises, and the provincial, district and commune people's committees and women's unions, should be established and meet regularly to discuss the development of the nature reserve.

Activities
- organisation of a meeting for representatives of communes in the buffer zone to introduce the management plan for Ke Go Nature Reserve and to discuss potential shared responsibilities, with regard to the buffer zone area in particular;
- establishment of a nature reserve management advisory committee and identification of its members; and
- regular meetings to share experiences, opinions and ideas about the protection, management

and development strategy of the nature reserve.

Responsibility for Implementation. The provincial people's committee, the provincial FDD or an NGO, in collaboration with the nature reserve management board.

5.7 Management Plan Implementation

Based on this report, a number of activities have been identified that should be carried out during the first five-year plan. However, the relevance of each activity should be reviewed during the implementation period and the management plan be revised where necessary in order for the document to remain relevant to the current situation during the entire period of implementation.

Workplan
A five-year workplan for the management of Ke Go Nature Reserve is provided in Table 27. The cost estimates and investment required to implement all programmes is provided in Table 28 and schedule of activities in Table 29. Cost estimates for a five-year buffer zone development programme are presented in Table 30. Additional socio-economic data collected during the survey and used to formulate the buffer zone development programme are presented in Appendix 4.

Monitoring and Evaluation
A report evaluating the effectiveness and impacts of the nature reserve's activities will be prepared every year by the management board. On the basis of this annual evaluation, the workplan will be modified accordingly, in order to reflect current conditions.

International Co-operation
At an early stage, FIPI and BirdLife International will identify potential donors to fund the implementation of the management plan for Ke Go Nature Reserve. International funding is mainly required to construct nature reserve infrastructure, provide training for nature reserve staff and further develop and implement the buffer zone development programme.

Table 27: Five-year Workplan for Ke Go Nature Reserve

Programme	Project	Activities	Year 1 ****	Year 2 ****	Year 3 ****	Year 4 ****	Year 5 ****	Comments
Infrastructure development	Boundary demarcation	Hold demarcation workshop	****					
		Survey nature reserve boundary	****	**				
		Set boundary pillars		****				
		Construct signboards			****			Local involvement
		Plant trees along boundary		****				
	Headquarters construction	Select site	**					
		Prepare architectural plans	**					
		Prepare site, materials and labour	*	*				
		Construct headquarters		**				
		Install electricity and water supply		**				
	Guard stations construction	Select sites	**					
		Prepare architectural plans	**					
		Prepare sites, materials and labour	*	*				
		Construct guard stations		**				
		Install electricity and water supply		*	*			
	Road and trail upgrading	Survey			****			
		Prepare road plan				**		
		Prepare sites, materials and labour required				**		
		Upgrade, repair and maintain roads					****	
Conservation and protection	Globally threatened and endemic species	Patrol boundary and prevent encroachment and illegal trespassing			**	****	****	
		Patrol trails and prevent illegal activities			**	****	****	
		Introduce regulations to local communities	****	****	*	*	*	
	Forest rehabilitation	Survey sites and evaluate requirements			****			Technical expert
		Select tree species for plantation			****			Technical expert
		Prepare nursery for tree saplings			****			
		Plant and take care of tree saplings			*	****	****	Local communities

Programme	Project	Activities	Year 1 ****	Year 2 ****	Year 3 ****	Year 4 ****	Year 5 ****	Comments
Buffer zone development	Forestry	Decide buffer zone boundaries with FPD and FDD	****					
		Review forest management and protection plans in the buffer zone	****					
	Rural development	Discuss the development and protection of the buffer zone with local communities	****					
		Design rural development activities	**	****	**			Approach international assistance
		Implement rural development activities		**	****	****	****	
Education and awareness	Education and awareness	Design and produce materials, including posters, photographs and drawings			****	****	****	Approach international assistance
		Educational extension for schools			****	****	****	
		Conservation awareness linked to rural development activities			****	****	****	
Scientific research and monitoring	Scientific research	Design and conduct scientific studies			****	****	****	Approach international assistance
Administrative management	Recruitment of staff	Recruit staff and draw up terms of reference and work schedules	****	****	****	****	****	
	Staff training	Train staff in relevant fields			****	****	****	
	Facilities and equipment	Purchase equipment for boundary demarcation	****					
		Purchase equipment for the guard stations		****				
		Purchase educational materials		****				
		Purchase scientific equipment		****				
	Framework for management and development of the nature reserve	Organise meetings with local communities	****					
		Establish a nature reserve management advisory committee involving local representatives	****					
		Set up regular meetings between the management board and the management advisory committee	****	****	****	****	****	

Table 28: Cost Estimates for the Five-year Management Plan (in VND million)

Item	Quantity	Unit Price	Cost
1. Infrastructure development programme			**5,882**
Meetings with forest enterprises and local communities	14	2	28
Headquarters	500 m^2	1.2	600
Guard stations	7 x 60 m^2	1.0	420
Boundary pillars	300	0.5	150
Signboards	25	3	75
Road and trail upgrading	70 km	30	2,100
15W mobile phone	1	10	10
6W mobile phones	5	6	30
Binoculars	6	5	30
Camera	1	20	20
Compasses, altimeter	7	2	15
Generators	9	8	72
Car (Toyota Land Cruiser)	1	850	850
Truck	1	200	200
Motorbikes (Minsks)	10	8	80
Motor boats	2	35	70
Vehicle registration and maintenance	-	-	300
Vehicle and personal insurance	-	-	250
Petrol	-	-	370
Computer and printer	1	20	20
Photocopier	1	25	25
Telephone	1	17	17
Other office equipment	-	-	150
2. Educational and awareness programme	5 yrs	50	**250**
3. Conservation and protection programme			**2,372**
Land allocation for natural regeneration	2,292 ha	0.39	894
Reforestation with native tree species	15 ha	3.9	58
Land allocation for active rehabilitation	2,000 ha	0.71	1420
4. Scientific research and monitoring programme			**700**
Baseline surveys	2 yrs	100	200
Monitoring forest rehabilitation	5 yrs	50	250
Studies of Vietnamese Pheasant	5 yrs	50	250
5. Administrative management programme	50 yrs	12	**3,000**
6. Contingency			**100**
Total			**12,304**

Table 29: Disbursement Schedule for the Management Plan (in VND million)

Item	1996	1997	1998	1999	2000	Total
1. Infrastructure development programme						**5,882**
Meetings with forest enterprises and local communities	28					28
Headquarters		600				600
Guard stations		420				420
Boundary pillars		150				150
Signboards			75			75
Roads and trail upgrading		1000	500	600		2,100
15W mobile phone		10				10
6W mobile phones		30				30
Binoculars		30				30
Camera		20				20
Compasses, altimeter		15				15
Generators		72				72
Car (Toyota Land Cruiser)		850				850
Truck		200				200
Motorbikes (Minsks)	80					80
Motor boats		35	35			70
Vehicle registration and maintenance	50	50	100	100		300
Vehicle and personal insurance	62.5	62.5	62.5	62.5		250
Petrol		97	91	91	91	370
Computer and printer		20				20
Photocopier		25				25
Telephone		17				17
Other office equipment		150				150
2. Education and awareness programme			150	50	50	**250**
3. Conservation and protection programme						**2,372**
Land allocation for natural regeneration	178.8	178.8	178.8	178.8	178.8	894
Reforestation with native tree species		58.4				58
Land allocation for active rehabilitation	284	284	284	284	284	1420
4. Scientific research and monitoring programme						**700**
Baseline survey		100	100			200
Monitoring forest rehabilitation			50	100	100	250
Studies of Vietnamese Pheasant			50	100	100	250
5. Administrative management programme	600	600	600	600	600	**3,000**
6. Contingency						**100**
Total						**12,304**

Table 30: Proposed Five-year Buffer Zone Management Programme

Item	Quantity	Amount Implemented each Year				
		1996	1997	1998	1999	2000
1. Forestry						
Land allocation for forest gardens	10,257 ha	5,000	5,257			
Land allocation for protection	222 ha	222				
Cinnamomum plantations	460 ha			60	200	200
Pinus / *Acacia* plantations	2,550 ha	200	400	600	600	750
Acacia / native species plantations	6,835 ha	300	1,000	1,700	1,700	2,135
Fruit tree plantations	190 ha		90	100		
Training classes	14	7	7			
Demonstration plots	28	14	14			
2. Agriculture						
Conversion to agriculture	185 ha	90	95			
Improvement of agricultural land	150 ha	70	80			
High-yielding seed rice	2,000 kg	2,000				
Training classes	14	7	7			
Demonstration plots	35	15	20			
Fruit tree gardens	310 ha	70	120	120		
Training classes	14	7	7			
Demonstration plots	35	10	25			
Grazing land	850 ha	850				
3. Infrastructure						
Water supply pipeline	1	1				
Irrigation dam repairs	3	1	2			
Irrigation canal repairs	10.5 km	5	5.5			
Irrigation dam construction	3	1	1	1		
Pumping stations	6	2	2	2		
Interest-free loans	786 h'holds	393	393			
Road construction	33 km	15	18			
Road upgrading	32 km		10	22		
Bridge repairs	6	2	2	2		
Bridge construction	2		1	1		
4. Education						
Classrooms and teachers' rooms	88	20	30	38		
5. Public health						
Examination and treatment rooms	33	15	18			
Wells	510	100	200	210		
Resettlement	160 h'holds	40	60	60		

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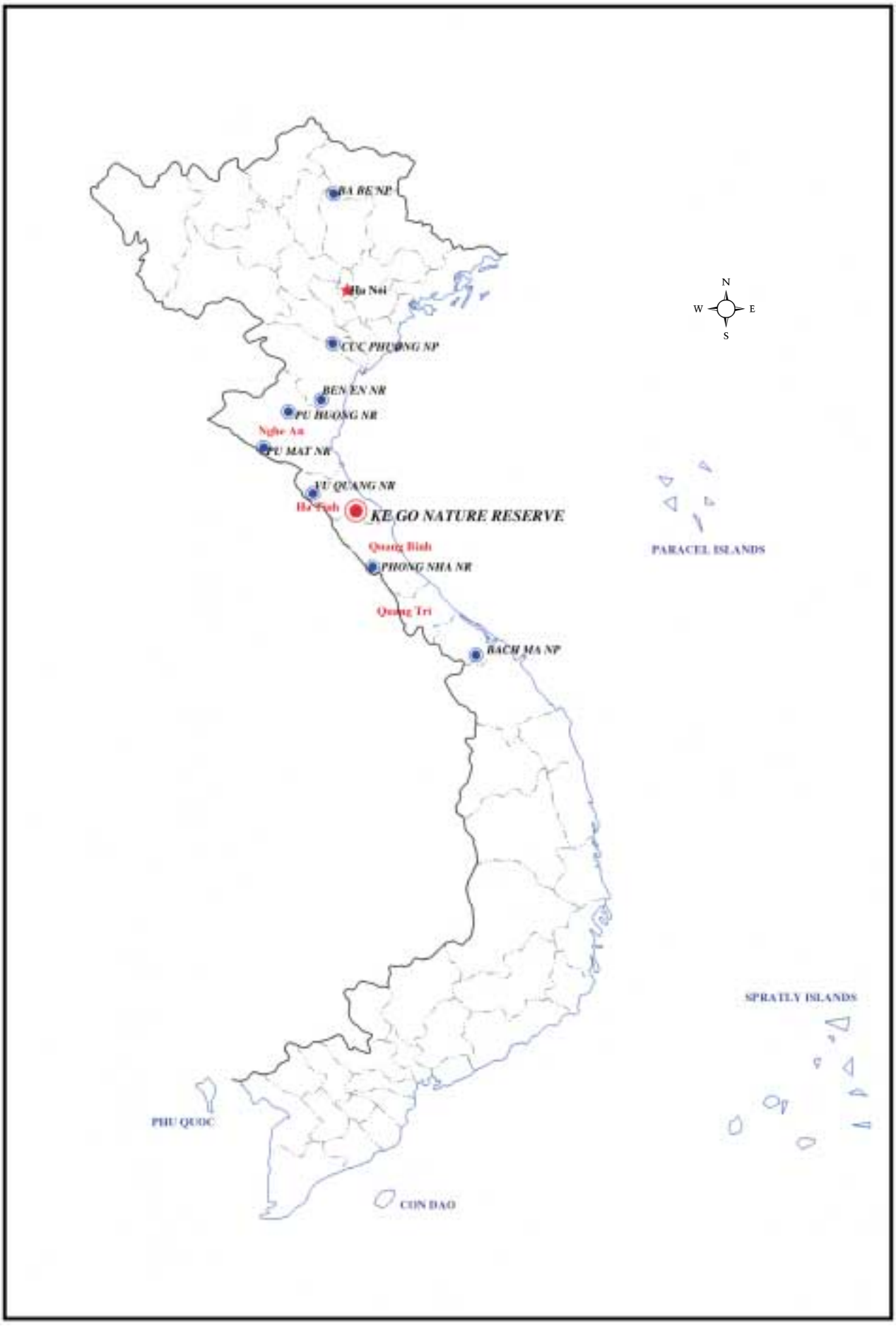
Map 1: Location of Ke Go Proposed Nature Reserve



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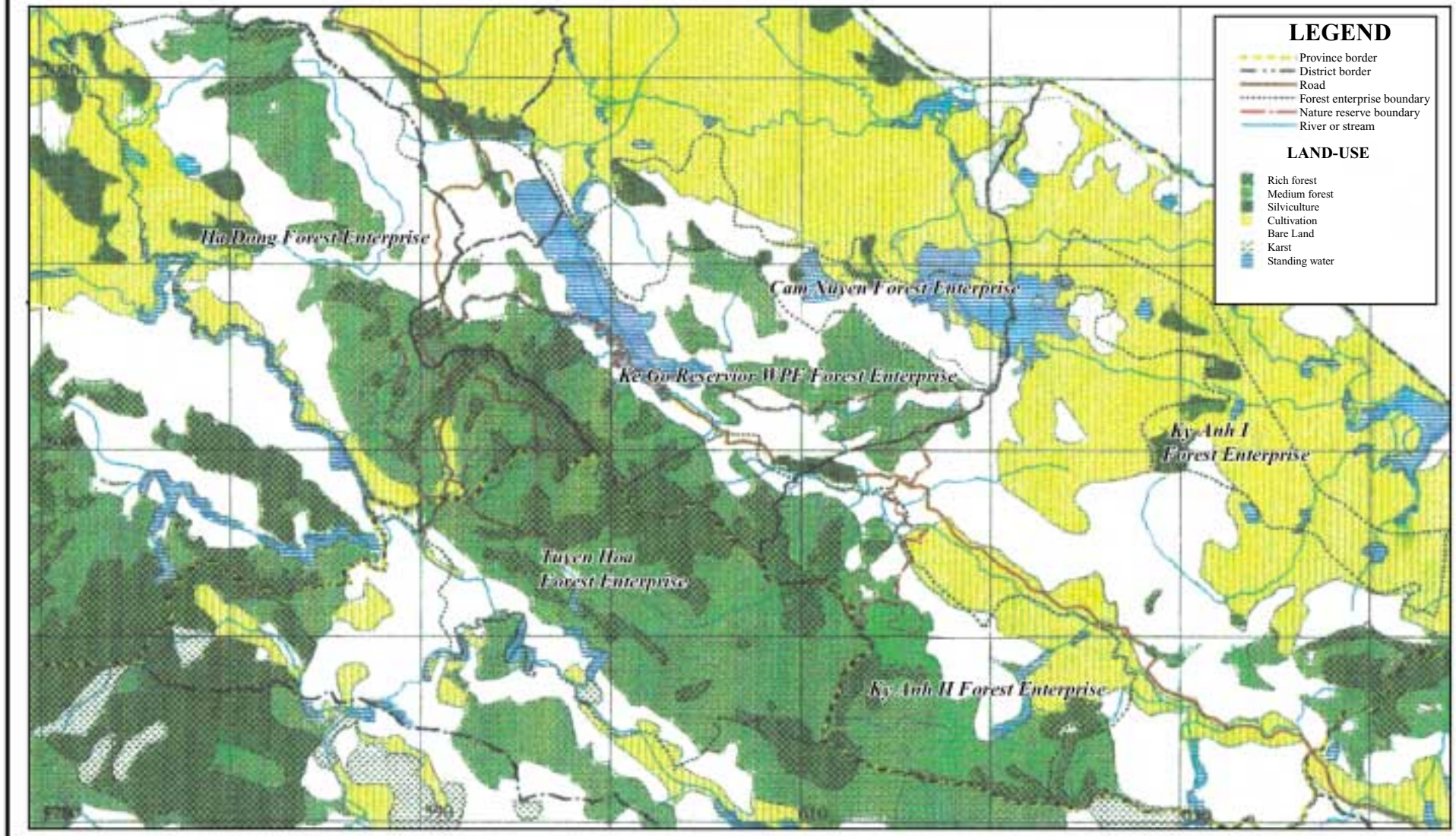
Map 2: Land-use in Southern Ha Tinh and Northern Quang Binh Provinces



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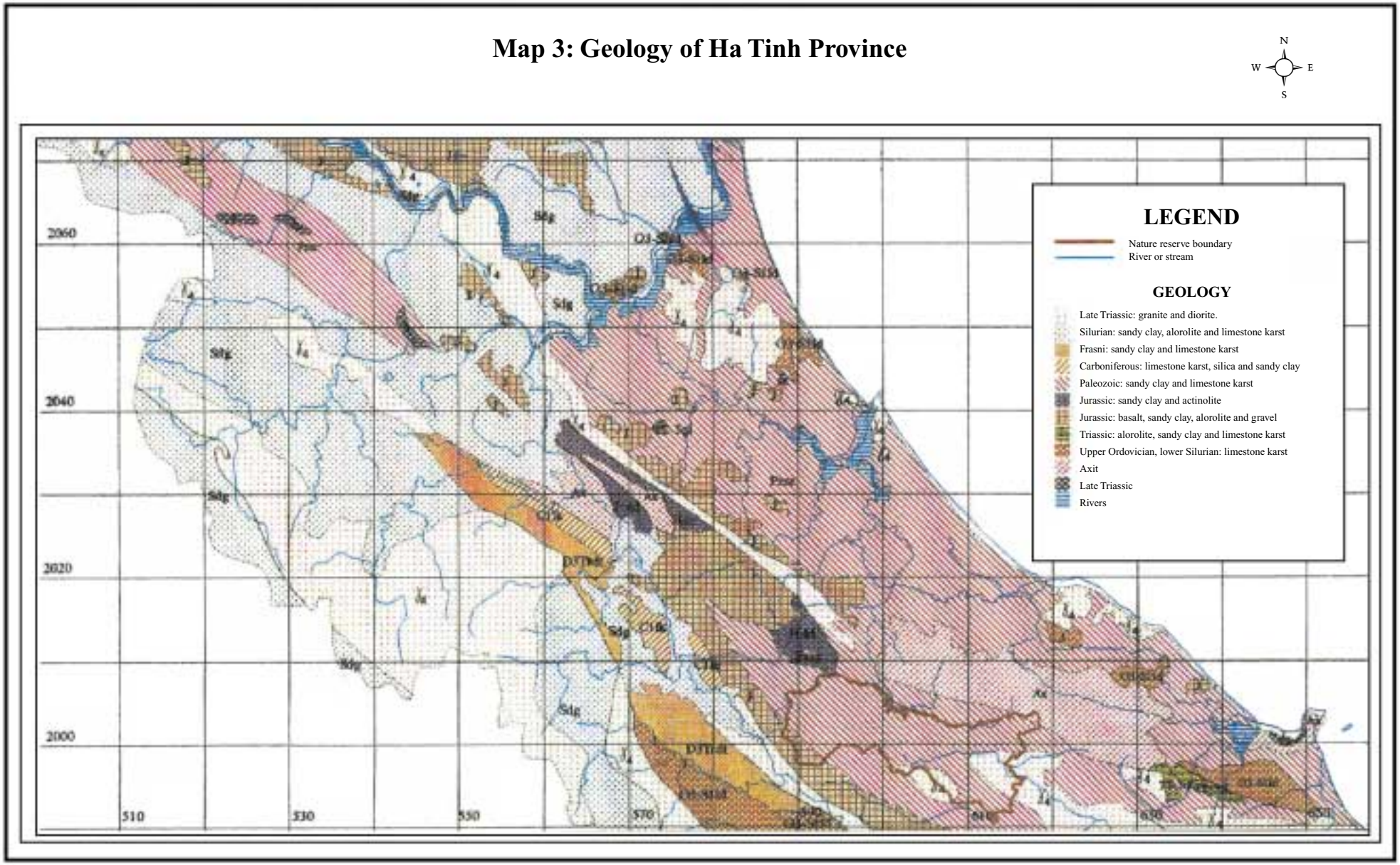
Map 3: Geology of Ha Tinh Province



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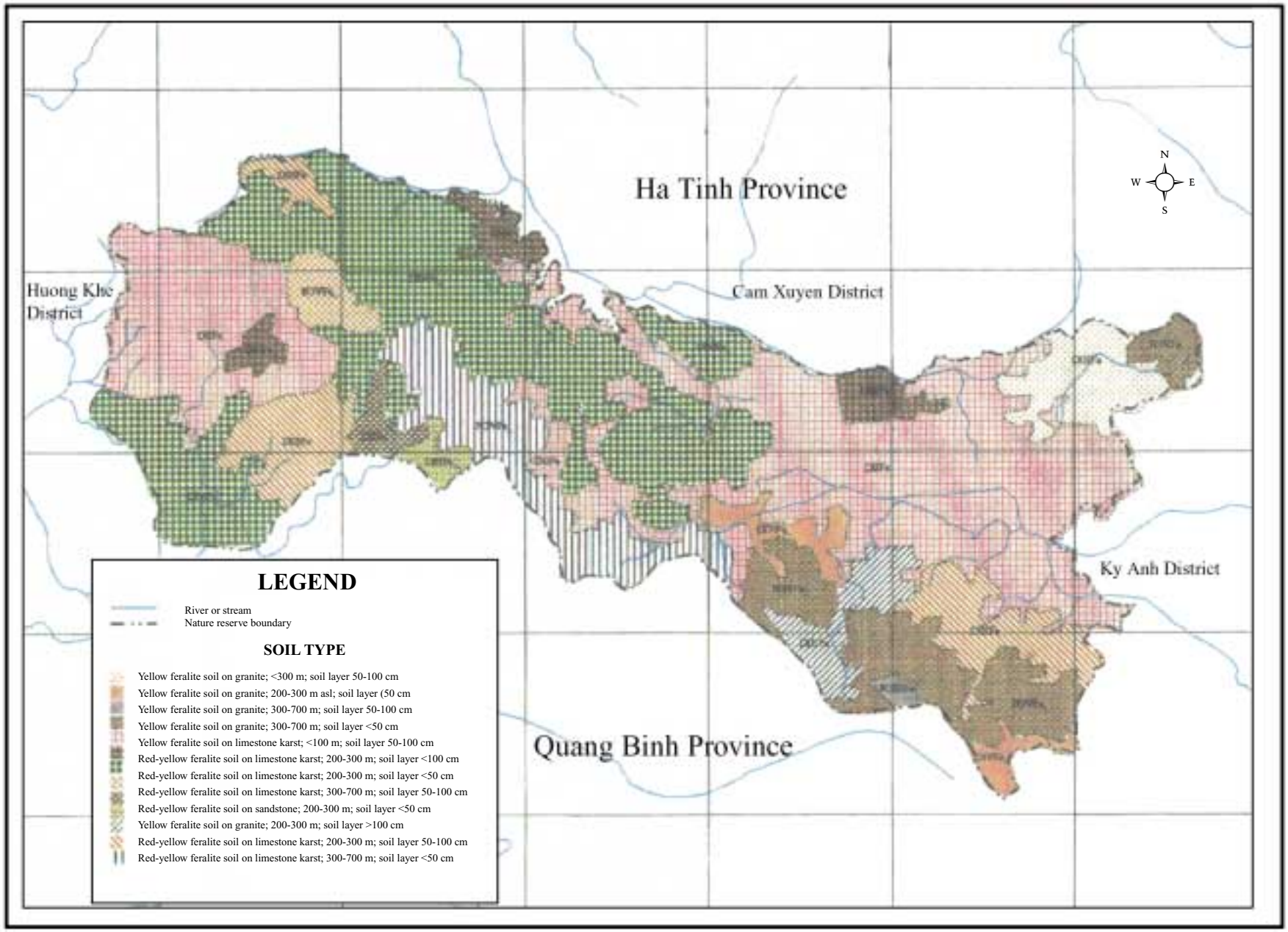
Map 4: Soil Map of Ke Go Proposed Nature Reserve



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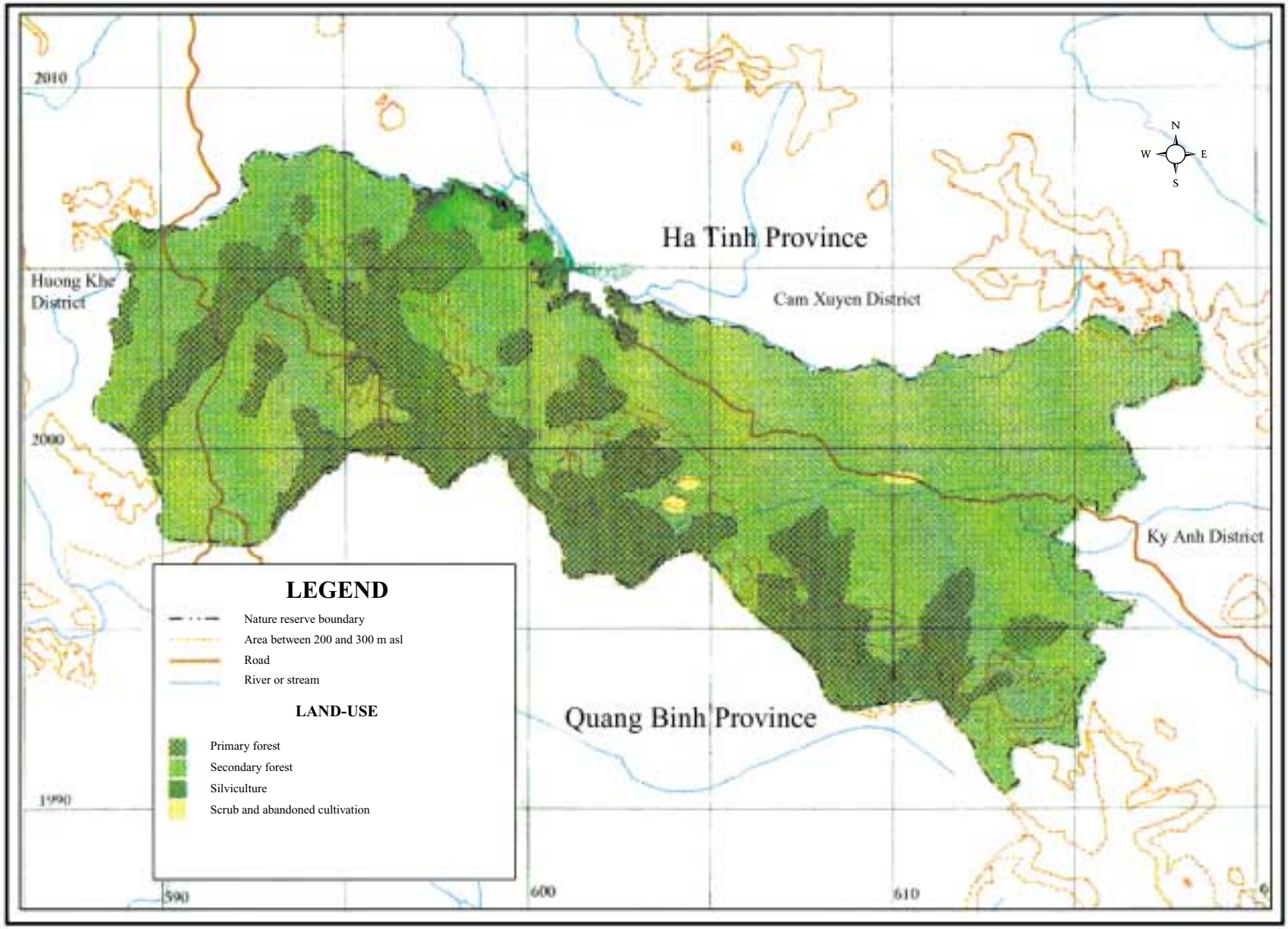
Map 5: Land-use in Ke Go Proposed Nature Reserve



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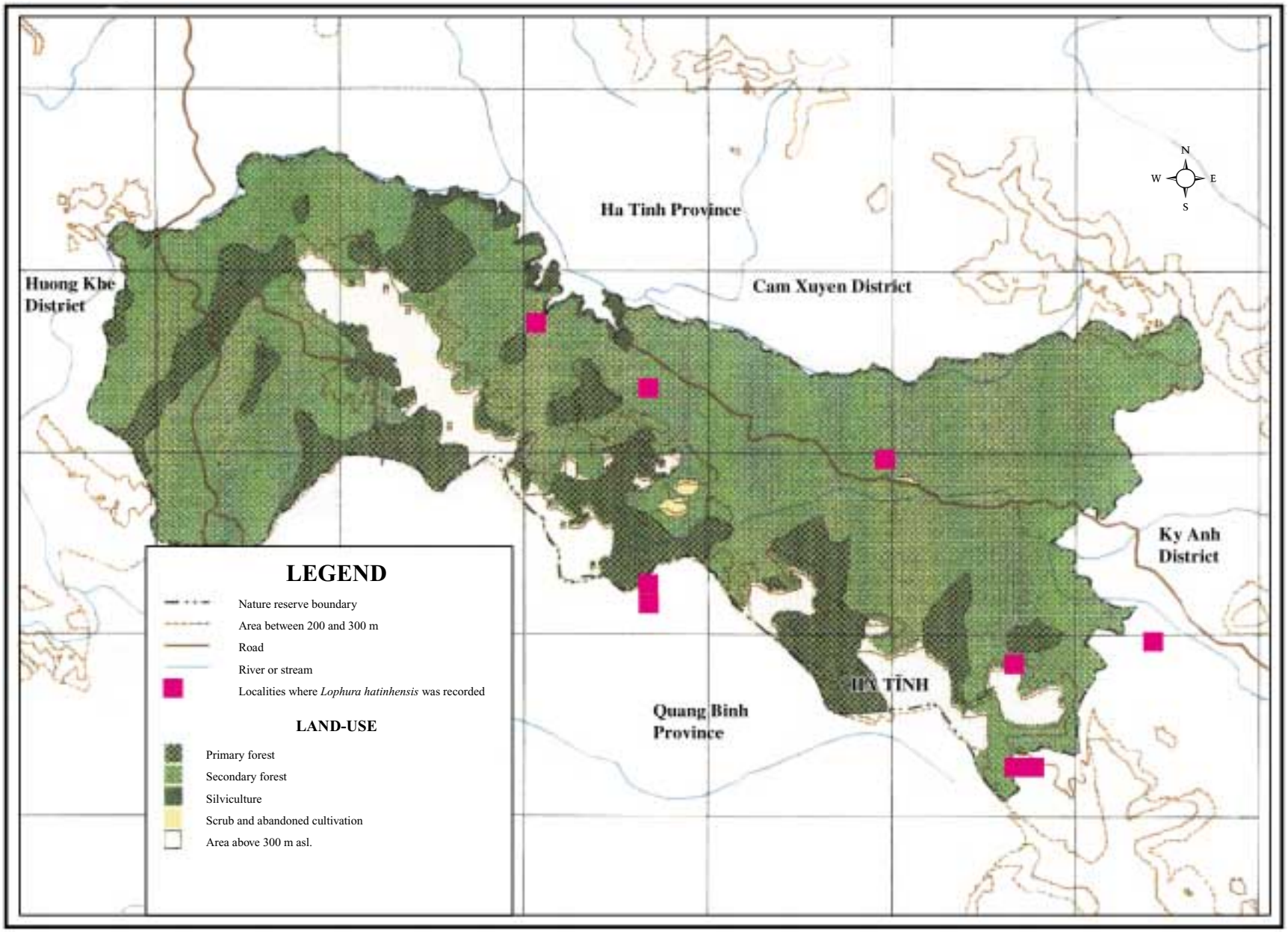
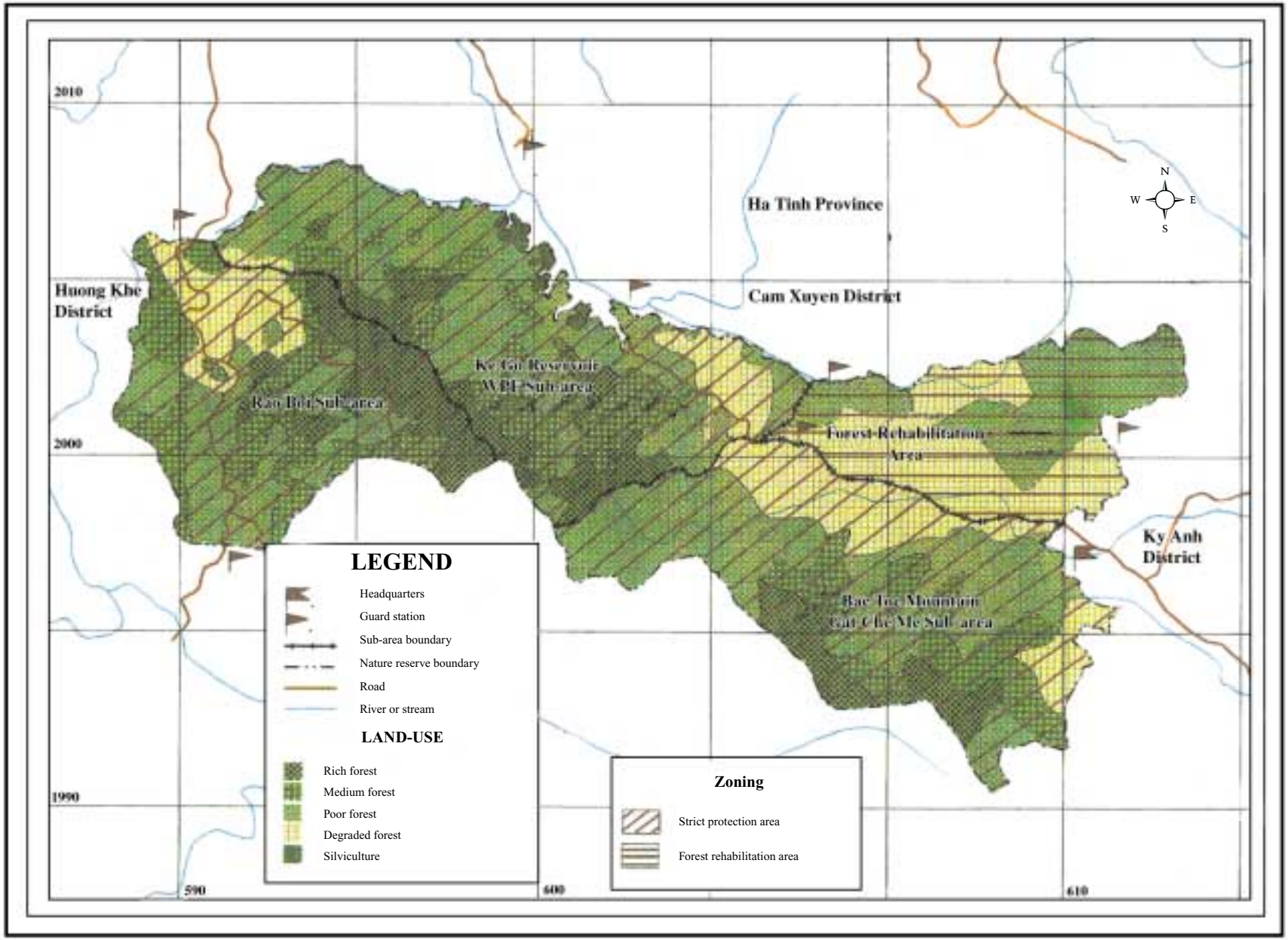
Map 6: Land-use between 200 and 300 m in Ke Go Proposed Nature Reserve



Scale :1:150,000

Map 7: Proposed Management Zoning for Ke Go Nature Reserve



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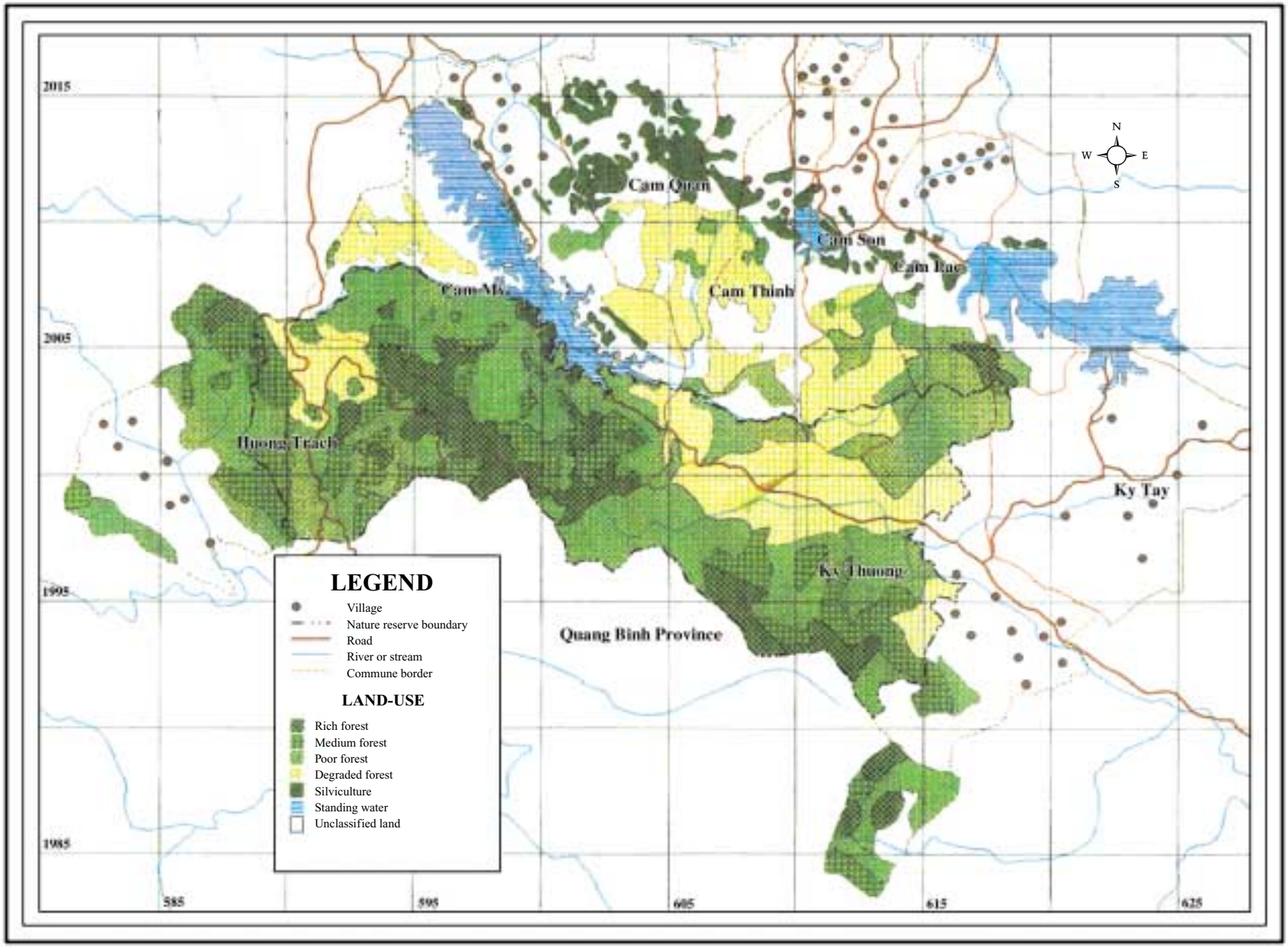
Map 8: Human Settlement around Ke Go Proposed Nature Reserve



Scale :1:250,000

Appendix 1: Flora Recorded in Ke Go Proposed Nature Reserve

Class, Family, Genus and Species	Notes
Lycopodiophyta	
Lycopodiaceae	
Lycopodium cernua	O
Selaginellaceae	
Selaginella dolichoclada	
Polypodiophyta	
Angiopteridaceae	
Angiopteris cochinchinensis	O,E
Schizeaceae	
Lygodium conforme	
L. flexuosum	
L. japonicum	M
Adiantaceae	
Adiantum caudatum	O
Pteris semipinnata	
P. cretica	
P. ensiformis	
P. linearis	
Hymenophyllaceae	
Vandenboschia auriculata	
Gleicheniaceae	
Dicranopteris linearis	
Polypodiaceae	
Drynaria bonii	M
D. quercifolia	
Lemmaphyllum microphyllum	
Thyrsopteridaceae	
Cibotium barometz	M
Dennstaedtiaceae	
Lindsaea sp.	
Athyriaceae	
Callipteris esculenta	
Blechnaceae	
Blechnum orientale	O
Pinophyta	
Gnetaceae	
Gnetum montanum	
Podocarpaceae	
Podocarpus neriifolius	W
Decussocarpus wallichianus (Podocarpus wallichianus)	W,E,R
Magnoliophyta	
Magnoliopsida	
Magnoliaceae	
Manglietia fordiana	W,E,R
M. hainanensis	W

Class, Family, Genus and Species	Notes
Michelia balansae	W
M. mediocris	W
Annonaceae	
Desmos cochinchinensis	O
Polyalthia lauii	W
P. nemoralis	W
Xylopia pierrei	M
Miliusa calcarea	W
M. elongata	
Alphonsea boniana	
A. monogyna	W
Myristicaceae	
Knema conferta	W
K. corticosa	W
Horsfieldia amygdalina	W
Chloranthaceae	
Chloranthus spicatus	
Piperaceae	
Zippelia begonifolia	
Piper betle	M
P. lolot	
P. pierrei	
Sargentodoxiaceae	
Sargentodoxia cuneata	M
Menispermaceae	
Coscinium fenestratum (C. usitatum)	M
Pericampilus glaucus	
Cocculus sarmentosus	
Stephania japonica var. *discolor (S. hernandifolia)*	
Cissampelos pareira	
C. poilanei	
Lauraceae	
Cinnamomum parthenoxylon	W,R
C. polyadelphum (C. litsaefolium)	W
C. orocolum (C. validilerve var. *poilanei)*	W
C. bejolghota (C. obtusifolium)	W
C. iners	W
C. tetragonum	W
Actinodaphne pilosa	W
Litsea baviensis	W,E
L. cubeba	

Class, Family, Genus and Species	Notes
L. glutinosa	W
L. monopetala	W
L. pierrei (L. vang)	W,E
L. verticillata	W
Neolitsea poilanei	W
N. zeylanica	W
Lindera metcalfiana	W
Cryptocarya concinna (C. lenticellata)	W
C. ferrea	W
C. maclurei	W
C. metcalfiana	W
Beilschmiedia percoriacea	W
B. laevis	W
Phoebe tavoyana (P. cuneata)	W
Machilus bonii	W,E
M. velutina	W
Alseodaphne chinensis (Machilus chinensis)	W
A. hainanensis	W
Dilleniaceae	
Dillenia aurea	W
D. indica	W
D. scabrella	W
Tetracera scandens	M
Actinidiaceae	
Saurauja oldhami	
Theaceae	
Adinandra annamensis	E
Eurya japonica	
E. trichocarpa	
Schima wallichii	W
Dipterocarpaceae	
Dipterocarpus retusus	W
Hopea ashtonii	W
H. mollissima	W
Parashorea chinensis (Shorea chinensis)	W,R
Vatica odorata subsp. *brevipetiolata (V. fleuryana)*	W
Ancistrocladaceae	
Ancistrocladus tectorius	
Gutiferae	
Garcinia bonii	W,E
G. cowa	W
G. multiflora	W

Class, Family, Genus and Species	Notes
Calophyllum soulatri	W
Cratoxylon formosum	W
C. cochinchinensis	W
C. polyanthum	W
Elaeocarpaceae	
Elaeocarpus griffithii (E. bachmaensis)	W,E
E. cochinchinensis	W,E
E. dubius	W
E. nitentifolius	W
E. petiolatus	W
E. silvestris	W
E. stipularis (E. thorelii)	W,E
Tiliaceae	
Grewia asiatica	
G. annamica	
G. bulot	
G. paniculata (G. microcos)	W
Paragrewia poilanei	
Colona evecta	
Triumfetta bartramia (T. rhomboidea)	
Sterculiaceae	
Byttneria aspera	
Commersonia bartramia	
Abroma angusta	
Helicteres viscida	
Pterospermum angustifolium	W
P. heterophyllum	W
P. lancaefolium	W
P. megalocarpum	W
P. pierrei	W
Sterculia hyposticta	
S. lanceolata	W
S. parviflora	
S. radicans	
Firmannia colorata	W
Heritiera macrophylla	W
Malvaceae	
Sida rhombifolia	M
Urena lobata	
Flacourtiaceae	
Hydnocarpus annamensis	O,E,W
H. serratus	W
Flacourtia rukkam	W
Passifloraceae	
Passiflora foetida	M

Class, Family, Genus and Species	Notes
Cucurbitaceae	
Thladiantha cordifolia	
Solena heterophylla	
Gymnopetalum cochinchinensis	
Hodgsonia macrocarpa	
Trichosanthes rubriflos	
Gynostemma pentaphyllum	
Datiscaceae	
Tetrameles nudiflora	W
Begoniaceae	
Begonia davisii	
B. lecomtei	
Capparaceae	
Capparis acutifolia	
Cleome gynandra	
C. viscosa	
Crateva magna	
C. religiosa	
Sapotaceae	
Madhuca pasquieri	W,R
Palaquium annamense	W,E
Eberhardtia aurata	W
Sinosideroxylon cambodianum	W
Ebenaceae	
Diospyros kaki	W
D. eriantha	W
D. longebracteata	W
D. nitida	W
D. pilosula	W
Symplocaceae	
Symplocos adenophylla	W
S. cochinchinensis	W
S. glauca (S. sordida)	
S. laurina	W
Myrsinaceae	
Ardisia aciphylla	
A. quinquegona	W
A. florida	
A. silvestris	
Aizoaceae	
Glinus oppositifolius	
Chenopodiaceae	
Chenopodium ambrosioides	
Amaranthaceae	
Amaranthus spinosus	
Cyathula prostrata	M
Portulacaceae	
Portulaca oleracea	W

Class, Family, Genus and Species	Notes
Polygonaceae	
Polygonum chinensis	
P. hydropiper	
P. leptostachyum	
Connaraceae	
Ellipanthus tomentosus	
Rourea minor	
Rosaceae	
Rubus alceaefolius	
R. cochinchinensis	
Duchesna indica (Fragaria indica)	
Prunus arborea	W
Fabaceae	
Mimosoideae	
Adenanthera pavonina	W
Entada phaseoloides	
E. tonkinensis	E
Mimosa invisa	
Albizia chinensis	W
A. lucidior	W
Archidendron clypearia (Pithecellobium clypearia)	W
A. lucidum (Paralbizia lucida)	W
Caesalpiniodeae	
Gleditsia fera	
Peltophorum dasyrrachis	W
P. dasyrrachis var. *tonkinensis*	W
Erythrophleum fordii	W,E
Cassia hirsuta	
C. tora	M
Bauhinia scandens	
B. touranensis	
B. australis	
B. pierrei	
Sindora tonkinensis	W,E,R
Papilionoideae	
Ormosia balansae	W
O. cambodiana	W
O. pinnata	W
Dalbergia rimosa	
D. rimosa var. *tonkinensis*	W,E,R
Milletia sp.	W
Derris elliptica	
Antheroporum pierrei	W,E
Desmodium triflorum	
D. gangeticum	
Erythrina orientalis	M

Class, Family, Genus and Species	Notes
Pueraria lobata var. *thomsonii (P. triloba)*	
Parochetus communis	
Crotalaria pallida (C. mucronata)	
Proteaceae	
Helicia cochinchinensis	W
H. robusta	
Sonneratiaceae	
Duabanga grandiflora	
Lythraceae	
Lagerstroemia tomentosa	W
Thymeleaceae	
Aquilaria crassna	W,R
Myrtaceae	
Decaspermum parviflorum (D. paniculatum)	W
Rhodomyrtus tomemtosa	
Syzygium cumini	W
S. wightianum	W
S. zeylanicum	W
Psidium gujava	
Baeckea frutescens	
Onagraceae	
Ludwidgia hyssopifolia	
L. octovalis	
Melastomataceae	
Melastoma septemnervium (M. candidum)	
M. sanguineum	
Blastus cochinchinensis	
B. borneensis var. *eberhardtii (B. eberhardtii)*	
Memecylon edule	
Rhizophoraceae	
Carallia brachiata	W
Alangiaceae	
Alangium kurzii	W
A. ridleyi	W,E
Celastraceae	
Glyptopetalum calyptratum	
G. chaudocensis	
Euonymus longipedicellata	
Aquifoliaceae	
Ilex crenata	W
Icacinaceae	
Gonocaryum lobbianum	W
Gomphandra hainanensis	

Class, Family, Genus and Species	Notes
Pandaceae	
Microdesmis casearifolia	W
Euphorbiaceae	
Securinega spirei	
Phyllanthus reticulata	
P. amarus (P. niruri)	
P. chamaepeuce (P. quangtriensis)	E
P. urinaria	
P. ruber	
Glochidion hirsutum	
G. octophylla	
Breynia fruticosa	
B. grandiflora	
B. septata	
Drypetes perreticulata	W
Aporusa dioica	W
Baccaurea ramiflora (B. sapida)	W
B. silvestris (B. annamensis)	W,E
Antidesma acidum (A. diandrum)	
A. bunius	W
A. cochinchinensis	E
Bischofia javanica	W
Cleistanthus acuminatus	W
C. pierrei	
Bridelia balansae	W
B. monoica	W
B. parvifolia (B. poilanei)	W
Sumbabiopsis macrophylla (S. albicans)	W
Claoxylon indicum (C. polot)	M
Trewia nudiflora	W
Mallotus barbatus	W
M. apelta	W
M. paniculatus	
Alchornia rugosa	
Macaranga denticulata	W
M. tanarius	
Acalypha siamensis (A. evrardii)	O
Homonoia riparia	
Vernicia montana	W
Deutzianthus tonkinensis	W,E
Trigonostemon murtonii (T. pinnata)	
Ostodes paniculata	W

Class, Family, Genus and Species	Notes
Oligoceras eberhardtii	E
Chaetocarpus castanocarpus	W
Endospermum chinense	W
Sapium baccatum	W
S. cochinchinensis	W
S. discolor	W
S. sebiferum	W
Euphorbia hirta	M
E. thymifolia	M
Excoecaria cochinchinensis	M,E
Coelodepas hainanensis	W
Oxalidaceae	
Averrhoa carambola	W
Oxalis corniculata	
Ixonanthaceae	
Ixonanthes reticulata (I. cochinchinensis)	W
Sapindaceae	
Sapindus mukorossi	W
Cardiospermum halicacabum	
Allophylus cochinchinensis	E
Dimocarpus longan subsp. *longan* var. *obtusus (Euphoria obtusa)*	W
Nephelium cuspidatum var. *bassacensis*	W
Pometia pinnata	W
Arytera littoralis	W
Mischocarpus poilanei	W
M. sundaicus	W
Paranephelium spirei	W
Amesiodendron chinense	W
Paviesia annamensis	W
Aceraceae	
Acer laurinum (A. decandrum)	W,O
Xanthophyllaceae	
Xanthophyllum hainanensis	
Burseraceae	
Dacryodes dungii	W
Canarium album	W
C. bengalense	W
C. tonkinensis	W
Anacardiaceae	
Mangifera sp.	W
Gluta laccifera	W
Choerospondias axillaris	W,M
Dracontomelon duperreanum	W

Class, Family, Genus and Species	Notes
Rhus javanica var. *roxburghii* *(R. chinensis)*	
Toxicodendron succedana	W
Drymicarpus racemosa	W
Simarubaceae	
Ailanthus triphysa	W
Meliaceae	
Toona sureni	W
Chukrasia tabularis	W,R
Melia azedarach	W
Dysoxylum acutangulum	W
D. binectariferum	W
D. cochinchinensis	W,E
D. gobara (D. procerum)	W
D. tonkinensis	W
D. hainanensis var. *glaberrimum*	W
Chisocheton globosus	W
Aphanamixis polystachya	W
Aglaia cochinchinensis	W,E
A. gigantea	W
Rutaceae	
Euodia lepta	
E. meliaefolia	W
E. trichotoma	
Acronychia pedunculata	
Glycosmis pentaphylla *(G. cochinchinensis)*	
Micromelum minutum *(M. falcatum)*	
Murraya koenigii	
Rhamnaceae	
Zizyphus rugosus	
Berchemia lineata	
Vitaceae	
Tetrastigma annamense	E
T. harmandii	
Cissus annamica	
C. assamica	
Cayratia japonica	
Araliaceae	
Schefflera octophylla	W,M
Aralia armata	
Heteropanax fragrans	W
Apiaceae	
Hydrocotyle nepalensis	
Centella asiatica	M
Ulmaceae	
Gironniera cuspidata	W

Class, Family, Genus and Species	Notes
G. subaequalis	W
Celtis orientalis	W
Trema cannabina	
T. orientalis	W
Moraceae	
Morus alba	
Streblus asper	
S. ilicifolia	
Broussonetia papyrifera	W
Artocarpus styracifolius	W
Antiaris toxicaria	W
Ficus altissima	W
F. callosa	W
F. racemosa	W
F. heterophylla	
F. auriculata	W
F. hispida	
F. championii	W
Cudrania cochinchinensis	M
Urticaceae	
Dendrocnide sinuata	
Elatostema cuneatum	
Boehmeria macrophylla *(B. platyphyllum)*	
Pouzolzia zeylanica	
P. sanguinea	
Debregeasia squamata	
Juglandaceae	
Engelhardtia chrysolepis	W
E. wallichiana	W
Fagaceae	
Castanopsis acuminatissima *(C. echinocarpa)*	W
C. indica	W
Lithocarpus amygdalifolius	W
L. cerebrina	W
L. corneus	W
L. ducampii	W,E
L. fissa	W
L. obovatifolia	W
L. polystachya	W
Quercus arbutifolia	W
Q. quangtriensis	W,E
Q. glauca	
Apocynaceae	
Bousingonia mekongense	
Melodinus cochinchinensis *(M. silvaticus)*	

Class, Family, Genus and Species	Notes
Alstonia scholaris	W,M
Tabernaemontana jasminiflora	O
T. microphylla	
Wrightia annamensis	W,E
W. pubescens	W
Asclepiadaceae	
Streptocaulon juventas	M
Dischidia collyris	
Solanaceae	
Solanum americanum *(S. nigrum)*	
S. virginianum *(S. xanthocarpum)*	
S. torvum	
S. biflorum	
Convolvulaceae	
Hewittia scandens *(H. sublobata)*	
Ipomoea bonii	
Argyreia mollis	
Cuscutaceae	
Cuscuta hydrophylae	M
Boraginaceae	
Heliotropium indicum	M
Verbenaceae	
Stachytarpheta indica	
S. jamaicensis	
Callicarpa albida	
Premna balansae	
P. cambodiana	W
P. scandens	
Vitex quinata	W
V. trifolia	W
Gmelina annamensis	W,E
G. arborea	W
Clerodendrum cyrtophyllum	M
Lamiaceae	
Basilicum polystachyum	
Plantaginaceae	
Plantago major	M
Oleaceae	
Osmanthus matsumuranus	W
Scrophulariaceae	
Scoparia dulcis	M
Acanthaceae	
Thunbergia geoffrayi	O
T. laurifolia	O
Neuracanthus tetragonostachyus	

Class, Family, Genus and Species	Notes
Phlogacanthus annamensis	E
Asystasia gangetica	
Pseuderanthemum palatiferum	
Bignoniaceae	
Oroxylon indicum	O,M
Radermachera ignea	O
Markhamia indica	W
M. stipulata var. *kerrii*	W
Pentaphragmataceae	
Pentaphragma sinense	
Rubiaceae	
Hedyotis racemosa	
H. capitellata	
H. hispida (H. verticillata)	
Wendlandia glabrata	
W. paniculata	
Uncaria macrophylla	
Neonauclea purpurea	W
N. stellata	
Anthocephalus chinensis	W
Mussaenda cambodiana var. *annamensis*	
Randia canthioides	W
R. dasycarpa (R. tomentosa)	
R. spinosa	
R. oxydonta	
Canthium dicoccum	W
C. umbellatum	
Ixora coccinea	
I. pavettaefolia	
Psychotria montana	
P. rubra	M
Lasianthus kamputensis	
L. tonkinensis	
Morinda officinalis	M
Chasalia curviflora	
Caprifoliaceae	
Sambucus hookeri (S. javanica)	M
Asteraceae	
Vernonia arborea	W
V. patula	
Elephantopus scaber	M
Ageratum conyzoides	M
Eupatorium odoratum	M
Erigeron canadensis	
Blumea balsamifera	M
B. lacera	

Class, Family, Genus and Species	Notes
Sphaeromorpha australis	
Sphaeranthus africanus	
Xanthium inaequilaterum	M
Eclipta prostrata (E. alba)	M
Wedelia urticaefolia	
Synedrella nodiflora	
Bidens pilosa	
Artemisia vulgaris	M
Emilia scabra	
E. sonchifolia	M
Crassocephalum crepidioides	
Liliopsida	
Alismataceae	
Sagittaria sagittaefolia	
Araceae	
Acorus gramineus	M
Pothos repens	
P. yunnanensis	
Epipremnum giganteum	
Lasia spinosa	
Homalomena occulta	M
Alocasia macrorrhiza	
Amorphophallus konjac (A. rivieri)	
Commelinaceae	
Aneilema ovalifolium	
Cyanotis arachnoidea	
C. vaga (C. barbata)	
Arecaceae	
Licuala spinosa	O
L. robinsoniana	O
Livistona saribus (L. cochinchinensis)	O
Caryota mitis	O
Areca laosensis	
Pinanga banaensis	E,O
Calamus dioicus	
C. platyacanthus	R
C. tetradactylus	
C. pseudoscutellaris	
C. rudentum	
C. sp.	
Daemonorops pierreanus	
Musaceae	
Musa uranoscopos	
Zingiberaceae	
Amomum villosum var. *xanthoides*	M

Class, Family, Genus and Species	Notes
Languas officinarum	M
Catimbium bracteatum	
Zingiber zerumbet	
Marantaceae	
Phrynium placentarium (P. parviflorum)	
Donax cannaeformis	
Hemodoraceae	
Ophiopogon reptans	
O. longifolius	
Liliaceae	
Dianella nemorosa (D. ensifolia)	
Asparagus cochinchinensis	M
Smilacaceae	
Smilax macrophylla	
S. perfoliata	
Amaryllidaceae	
Zephyranthes rosea	
Cyperaceae	
Fimbristylis sp.	
Cyperus malaccensis	
C. halpan	
Poaceae	
Arundinaria vicinia	
Bambusa spinosa	
B. multiplex var. *nana*	
Dendrocalamus aff. *patellaris*	
Neohouzeana dulloa	
Lophatherum gracile	M
Arundo donax	
Neyraudia reynaudiana	
Thysanolaena maxima	
Eragrostis brizoides	
E. unioloides	
E. zeylanica	
Dactyloctenium aegyptiacum	
Cynodon dactylon	
Chloris barbata	
Panicum repens	
P. sarmentosum	
Digitaria ciliaris	
Pennisetum alopecuroides	
Imperata cylindrica	M
Miscanthus floridulus	
Saccharum arundinaceum	
Chrysopogon aciculatus	
Ischaemum timorense	

Class, Family, Genus and Species	Notes
Agavaceae	
Dracaena gracilis	
D. cambodiana	
Dioscoreaceae	
Dioscorea persimilis	M
D. cirrhosa	
D. poilanei	
Orchidaceae	
Anoectochilus roxburghii	
Dendrobium farmeri	
D. cretaceum	
D. anceps	
Aerides falcata	
A. odorata	
Thrixspermum centipeda	
Doritis pulcherrima	
Phalaenopsis decumbens	
Renanthera coccinea	
Saccolabium intermedium	

Follows Pham Hoang Ho (1991)

Notes: EV = Endemic to Vietnam;

M = Medicinal;

W = Wood;

O = Ornamental.

Status; V = Vulnerable;

R = Rare as per IUCN (1997).

Appendix 2: Mammals Recorded in Ke Go Proposed Nature Reserve

No.	Common Name	Order, Family, Genus and Species	IUCN 1996	Data Source
	Pangolins:	**Pholidota:**		
	Pangolins	**Manidae**		
1	Chinese Pangolin	*Manis pentadactyla*	NT	I
2	Sunda Pangolin	*M. javanica*	NT	I
	Treeshrews:	**Scandentia:**		
	Treeshrews	**Tupaiidae**		
3	Northern Treeshrew	*Tupaia belangeri*		O
	Flying Lemurs:	**Dermoptera:**		
	Flying Lemurs	**Cynocephalidae**		
4	Malayan Flying Lemur	*Cynocephalus variegatus*		I
	Primates:	**Primates:**		
	Lorises	**Loridae**		
5	Slow Loris	*Nycticebus coucang*		I
	Old-World Monkeys	**Cercopithecidae**		
6	Pig-tailed Macaque	*Macaca nemestrina*	VU	O
7	Assamese Macaque	*M. assamensis*	VU	
8	Rhesus Macaque	*M. mulatta*	NT	I
9	Bear Macaque	*M. arctoides*	VU	O
10	Red-shanked Douc Langur	*Pygathrix nemaeus nemaeus*	EN	I
	Gibbons	**Hylobatidae**		
11	Buff-cheeked Gibbon	*Hylobates gabriellae*	DD	H
	Carnivores:	**Carnivora:**		
	Bears	**Ursidae**		
12	Asiatic Black Bear	*Ursus thibetanus*	VU	I
13	Sun Bear	*U. malayanus*	DD	I
	Weasels, etc.	**Mustelidae**		
14	Yellow-throated Marten	*Martes flavigula*		O
15	Hog-badger	*Arctonyx collaris*		I
16	Large-toothed Ferret-badger	*Melogale personata*		S
17	Eurasian Otter	*Lutra lutra*		I
	Civets	**Viverridae**		
18	Large Indian Civet	*Viverra zibetha*		I
19	Small Indian Civet	*Viverricula indica*		I
20	Spotted Linsang	*Prionodon pardicolor*		I
21	Common Palm Civet	*Paradoxurus hermaphroditus*		I
22	Masked Palm Civet	*Paguma larvata*		I
23	Binturong	*Arctictis binturong*		I
	Mongooses	**Herpestidae**		
24	Small Asian Mongoose	*Herpestes javanicus*		O
25	Crab-eating Mongoose	*H. urva*		O
	Cats	**Felidae**		
26	Leopard Cat	*Prionailurus bengalensis*		O
27	Golden Cat	*Catopuma temminckii*	NT	I
28	Tiger	*Panthera tigris*	EN	I

No.	Common Name	Order, Family, Genus and Species	IUCN 1996	Data Source
	Elephants:	**Proboscidea**		
	Elephants	**Elephantidae**		
29	Asian Elephant	*Elephas maximus*	EN	I
	Even-toed Ungulates:	**Artiodactyla:**		
	Pigs	**Suidae**		
30	Wild Boar	*Sus scrofa*		T
	Mouse-deer	**Tragulidae**		
31	Lesser Malay Mouse-deer	*Tragulus javanicus*		I
	Deer	**Cervidae**		
32	Sambar	*Cervus unicolor*		T
33	Giant Munjac	*Megamuntiacus vuquangensis*		S
34	Barking Deer	*Muntiacus muntjak*		T
	Cattle, Antelopes, etc.	**Bovidae**		
35	Gaur	*Bos gaurus*	VU	I
36	Southern Serow	*Naemorhedus sumatraensis*	VU	I
	Rodents:	**Rodentia**		
	Non-flying Squirrels	**Sciuridae**		
37	Black Giant Squirrel	*Ratufa bicolor*		O
38	Pallas's Squirrel	*Callosciurus erythraeus*		O
39	Cambodian Striped Squirrel	*Tamiops rodolphii*		O
40	Swinhoe's Striped Squirrel	*T. swinhoei*		O
41	Red-cheeked Squirrel	*Dremomys rufigenis*		O
	Flying Squirrels	**Pteromyidae**		
42	Red Giant Flying Squirrel	*Petaurista philippensis*		I
	Mice, Rats, etc.	**Muridae**		
43	Sladen's Rat	*Rattus koratensis*		O
	Bamboo Rats	**Rhizomyidae**		
44	Hoary Bamboo Rat	*Rhizomys pruinosus*		O
	Old-World Porcupines	**Hystricidae**		
45	Malayan Porcupine	*Hystrix brachyura*	VU	S
46	Asiatic Brush-tailed Porcupine	*Atherurus macrourus*		O

Follows Corbet and Hill (1992)

Notes: EN = Endangered; VU = Vulnerable; NT = Near-threatened; DD = Data Deficient as per IUCN (1996)

Data Source: S = Specimen; O = Observed; I = Interview; H = Heard; T =Tracks

Appendix 3: Birds Recorded in Ke Go Proposed Nature Reserve

No.	Common Name	Order, Family, Genus and Species	Restricted-range Species	Collar *et al.* 1994
		Galliformes:		
		Phasianidae		
1	Chinese Francolin	*Francolinus pintadeanus*		
2	Bar-backed Partridge	*Arborophila brunneopectus*		
3	Chestnut-necklaced Partridge	*A. charltonii*		VU
4	Red Junglefowl	*Gallus gallus*		
5	Silver Pheasant	*Lophura nycthemera*		
6	Imperial Pheasant	*L. imperialis*	RRS	CR
7	Vietnamese Pheasant	*L. hatinhensis*	RRS	EN
8	Siamese Fireback	*L. diardi*		VU
9	Grey Peacock Pheasant	*Polyplectron bicalcaratum*		
10	Crested Argus	*Rheinardia ocellata*	RRS	VU
		Anseriformes:		
		Anatidae		
11	White-winged Wood Duck	*Cairina scutulata*		EN
12	Garganey	*Anas querquedula*		
		Turniciformes:		
		Turnicidae		
13	Barred Buttonquail	*Turnix suscitator*		
		Piciformes:		
		Picidae		
14	White-browed Piculet	*Sasia ochracea*		
15	Grey-capped Pygmy Woodpecker	*Dendrocopos canicapillus*		
16	Rufous Woodpecker	*Celeus brachyurus*		
17	Lesser Yellownape	*Picus chlorolophus*		
18	Greater Yellownape	*P. flavinucha*		
19	Laced Woodpecker	*P. vittatus*		
20	Red-collared Woodpecker	*P. rabieri*		VU
21	Greater Flameback	*Chrysocolaptes lucidus*		
22	Pale-headed Woodpecker	*Gecinulus grantia*		
23	Bay Woodpecker	*Blythipicus pyrrhotis*		
24	Great Slaty Woodpecker	*Mulleripicus pulverulentus*		
		Megalaimidae		
25	Red-vented Barbet	*Megalaima lagrandieri*		
26	Green-eared Barbet	*M. faiostricta*		
27	Coppersmith Barbet	*M. haemacephala*		
		Bucerotiformes:		
		Bucerotidae		
28	Oriental Pied Hornbill	*Anthracoceros albirostris*		
29	Great Hornbill	*Buceros bicornis*		
30	Brown Hornbill	*Anorrhinus tickelli*		NT
31	Wreathed Hornbill	*Aceros undulatus*		
		Upupiformes:		
		Upupidae		
32	Common Hoopoe	*Upupa epops*		

No.	Common Name	Order, Family, Genus and Species	Restricted-range Species	Collar *et al.* 1994
		Trogoniformes:		
		Trogonidae		
33	Orange-breasted Trogon	*Harpactes oreskios*		
34	Red-headed Trogon	*H. erythrocephalus*		
		Coraciiformes:		
		Coraciidae		
35	Dollarbird	*Eurystomus orientalis*		
		Alcedinidae		
36	Blyth's Kingfisher	*Alcedo hercules*		VU
37	Common Kingfisher	*A. atthis*		
38	Blue-eared Kingfisher	*A. meninting*		
39	Oriental Dwarf Kingfisher	*Ceyx erithacus*		
		Halcyonidae		
40	White-throated Kingfisher	*Halcyon smyrnensis*		
41	Black-capped Kingfisher	*H. pileata*		
		Cerylidae		
42	Crested Kingfisher	*Megaceryle lugubris*		
43	Pied Kingfisher	*Ceryle rudis*		
		Meropidae		
44	Blue-bearded Bee-eater	*Nyctyornis athertoni*		
45	Blue-throated Bee-eater	*Merops viridis*		
		Cuculiformes:		
		Cuculidae		
46	Chestnut-winged Cuckoo	*Clamator coromandus*		
47	Large Hawk Cuckoo	*Hierococcyx sparverioides*		
48	Indian Cuckoo	*Cuculus micropterus*		
49	Banded Bay Cuckoo	*Cacomantis sonneratii*		
50	Plaintive Cuckoo	*C. merulinus*		
51	Asian Emerald Cuckoo	*Chrysococcyx maculatus*		
52	Violet Cuckoo	*C. xanthorhynchus*		
53	Drongo Cuckoo	*Surniculus lugubris*		
54	Asian Koel	*Eudynamys scolopacea*		
55	Green-billed Malkoha	*Phaenicophaeus tristis*		
56	Coral-billed Ground Cuckoo	*Carpococcyx renauldi*		NT
		Centropodidae		
57	Greater Coucal	*Centropus sinensis*		
58	Lesser Coucal	*C. bengalensis*		
		Psittaciformes:		
		Psittacidae		
59	Grey-headed Parakeet	*Psittacula finschii*		
60	Blossom-headed Parakeet	*P. roseata*		
61	Red-breasted Parakeet	*P. alexandri*		
		Apodiformes:		
		Apodidae		
62	Brown-backed Needletail	*Hirundapus giganteus*		
63	Asian Palm Swift	*Cypsiurus balasiensis*		
64	Fork-tailed Swift	*Apus pacificus*		
65	House Swift	*A. affinis*		

No.	Common Name	Order, Family, Genus and Species	Restricted-range Species	Collar *et al.* 1994
		Strigiformes:		
		Strigidae		
66	Mountain Scops Owl	*Otus spilocephalus*		
67	Collared Scops Owl	*O. bakkamoena*		
68	Collared Owlet	*Glaucidium brodiei*		
69	Asian Barred Owlet	*G. cuculoides*		
70	Brown Hawk Owl	*Ninox scutulata*		
		Caprimulgidae		
71	Large-tailed Nightjar	*Caprimulgus macrurus*		
72	Savanna Nightjar	*C. affinis*		
		Columbiformes:		
		Columbidae		
73	Oriental Turtle Dove	*Streptopelia orientalis*		
74	Spotted Dove	*S. chinensis*		
75	Red Collared Dove	*S. tranquebarica*		
76	Emerald Dove	*Chalcophaps indica*		
77	Orange-breasted Green Pigeon	*Treron bicincta*		
78	Thick-billed Green Pigeon	*T. curvirostra*		
79	Pin-tailed Green Pigeon	*T. apicauda*		
80	Green Imperial Pigeon	*Ducula aenea*		
81	Mountain Imperial Pigeon	*D. badia*		
		Gruiformes:		
		Rallidae		
82	Slaty-breasted Rail	*Gallirallus striatus*		
83	White-breasted Waterhen	*Amaurornis phoenicurus*		
		Ciconiiformes:		
		Scolopacidae		
84	Eurasian Woodcock	*Scolopax rusticola*		
85	Spotted Redshank	*Tringa erythropus*		
86	Common Greenshank	*T. nebularia*		
87	Green Sandpiper	*T. ochropus*		
88	Wood Sandpiper	*T. glareola*		
89	Common Sandpiper	*Actitis hypoleucos*		
		Charadriidae		
90	Pacific Golden Plover	*Pluvialis fulva*		
91	Little Ringed Plover	*Charadrius dubius*		
92	River Lapwing	*Vanellus duvaucelii*		
93	Grey-headed Lapwing	*V. cinereus*		NT
94	Red-wattled Lapwing	*V. indicus*		
		Glareolidae		
95	Oriental Pratincole	*Glareola maldivarum*		
		Laridae		
96	Bridled Tern	*Sterna anaethetus*		
		Accipitridae		
97	Osprey	*Pandion haliaetus*		
98	Black Baza	*Aviceda leuphotes*		
99	Oriental Honey-buzzard	*Pernis ptilorhynchus*		
100	Grey-headed Fish Eagle	*Icthyophaga ichthyaetus*		NT

No.	Common Name	Order, Family, Genus and Species	Restricted-range Species	Collar *et al.* 1994
101	Crested Serpent Eagle	*Spilornis cheela*		
102	Crested Goshawk	*Accipiter trivirgatus*		
103	Shikra	*A. badius*		
104	Black Eagle	*Ictinaetus malayensis*		
105	Rufous-bellied Eagle	*Hieraaetus kienerii*		
106	Changeable Hawk Eagle	*Spizaetus cirrhatus*		
		Falconidae		
107	Pied Falconet	*Microhierax melanoleucos*		NT
108	Peregrine Falcon	*Falco peregrinus*		
		Podicipedidae		
109	Little Grebe	*Tachybaptus ruficollis*		
		Ardeidae		
110	Little Egret	*Egretta garzetta*		
111	Grey Heron	*Ardea cinerea*		
112	Purple Heron	*A. purpurea*		
113	Great Egret	*Casmerodius alba*		
114	Intermediate Egret	*Mesophoyx intermedia*		
115	Chinese Pond Heron	*Ardeola bacchus*		
116	Little Heron	*Butorides striatus*		
117	Cinnamon Bittern	*Ixobrychus cinnamomeus*		
118	Black Bittern	*Dupetor flavicollis*		
		Passeriformes:		
		Pittidae		
119	Blue-rumped Pitta	*Pitta soror*		NT
120	Bar-bellied Pitta	*P. elliotii*		NT
		Eurylaimidae		
121	Silver-breasted Broadbill	*Serilophus lunatus*		
122	Long-tailed Broadbill	*Psarisomus dalhousiae*		
		Irenidae		
123	Asian Fairy Bluebird	*Irena puella*		
124	Blue-winged Leafbird	*Chloropsis cochinchinensis*		
125	Golden-fronted Leafbird	*C. aurifrons*		
126	Oranged-bellied Leafbird	*C. hardwickii*		
		Laniidae		
127	Tiger Shrike	*Lanius tigrinus*		
128	Brown Shrike	*L. cristatus*		
129	Long-tailed Shrike	*L. schach*		
130	Grey-backed Shrike	*L. tephronotus*		
		Corvidae		
131	White-winged Magpie	*Urocissa whiteheadi*		NT
132	Common Green Magpie	*Cissa chinensis*		
133	Indochinese Green Magpie	*C. hypoleuca*		NT
134	Rufous Treepie	*Dendrocitta vagabunda*		
135	Racket-tailed Treepie	*Crypsirina temia*		
136	Ratchet-tailed Treepie	*Temnurus temnurus*		
137	Large-billed Crow	*Corvus macrorhynchos*		
138	Ashy Woodswallow	*Artamus fuscus*		
139	Black-naped Oriole	*Oriolus chinensis*		

No.	Common Name	Order, Family, Genus and Species	Restricted-range Species	Collar *et al.* 1994
140	Maroon Oriole	*O. traillii*		
141	Large Cuckooshrike	*Coracina macei*		
142	Black-winged Cuckooshrike	*C. melaschistos*		
143	Ashy Minivet	*Pericrocotus divaricatus*		
144	Scarlet Minivet	*P. flammeus*		
145	Bar-winged Flycatcher-shrike	*Hemipus picatus*		
146	White-throated Fantail	*Rhipidura albicollis*		
147	Black Drongo	*Dicrurus macrocercus*		
148	Ashy Drongo	*D. leucophaeus*		
149	Crow-billed Drongo	*D. annectans*		
150	Bronzed Drongo	*D. aeneus*		
151	Spangled Drongo	*D. hottentottus*		
152	Greater Racket-tailed Drongo	*D. paradiseus*		
153	Black-naped Monarch	*Hypothymis azurea*		
154	Asian Paradise-flycatcher	*Terpsiphone paradisi*		
155	Common Iora	*Aegithina tiphia*		
156	Great Iora	*A. lafresnayei*		
157	Large Woodshrike	*Tephrodornis gularis*		
		Muscicapidae		
158	Blue Rock Thrush	*Monticola solitarius*		
159	Blue Whistling Thrush	*Myophonus caeruleus*		
160	Orange-headed Thrush	*Zoothera citrina*		
161	Japanese Thrush	*Turdus cardis*		
162	Eurasian Blackbird	*T. merula*		
163	Asian Brown Flycatcher	*Muscicapa dauurica*		
164	Verditer Flycatcher	*Eumyias thalassina*		
165	Blue-and-white Flycatcher	*Cyanoptila cyanomelana*		
166	Large Niltava	*Niltava grandis*		
167	Fujian Niltava	*N. davidi*		NT
168	White-tailed Flycatcher	*Cyornis concretus*		
169	Hainan Blue Flycatcher	*C. hainanus*		
170	Tickell's Blue Flycatcher	*C. tickelliae*		
171	Siberian Rubythroat	*Luscinia calliope*		
172	Siberian Blue Robin	*L. cyane*		
173	Oriental Magpie Robin	*Copsychus saularis*		
174	White-rumped Shama	*C. malabaricus*		
175	Slaty-backed Forktail	*Enicurus schistaceus*		
176	White-crowned Forktail	*E. leschenaulti*		
177	Common Stonechat	*Saxicola torquata*		
		Sturnidae		
178	Chestnut-tailed Starling	*Sturnus malabaricus*		
179	White-shouldered Starling	*S. sinensis*		
180	Black-collared Starling	*S. nigricollis*		
181	Common Myna	*Acridotheres tristis*		
182	White-vented Myna	*A. cinereus*		
183	Crested Myna	*A. cristatellus*		
184	Golden-crested Myna	*Ampeliceps coronatus*		
185	Hill Myna	*Gracula religiosa*		

No.	Common Name	Order, Family, Genus and Species	Restricted-range Species	Collar *et al.* 1994
		Sittidae		
186	Velvet-fronted Nuthatch	*Sitta frontalis*		
		Paridae		
187	Great Tit	*Parus major*		
188	Sultan Tit	*Melanochlora sultanea*		
		Hirundinidae		
189	Barn Swallow	*Hirundo rustica*		
		Pycnonotidae		
190	Black-crested Bulbul	*Pycnonotus melanicterus*		
191	Red-whiskered Bulbul	*P. jocosus*		
192	Light-vented Bulbul	*P. sinensis*		
193	Sooty-headed Bulbul	*P. aurigaster*		
194	Stripe-throated Bulbul	*P. finlaysoni*		
195	Puff-throated Bulbul	*Alophoixus pallidus*		
196	Grey-eyed Bulbul	*Iole propinqua*		
197	Black Bulbul	*Hypsipetes leucocephalus*		
		Cisticolidae		
198	Zitting Cisticola	*Cisticola juncidis*		
199	Hill Prinia	*Prinia atrogularis*		
200	Rufescent Prinia	*P. rufescens*		
201	Grey-breasted Prinia	*P. hodgsonii*		
202	Plain Prinia	*P. inornata*		
		Zosteropidae		
203	Oriental White-eye	*Zosterops palpebrosus*		
204	Japanese White-eye	*Z. japonicus*		
		Sylviidae		
205	Asian Stubtail	*Urosphena squameiceps*		
206	Japanese Bush Warbler	*Cettia diphone*		
207	Lanceolated Warbler	*Locustella lanceolata*		
208	Thick-billed Warbler	*Acrocephalus aedon*		
209	Common Tailorbird	*Orthotomus sutorius*		
210	Dark-necked Tailorbird	*O. atrogularis*		
211	Dusky Warbler	*Phylloscopus fuscatus*		
212	Buff-throated Warbler	*P. subaffinis*		
213	Radde's Warbler	*P. schwarzi*		
214	Yellow-browed Warbler	*P. inornatus*		
215	Arctic Warbler	*P. borealis*		
216	Pale-legged Leaf Warbler	*P. tenellipes*		
217	White-tailed Leaf Warbler	*P. davisoni*		
218	Sulphur-breasted Warbler	*P. ricketti*		
219	Golden-spectacled Warbler	*Seicercus burkii*		
220	Yellow-bellied Warbler	*Abroscopus superciliaris*		
221	Striated Grassbird	*Megalurus palustris*		
222	Masked Laughingthrush	*Garrulax perspicillatus*		
223	White-crested Laughingthrush	*G. leucolophus*		
224	Lesser Necklaced Laughingthrush	*G. monileger*		
225	Greater Necklaced Laughingthrush	*G. pectoralis*		
226	Black-throated Laughingthrush	*G. chinensis*		

No.	Common Name	Order, Family, Genus and Species	Restricted-range Species	Collar *et al.* 1994
227	Hwamei	*G. canorus*		
228	Abbott's Babbler	*Malacocincla abbotti*		
229	Buff-breasted Babbler	*Pellorneum tickelli*		
230	Puff-throated Babbler	*P. ruficeps*		
231	Scaly-crowned Babbler	*Malacopteron cinereum*		
232	Large Scimitar Babbler	*Pomatorhinus hypoleucos*		
233	White-browed Scimitar Babbler	*P. schisticeps*		
234	Streak-breasted Scimitar Babbler	*P. ruficollis*		
235	Short-tailed Scimitar Babbler	*Jabouilleia danjoui*	RRS	VU
236	Eyebrowed Wren Babbler	*Napothera epilepidota*		
237	Rufous-fronted Babbler	*Stachyris rufifrons*		
238	Rufous-capped Babbler	*S. ruficeps*		
239	Grey-throated Babbler	*S. nigriceps*		
240	Spot-necked Babbler	*S. striolata*		
241	Striped Tit Babbler	*Macronous gularis*		
242	Grey-faced Tit Babbler	*M. kelleyi*	RRS	NT
243	Chestnut-capped Babbler	*Timalia pileata*		
244	Rufous-throated Fulvetta	*Alcippe rufogularis*		NT
245	Brown-cheeked Fulvetta	*A. poioicephala*		
246	Mountain Fulvetta	*A. peracencis*		
247	White-bellied Yuhina	*Yuhina zantholeuca*		
248	Short-tailed Parrotbill	*Paradoxornis davidianus*		VU
		Alaudidae		
249	Oriental Skylark	*Alauda gulgula*		
		Nectariniidae		
250	Yellow-vented Flowerpecker	*Dicaeum chrysorrheum*		
251	Plain Flowerpecker	*D. concolor*		
252	Scarlet-backed Flowerpecker	*D. cruentatum*		
253	Ruby-cheeked Sunbird	*Anthreptes singalensis*		
254	Purple-naped Sunbird	*Hypogramma hypogrammicum*		
255	Olive-backed Sunbird	*Nectarinia jugularis*		
256	Fork-tailed Sunbird	*Aethopyga christinae*		
257	Crimson Sunbird	*A. siparaja*		
258	Little Spiderhunter	*Arachnothera longirostra*		
259	Streaked Spiderhunter	*A. magna*		
		Passeridae		
260	Eurasian Tree Sparrow	*Passer montanus*		
261	Forest Wagtail	*Dendronanthus indicus*		
262	White Wagtail	*Motacilla alba*		
263	Yellow Wagtail	*M. flava*		
264	Grey Wagtail	*M. cinerea*		
265	Richard's Pipit	*Anthus richardi*		
266	Olive-backed Pipit	*A. hodgsoni*		
267	Red-throated Pipit	*A. cervinus*		
268	White-rumped Munia	*Lonchura striata*		
269	Scaly-breasted Munia	*L. punctulata*		
		Frigillidae		
270	Crested Bunting	*Melophus lathami*		

Follows Inskipp *et al.* (1996)

Notes: CR = Critical; EN = Endangered; VU = Vulnerable; NT = Near Threatened as per Collar *et al.* (1994); RRS = Restricted-range Species

Appendix 4: Socio-economic Data

Table I: Land Available for Household Silviculture and Forest Protection

Commune	Land Available for Household Silviculture (ha)	Land Available for Forest Protection (ha)
Cam My	579	0
Cam Thinh	960	0
Cam Son	538	0
Cam Lac	478	0
Ky Thuong	3,773	0
Ky Tay	2,453	0
Huong Trach	1,254	222
Total	10,035	222

Table II: Land with Potential for Conversion to Agriculture or Improvement

Commune	Uncultivated Land with Potential for Conversion to Agriculture (ha)	Cultivated Land with Potential for Improvement (ha)
Cam My	65	0
Cam Thinh	0	0
Cam Son	0	70
Cam Lac	70	0
Ky Thuong	0	0
Ky Tay	0	40
Huong Trach	50	0
Total	185	110

Table III: Plan for Developing the Irrigation System

Commune	Number of Dams		Irrigation Canals (m)	Pumping Stations
	to be Built	to be Upgraded		
Cam My	0	0	2,200	0
Cam Thinh	2	0	0	0
Cam Son	1	0	2,000	2
Cam Lac	1	0	0	2
Ky Thuong	0	2	2,300	0
Ky Tay	0	1	4,000	0
Huong Trach	0	0	0	2
Total	4	3	10,500	6

Table IV: Grazing Land in the Buffer Zone

Commune	Grazing Land (ha)
Cam My	100
Cam Thinh	100
Cam Son	50
Cam Lac	50
Ky Thuong	200
Ky Tay	200
Huong Trach	150
Total	850

Table V: Estimated Number of Households Interested in Six-month Loans

Commune	Households
Cam My	192
Cam Thinh	36
Cam Son	174
Cam Lac	59
Ky Thuong	143
Ky Tay	106
Huong Trach	76
Total	786

Table VI: Plan for Developing the Road Network

Commune	Kilometres of Road		No. of Bridges to be Built	No. of Fords to be Repaired
	to be Built	to be Upgraded		
Cam My	7	0	0	0
Cam Thinh	0	9	0	2
Cam Son	10	0	0	2
Cam Lac	7	0	0	2
Ky Thuong	3	0	2	0
Ky Tay	6	10	0	0
Huong Trach	0	13	0	0
Total	33	32	2	6

Table VII: Estimated Number of School and Health Station Rooms, and Wells Required

Commune	School Rooms	Health Station Rooms	Wells
Cam My	9	10	0
Cam Thinh	10	6	90
Cam Son	9	5	120
Cam Lac	15	6	210
Ky Thuong	25	0	0
Ky Tay	10	6	0
Huong Trach	10	0	90
Total	88	33	510

BirdLife International is a global conservation federation with a worldwide network of Partner organizations, Representatives and committed individuals.

BirdLife International seeks to conserve all bird species on earth and their habitats and, through this, it works for the world's biological diversity. It recognizes that the problems affecting birds, their habitats and our global environment are linked inseparably with social, economic and cultural factors and that these can only be resolved if human societies function in an ecologically sustainable manner and if the needs, welfare and aspirations of people form a part of all conservation action.

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* **scientific research and analysis** to identify and monitor worldwide the most threatened bird species and the most critical sites for the conservation of bird diversity;

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BirdLife®
INTERNATIONAL
11 Lane 167, Tay Son, Dong Da, Hanoi, Vietnam
Tel/Fax: 844 857 3866
E-mail: birdlife@netnam.org.vn