MANAGEMENT PLAN 2010-2014

PREAH VIHEAR PROTECTED FOREST FOR PLANT AND WILDLIFE GENETIC RESOURCES CONSERVATION

FORESTRY ADMINISTRATION
DEPARTMENT OF WILDLIFE AND BIODIVERSITY
Cambodia, May 2010

THE MANAGEMENT PLAN OF THE PREAH VIHEAR PROTECTED FOREST FOR PLANT AND WILDLIFE GENETIC RESOURCES CONSERVATION

Forestry Administration (FA)
#40, Preah Norodom Blvd.
Phnom Penh, Cambodia
Tel: (855-23) 214 651
Fax: (855-23) 212 201
Website: http://www.forestry.gov.kh/

International Tropical Timber Organization (ITTO)
International Organization Center, 5th Floor
Pacifico-Yokohama, 1-1-1, Ninato-Mirai, Nishi-Ku
Yokohama, 220-1012, Japan
Tel: (81-45) 223-1110
Fax: (81-45) 223-1111
Web Page: http://www.itto.or.jp

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Project Team and Contributors to the Management Plan of the Preah Vihear Protected Forest for Plant and Wildlife Genetic Resources Conservation 2010 – 2014

Forestry Administration Project Team

Department of Wildlife and Biodiversity

Mr. Bun Radar	Protected Forest Management Specialist
Mr. Chheang Dany	Project Manager
Mr. Hort Sothea	Community Outreach Coordinator
Mr. Hunter Weiler	International Technical Advisor
Mr. Kong Puthyra	Law Enforcement Leader
Ms. Lim Sopheap	Project Accountant
Mr. Nhan Buthan	GIS Specialist
Mr. Thuch Phalla	Law Enforcement Coordinator

Contributors

Dr. Hugo Rainey	Technical Advisor, WCS Northern Plains Project
Mr. Tan Setha	Project Manager, CALM Project PVPF Component

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ABBREVIATIONS

a.s.l.	above sea level
ADB	Asian Development Bank
CAT	Cat Action Treasury
CBET	Community Based Ecotourism
CFA	Contonment Forestry Administration
CITES	Convention on International Trade in Endangered Species
CTSP	Cambodia Tree Seed Project
CWRP	Community Wildlife Ranger Program
DWB	Department of Wildlife and Biodiversity (Forestry Administration)
EM	Enzyme (chemical fertilizer)
FA	Forestry Administration
GDP	Gross Domestic Product
GIS	Geographic Information System
GPS	Global Positioning System
GTZ	German Technical Cooperation
IUCN	The World Conservation Union
MAFF	Ministry of Agriculture, Forestry and Fisheries
MOC	Ministry of Culture
MOE	Ministry of Environment
MOT	Ministry of Tourism
NGOs	Non Governmental Organizations
NP	National Park
NPRS	National Poverty Reduction Strategy
NTFP	Non Timber Forest Products
pH	potential Hydrogen
RCG	Royal Government of Cambodia
RIs	Research Institutes
SSC	Species Survival Commission
UTM	Universal Transverse Mercator
WSC_1	1st Watershed Classification
WB	World Bank
WCS	Wildlife Conservation Society
WPO	Wildlife Protection Office
WS	Wildlife Sanctuary
X	Axis
Y	Ordinate

Zoning categories

CUZ	Reserved Forestlands for Community Use Zone
PFR	Research Forest
PFRe	Recreation Forest
PFW	Reserved Forest for Watershed Protection
PFWR	Reserved Forest for Regulating Water Sources
PVPF	Preah Vihear Protected Forest
RCF	Religious and Cultural Forests
SZ	Reserved Forests for Special Ecosytems

MAP NOTES & ORTHOGRAPHY

- **Boundaries** - International boundaries should not be considered authoritative.

- **Generalization** - All maps in this management plan have a high degree of generalization due to the small scale of the data sources.

- **Detail** - Greater map detail at the local level should refer to information at larger scale maps or field checks.

- **Orthography** - Province, district, commune & village, and topography place names generally follow the spelling on the *USAMSFE 1:100,000 maps of Cambodia compiled from the best available source materials on 1970, 1972 & 1973.*

These maps and the USAMSFE 1960's 1:50,000 series are still the best and most widely used for field work. Numerous other maps and documents consulted during preparation of the PVPF Management Plan contain up to nine different spellings of the same single important place names, due to phonetic translation from the original Khmer by different organizations at different points in time.

The original consistent place names on the USAMFSE maps have priceless historical value, since many villages were abandoned during the war years. Field researchers using these maps can determine the original location of villages and original local names for topographic features. This information can be used to determine to what extent post-war villages have changed location, and where new settlements have been established

It is recommended that all future spellings in documents and maps regarding the Preah Vihear Protected Forest use the conventions listed on the following page in order to avoid confusion and provide consistency over the long term among the various documents prepared by different individuals and organizations.

An Seh	Important Cambodia – Thailand local border crossing in the northwest section of the Preah Vihear Protected Forest, scheduled for upgrading to an official international border crossing and construction of a paved road.
Cha-eh	Community
Chendar	Plywood Company & Logging Concession adjacent to the PVPF
Chhep	District & District Town
Choam Ksan	District & District Town
Chunh	Community
Dang Phlet	Community
Dangrek	Mountain range along the Cambodia-Thailand border
Kakhoeuk	Abandoned village, now a PVPF Ranger Station Kampong Sralou Community
Kantout	Community
Molu Prey	Community
Mombei	Ranger Station in the Tri-border area
O Chheuteal	Ranger Station O = seasonal stream in Khmer
O Chunh	Preah Vihear Forest and Wildlife Research Station
O Krasang	Intermittent stream
Robunh	Abandoned & re-established Community
Thbeng Meanchey	Preah Vihear Province capital
Toeuk Kraham	Community
Tonle Ropov	Important river along the Cambodia-Laos border Tonle = stream or river in Khmer
Trapeang Pring	Preah Vihear Protected Forest Headquarters Trapeang = seasonal pond in Khmer
Veal Krous	Ranger Station Veal = large open grassy area within the forest

INTRODUCTION

The Preah Vihear Protected Forest (PVPF) of Cambodia is a part of the Indo-Burma Biodiversity Hotspot, one of the 25 Global Hotspots on our planet. This area is home to 57 mammal species existing in Cambodia and home to about 255 species of birds, 58 species of reptiles and numerous species of amphibians. The PVPF is part of the Indochinese Dry Forest.

Abundance of flora in the planning area is closely related to constant high humidity (80%), abundant rainfall (it rains 190 days a year, with average rainfall 2922-4000 mm a year), warm temperatures (32°C, average maximum temperature), geological formations and the composition of the soils.

Because of its diversity of vegetation environments, the PVPF is home to a mosaic of ecosystems and supports a large number of wildlife species. The Asian Development Bank has classified this area as a part of the nine High Priority Biodiversity Conservation Corridors in the Greater Mekong Sub-region.

Understanding the high value of the countries forest resources, the Royal Government of Cambodia (RGC) took the following actions:

- By early 1999, 12 logging concession agreements had been cancelled, illegal logging reduced, equipment and illegally harvested logs and wildlife seized, hundreds of sawmills closed, and policy and legal initiatives introduced.

- December 2001, MAFF issued a declaration (Prakas) on the Postponement of Logging in Coupes of All Forest Concessions.

- On July 30th, 2002, The RGC issued *Sub-decree 76* to establish the ***Preah Vihear Protected Forest for Plant and Wildlife Genetic Resources Conservation***.

These efforts are evidence of the commitment of the Royal Government of Cambodia to conserve biodiversity, protect forest cover and comply with international agreements associated with the Government's forestry sector reform program. The specific measures undertaken by the Royal Government of Cambodia have been fully supported by the international community.

Several sectors of the Cambodian economy, including agriculture, forestry, fisheries, tourism, energy, industry, infrastructure development and the strengthening of local livelihoods depend on the maintenance of healthy natural ecosystems. The loss of forests, forest resources, and biodiversity in the region, however, has been continuing at an alarming rate at the same time that comparable demands for forest natural resources for national economic development have been increasing.

These developments have provided a strong impetus for the preparation of the ***Preah Vihear Protected Forest Management Plan 2010 – 2014.*** Its preparation is intended to provide a road map of interrelated strategies and management activities designed to ensure the sustainable development of the natural resources in the area.

The initial PVPF Management Plan is for a period of five years, from 2010 to 2014. The plan, which provides a general framework for conservation and sustainable development objectives, includes five main sets of program activities:

- Natural Resource Conservation and Management.

- Recreation and Ecotourism Management.

- Integrated Community Livelihood Development and Cooperation.
- Institutional and Human Resource Development, and
- Research and Monitoring.

The PVPF Management Plan is designed to be a flexible document that can be readily modified to respond to changes and variations in socio-economic and environmental conditions consistent with the policies of the Royal Government of Cambodia. The plan describes the overall objectives, zoning classifications, and main program activities for conserving the resources and maintaining the biodiversity of the Preah Vihear Protected Forest.

Objectives

The Royal Government of Cambodia's Forest Policy Statement specifies the following objectives of Protected Forests:

- Conserve the forest resources and promote sustainable management initiatives in order to maximize contributions to the socio-economic development of the region.
- Promote the participation of the private sector and local communities in the development and implementation of management plans.
- Ensure wide-ranging coordination with all relevant institutions and multi-stakeholders to reduce conflicts and enhance cooperation.
- Continue reforestation and rehabilitation efforts to enhance forest productivity.

Article 1 of the Royal Government of Cambodia Sub-Decree No. 76 in 2002 stipulates that the PVPF in particular should be established with the following objectives:

- Protect and conserve all species of plants and wildlife, especially threatened and endangered species.
- Maintain a balanced ecological system for wildlife to live and to breed.
- Conduct scientific and technical research on the genetic resources and wildlife.
- Protect and maintain water sources.
- Promote education, awareness, and community development.
- Promote and develop ecotourism.
- Preserve cultural heritage and historical sites.

Chapter 1

GENERAL CONDITIONS

1.1 Location

1.1.1 Geography

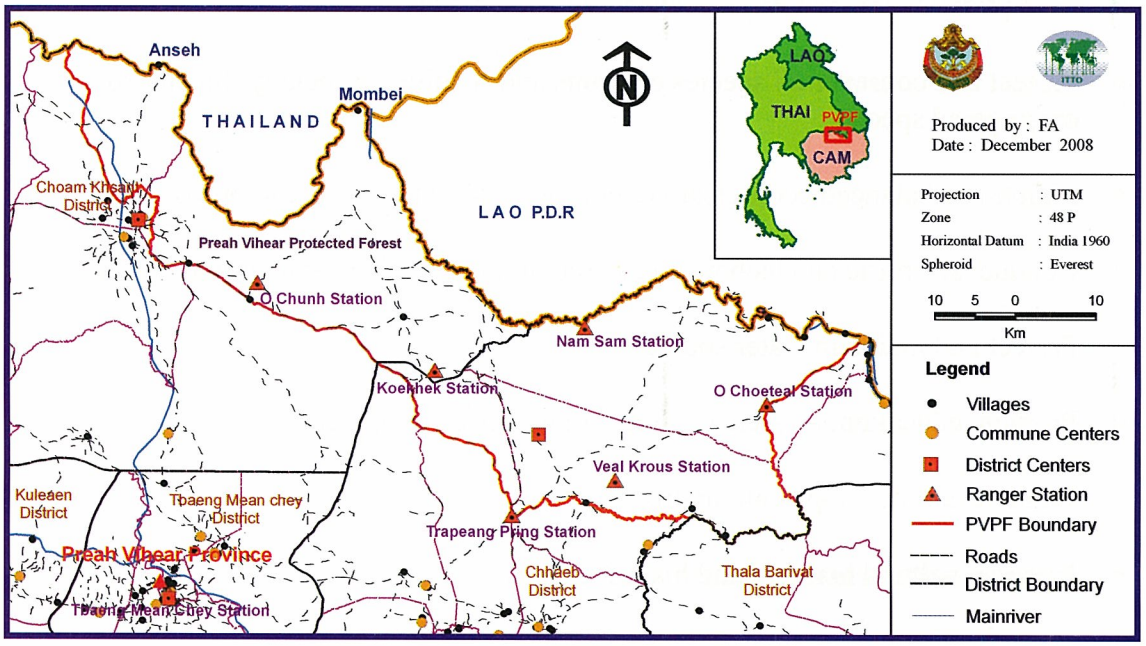
The Preah Vihear Protected Forest (PVPF) is located between 13°51'19" and 14°25'01" of latitude north, 104°51'42" and 105°47'04" of longitude east. PVPF is 300 kilometres from the Phnom Penh capital city of Cambodia and about 64 Kilometres from Thbeng Meanchey, the Preah Vihear provincial capital.

1.1.2 Administrative Location

The PVPF covers two districts, including Chhep and Choam Ksan District in Preah Vihear Province and shared its boundary with:

- Thailand and Lao PDR to the North.
- Kampong Sralou Muoy and Chhep Pir communes of Chhep district to the East
- Chendar Plywood Forest Concession areas to the South
- Choam Ksan and Toeuk Kraham commune, Choam Ksan District to the West

Map 1.1: Administrative Locations and Briefing Map of PVPF



1.1.3 Land Surface

The PVPF covers over land surface of 190,027 hectares, as shown in Table 1.1.

Table 1.1: Land Surface of two provincial districts encompassing the PVPF

No.	District Name	Land Surface in PVPF, ha	FA Division	FA Triages
1	Choam Ksan	83,613	Choam Ksan	Rum Dohsre-Pring Thom
2	Chhep	106,414	Chhep	Kampong Sralov-Mlou Prey
	Total	***190,027***		

1.2 History of Forest Management of PVPF

- **Before 1975**

Before 1975 forest areas of PVPF were not yet designated as Protected Forest, but the area had been managed by the Preah Vihear Forestry Cantonment of Northern Tonle Sap Lake Inspectorate. In that era, there were very few people living in this area. Ethnic minorities of Khmer deum, Kuy were selected to settle in this area. New settlements were established such as Choam Ksan & Chhep.

From 1970 to 1975 Cambodia civil war resulted in destruction of natural forests as well as wildlife. The Lon Nol regime was supported by the United States of America against the Khmer Rouge, and some parts of PVPF were destroyed by bombing. Many bomb craters can still be found in this protected forest.

- **1975-1979**

During 1975-79, the Khmer Rouge regime ruled the so called Democratic Kampuchia. The forests and forest resources in PVPF were cleared to set up new settlement for the people moved out from the cities.

- **1979-1998**

During the period of 1979-97, forest in this area was destroyed while the Vietnamese battled the Khmer Rouge. Forest management was the duty of the Department of Forestry and Wildlife (DFW); however; this activity was managed by the Forestry and Wildlife Offices under the Preah Vihear Provincial Department of Agriculture. At that time, there was some uncontrolled exploitation of timber and non-timber forest products and hunting wildlife. During the civil war, timber and non-timber forest products were destroyed in some parts of the area.

The Preah Vihear Province was highly insecure due to fighting between the Government of Republic of Kampuchia and Khmer Rouge from 1979-89.

During the State of Cambodia (1989-93) until the Royal Government of Cambodia (1993-present), the forests were harvested and some harvesting was unsustainable. The State of Cambodia granted the eastern part of the Preah Vihear Province as a Forest Concession to the BLP Import Export Company, Thailand, in 1991. This concession was cancelled on February 9, 1998 by the RGC due to lack of management according to the Agreement.

- **1975-present**

After the integration of Khmer Rouge into the RGC in 1998, the RGC directed the forest areas toward sustainable forest management and natural resources conservation. On July 30, 2002, the RGC issued Sub-decree No. 76 to establish the **Preah Vihear Protected Forest for Plant and Wildlife Genetic Resources Conservation** (or Preah Vihear Protected Forest, PVPF), which is under jurisdiction of the Forestry Administration, Ministry of Agriculture, Forestry and Fisheries according to the National Forest Sector Policy and the Law on Forestry. The Forestry Administration has an organisation structure for the whole country, divided into hierarchical levels: central, regional inspectorates, cantonments, divisions, and triages.

In 1998, the Wildlife Protection Office, with funding and technical support from the Cat Action Treasury, conducted an interview survey of hunters and local officials in Preah Vihear as part of a wider national survey to determine status and distribution of key wildlife species. In 1999 a workshop was held in Preah Vihear to discuss the results of the survey with District and Provincial officials and the feasibility of setting up a network of community rangers to monitor wildlife, reduce poaching, and carry out village-level conservation awareness activities.

In 2000, a WPO Preah Vihear Regional Project Office was established in Preah Vihear co-managed by WPO and a Provincial counterpart, and community rangers were recruited and trained. Subsequently District Police officers were added to the program to improve law enforcement. Monthly forest monitoring was conducted, and the project participated in a systematic WCS wildlife survey of the Northern Plains. Subsequently WCS established a program in Preah Vihear, initially co-sharing the WPO Regional Project Office building.

In early 2003 the FA-CAT Community Wildlife Ranger Program was integrated with the FA-Wildlife Conservation Society (WCS) Northern Plains Program in Preah Vihear, which continued to employ many of the rangers and provincial staff.

Since 2005 the FA, in cooperation with WCS has been implementing the Conservation Areas through Landscape Management in Northern Plains of Cambodia Project, in which the PVPF is the one of the target sites. The project has five component activities: Forestry law Enforcement and Patrolling, Eco-tourism, Participatory land-use planning (including Residential and Agriculture Land Mapping and Demarcation of Permanent Forest Estate), Education and Awareness Raising, and Wildlife Monitoring. The project duration is from 2005-2012.

Since 2008, the FA, in cooperation with the International Tropical Timber Organization (ITTO) and the Thailand Royal Forestry Department (RFD), has been implementing the project Management of the Emerald Triangle Protected Forests Complex to Promote Cooperation for Transboundary Biodiversity Conservation between Thailand, Cambodia and Laos (Phase II). For the Cambodia Component, the PVPF is the project target site. This project has three primary components activities: Forest law Enforcement, Community support and preparation of the PFPV Management Plan. The project duration is from March 2008 to May 2010.

1.3 Cultural and Historic importance of Preah Vihear Province

Although for much of the period the Angkorian empire was ruled from Angkor, important secondary centres existed. Koh Ker (in southern Preah Vihear) was the capital in the early 10th century under Jayavarman IV. Preah Khan of Kompong Svay, also in southern Preah Vihear, was the largest temple complex ever constructed by the empire with an enclosure measuring 5 × 5km.

Beyond these sites northern and north-western Cambodia and adjacent parts of Thailand and Laos are covered with small temple complexes, revealing a pattern of human settlements that in some areas may have been greater than the human population today.

Analysis of satellite imagery and aerial photographs for the Northern Plains shows that the landscape was extensively altered by the infrastructure of the Angkorian Empire. At least four types of remains are visible: temples, roads, water bodies and agricultural systems.

The Angkorian roads and temples were often associated with water sources – perhaps for religious reasons in addition to providing water for agriculture and livestock. Some of these man-made ponds (or trapeangs) are still visible and many contain permanent water. These provide a critical water supply to local people, livestock, and wildlife.

Prominent in the landscape of the Northern Plains are extensive patches of seasonally-flooded grassland, called veals. These are common in Preah Vihear Protected Forest particularly around eastern Chhep (Dang Phlet area) and in eastern Choam Ksan (near Robonh).

Individual grasslands can be quite large – measuring up to 2 km across. They are covered in a short grass sward and flood to a depth of 20-30cm during the height of the wet season (July-September). Signs of old agricultural systems are visible in many veals on the 1992-93 high-resolution aerial photographs.

These field systems have not been used within living memory, and the same structures can be seen on the 1958 aerial photographs, proving that they were not built during the Khmer Rouge period. Although their origin is unknown, similar structures are found around the main settlements at Angkor and have been attributed to the Angkorian period. At least in some areas the grasslands appear in association with Angkorian trapeangs and temples.

Whilst superficially appearing to be a collection of remote agricultural villages, there is ample evidence that the landscape has been artificially enriched particularly through the construction of permanent water sources and the conversion of seasonally flooded areas into extensive grasslands.

These features are concentrated around temple complexes and linked by a road network. Now abandoned, the trapeangs and veals provide critical resources for the collection of globally threatened species that is unique to the Northern Plains.

Pralay Ampil Temple in Preah Vihear Protected Forest

Don Chraom Temple in Preah Vihear Protected Forest

Kourk Temple in Preah Vihear Protected Forest

Neark Bous Temple in Preah Vihear Protected Forest

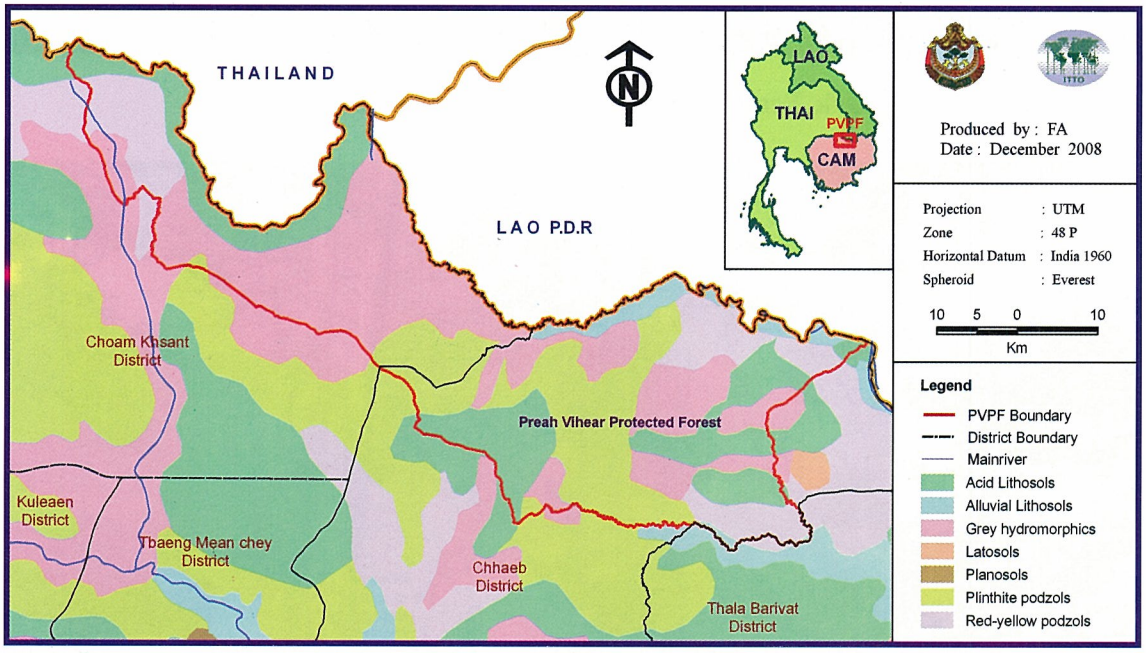
1.4 Soil types in the PVPF

Soil is an important factor for the growth of a variety of plants and therefore significant for the national economy. The soils developed under a humid to sub humid tropical climate with alternate wet-dry conditions, from the decomposition of acid or basic rocks and alluvial outwash from either or both of these rocks. Soil types in PVPF include Acid Lithosols, Alluvial Lithosols, Grey hydromorphics, Phinthite podzols and Red-yellow podzols. Each soil type and its areal extent are presented in Table 1.2. Soils in the planning areas are fertile in Choam Ksan District for rain fed rice production while less fertile in Chhep District.

Table 1.2: Soil types in the PVPF

N	Types of soil	Area, ha	pH
1	Acid Lithosols	44,494	5.2-5.5
2	Alluvial Lithosols	7,029	4.3-5.5
3	Grey hydromorphics	73,756	5.2-5.7
4	Phinthite podzols	38,488	4.5-5.0
5	Red-yellow podzols	26,260	4.2-5.8
	Total	***190,027***	

Map 1.2: Soil types in PVPF



1.5 Topography & Geology

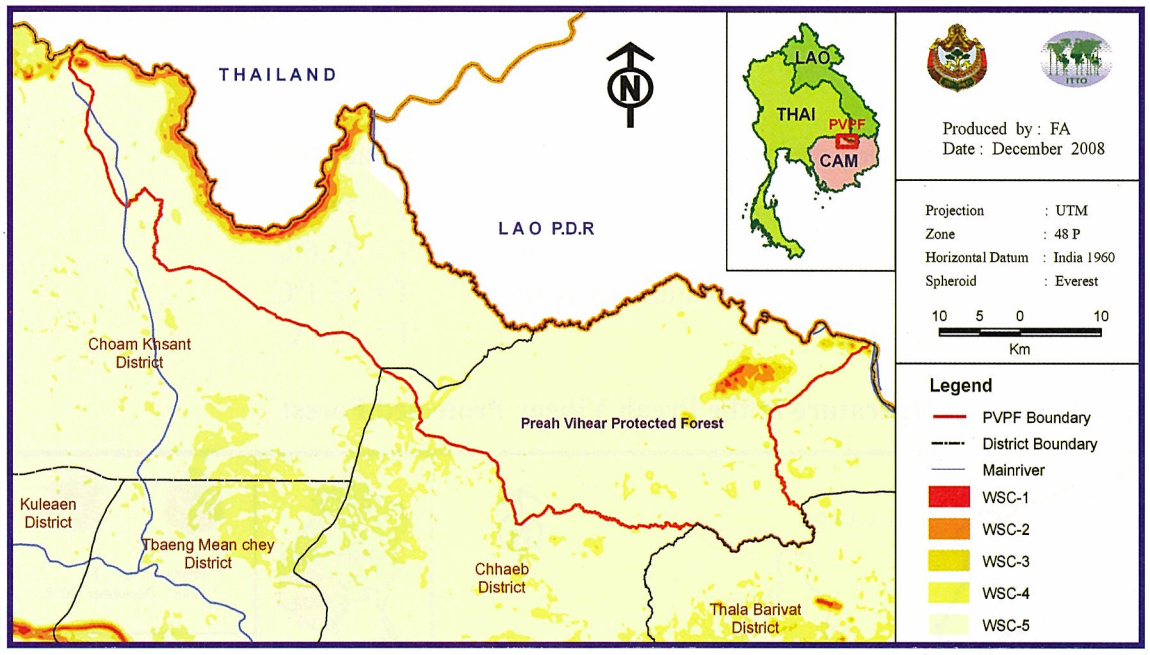
Generally, PVPF is lowland area, while its northern end is steep mountain of the Dangrek Range along the border of Thailand through the triangle area at the northwest of the planning area. The Dangrek Range is actually the steep edge of the Korat plateau, which extends over much of North-eastern Thailand.

The area has a gradual decreasing slope from the Northern part to the Southeast. The highest altitude of PVPF is 766 m a.s.l. at the triangle area of the Dangrek Ranges bordering Thailand, and the lowest altitude is 66 m a.s.l in Choam Ksan District.

Among the reasons that the PVPF areas is good habitat for large water birds and for large ungulates is the underlying geology resulting in the relatively flat topography, and the modification of the landscape over several centuries by agriculture. Geologically the area is part of an ancient flood plain with rocks predominantly of Quaternary age and sandstones of Jurassic – early Cretaceous and Triassic periods. The terrain is flat to undulating, with a steep escarpment to the north along the border with Thailand.

Hill features are mainly sandstone Phnoms which are a characteristic of the landscape in this part of Cambodia, but some higher ground has outcrops of unclassified rock. The relatively high ground of the plateau (not including Phnoms) appears free draining with sandy soils, while other areas have red soils and evidence of laterite deposits. During the wet season the comparatively higher ground, perhaps only 30m higher than other areas, contrasts with the inundated grassland of the lower areas. These veals and man-influenced features such as trapeangs, together with open deciduous dipterocarp forest, provide almost ideal conditions for both large water birds and ungulate species.

Map 1.3: Slope and Watershed



1.6 Climate

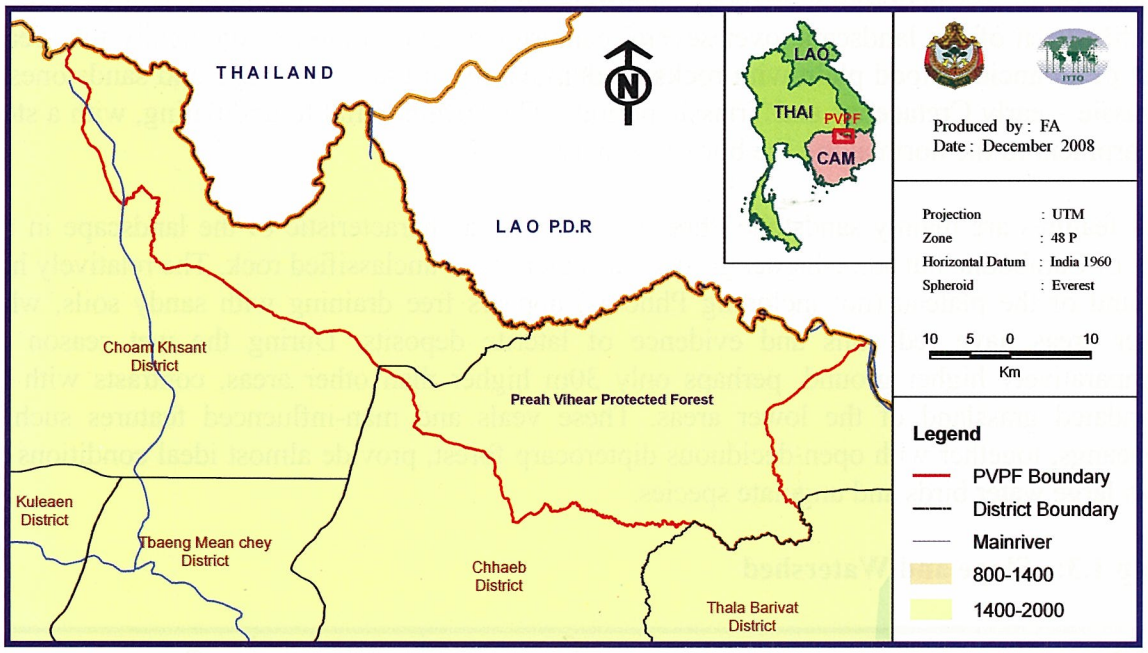
Preah Vihear Province borders Siem Reap, Stung Treng and Kompong Thom provinces; therefore, the climate in this area is similar--tropical monsoon climate of dry zone.

1.6.1 Rainfall

Precipitation is closely dependent on the monsoon. During the six-month-monsoon season from April to October, it rains in almost all places. Data from the meteorological station in Preah Vihear Province shows that:

- Average annual rainfall is 1,556.3 mm
- Maximum annual rainfall is 2,035.5 mm
- Minimum annual rainfall is 1,345.5 mm
- Average days of rain per year is 124 days

Map 1.4: Rainfall in the Preah Vihear Protected Forest

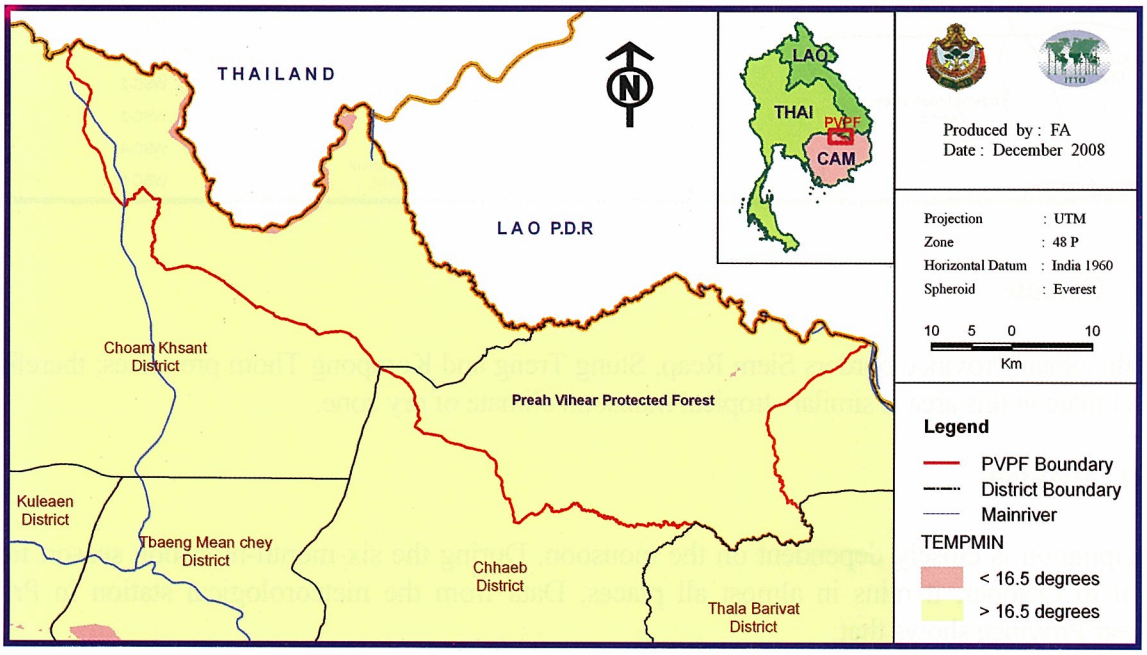


1.6.2 Temperature

Data from the meteorological station in Preah Vihear Province illustrates that:

- Average temperature per year: T = 33°C
- Average maximum temperature per year: T = 35.6°C
- Average minimum temperature per year: T = 32.1°C
- Amplitude heat T = 3.5 °C

Map 1.5: The Temperature in the Preah Vihear Protected Forest

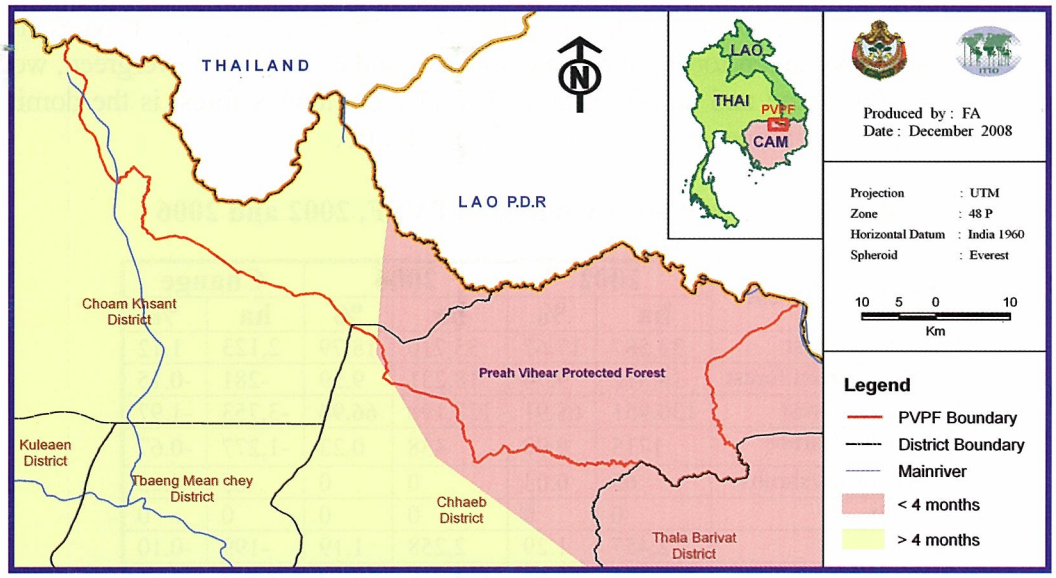


1.6.3 Humidity

The humid atmosphere is a part of climate and is dependent closely on the rainfall. Data provided by the meteorological station in Preah Vihear Province shows:

- Average humidity per year, (Ah) = 73.55%
- Average max humidity per year = 99.35%
- Average min humidity per year = 54.50%

Map 1.6: Humidity in the Preah Vihear Protected Forest

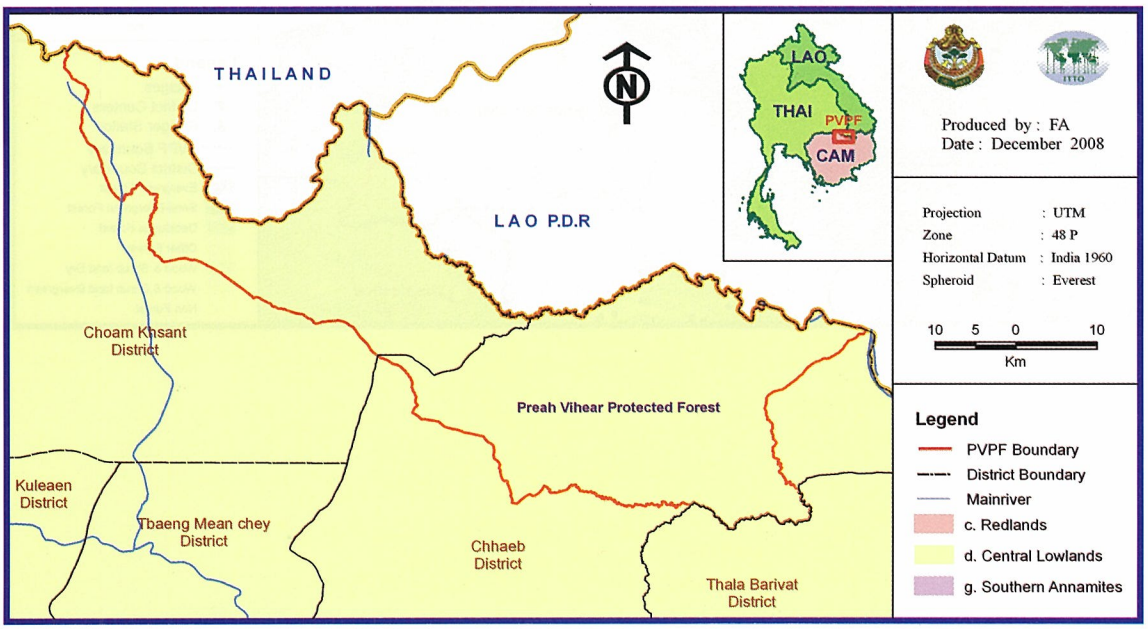


1.7 Forest Gene Ecological Zonation

The Preah Vihear Protected Forest is located within the Ecological Zone Type A Central Lowlands (Gene-Ecological Zones of Cambodia, 2003)

Most of PVPF is Dry Deciduous Forest, influenced by the Dangrek Mountain Range with its altitude ranging from 66 m to 766 m a.s.l. Because of the various factors that are similar in the region, such as ecological zone, climate, topography and geology and soil type, seeds can be brought from the nearby provinces of Cambodia such as Kampong Thom, Siem Reap, Oddar Meanchey, Stung Treng and Ratanakiri, and also other areas in the Dry Forest components of the Indo-Burma Ecoregion.

Map 1.7: Forest Gene Ecological Zonation in the Preah Vihear Protected Forest



1.8 Types of Forest and Wildlife

1.8.1 Types of Forest

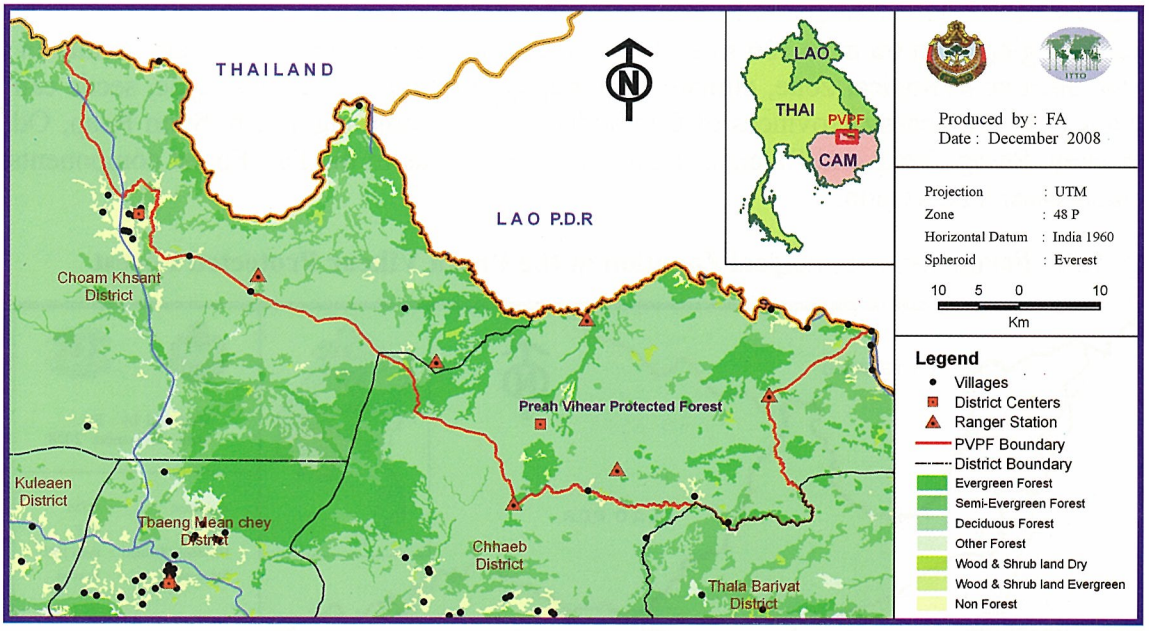
The Preah Vihear Protected Forest is located in Northern Cambodia with a land surface of 190,027 hectares. Most parts of PVPF grow multiple forest tree species, mostly Dipterocapacae. According to the Forest Cover Assessments of 2002, and 2006, PVPF has forest types such as evergreen forest, semi- evergreen forest, deciduous forest, wood & scrubland evergreen, wood & scrubland dry, other forestland and non-forestland. The Dry Deciduous forest is the dominance forest type, which represents almost 67% of total surface of PVPF.

Table 1.3: Forest Cover Change in PVPF, 2002 and 2006

Type of Forest	2002		2006		Change	
	ha	%	ha	%	ha	%
Evergreen forest	33,587	17.67	35,710	18.79	2,123	1.12
Semi-evergreen forest	18,512	9.74	18,231	9.59	-281	-0.15
Deciduous forest	130,951	68.91	127,198	**66.94**	-3,753	-1.97
Dry bushes/shrubs	1715	0.90	438	0.23	-1,277	-0.67
Green bushes/shrubs	65	0.03	0	0	-65	-0.03
Bamboo	0	0	0	0	0	0
Others	2,457	1.29	2,258	1.19	-199	-0.10
Total of Forest Area	**187,287**	**98.56**	**183,835**	**96.74**	**-3,452**	-1.82
Non-forest type	2,740	1.44	6,192	3.26	3,452	1.82
Total	***190,027***	***100***	***190,027***	***100***		

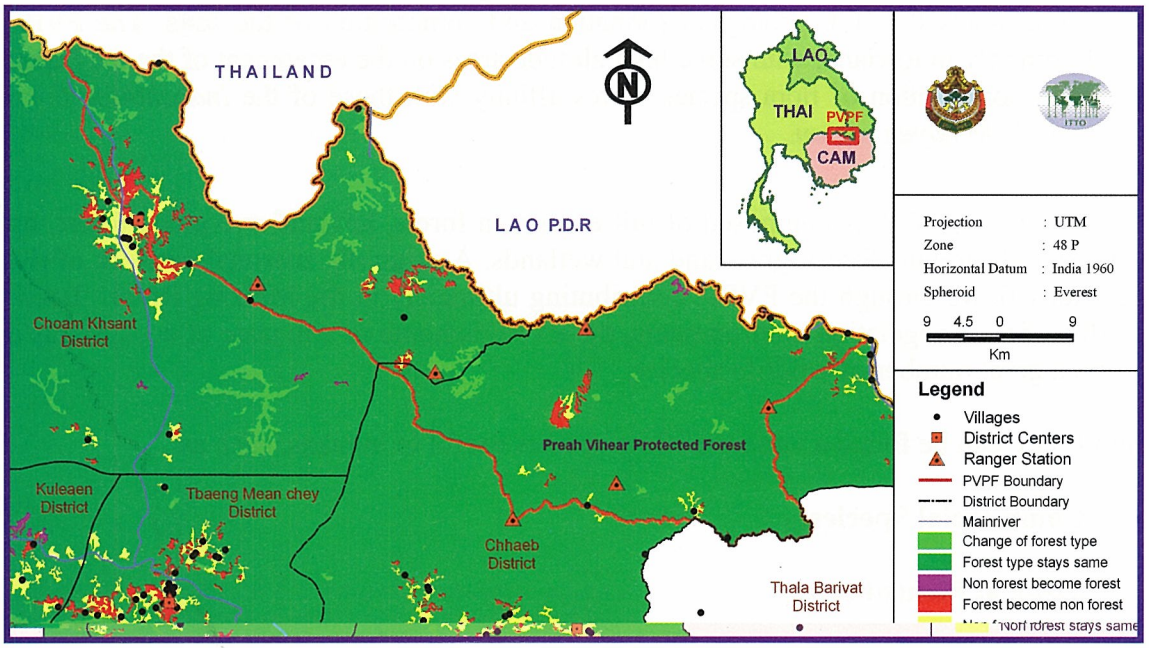
Source: *Forestry Administration Cambodian forestry statistics, 2007*

Map 1.8: Forest Cover 2002 of the Preah Vihear Protected Forest



Map 1.9: Forest Cover 2006 of the Preah Vihear Protected Forest

Map 1.10: Change of Forest Cover between 2002 and 2006 of the Preah Vihear Protected Forest



1.8.2 Vegetation and Wildlife

The Preah Vihear Protected Forest is a part of *Indo-Burma Biodiversity Hotspo,* one of *the 25 Global Hotspots* on the planet. In addition, the PVPF range is one of the biggest intact blocks of natural Dry Deciduous Forest on the Asia mainland.

1.8.2.1 Vegetation cover

Based on forest cover assessments in 2002, the PVPF has approximately 98.56 % forest cover of the total land surface. This is much higher than the 59.09 % of total countrywide forest cover.

PVPF is a primarily lowland with some mountainous area, and primarily natural vegetation. Because this area is rich in forest resources and has poor accessibility for management, some illegal activities such as forest land encroachment, illegal logging, and illegal wildlife hunting occur in the PVPF.

Moreover, forest fires occur every year during dry season, especially in the area of deciduous forest and bamboo forest. Most forest fires are started by humans for hunting purposes, although some are started by lightning strikes.

1.8.2.2 Flora

As Dy Phon (1981, 1982) indicates, Cambodia possesses 2,308 out of the 8,000 species described in the Flora Generale de l'Indochine (Cambodia, Laos and Vietnam). These 2,308 species belong to 852 genera in 164 families.

It is estimated that there are 12,000-15,000 species of plants *(IUCN, year 1995)* in the three countries of Cambodia, Laos and Vietnam. The World Conservation Monitoring Centre 2000 estimates 8,260 plant species in Cambodia, and 10% endemic (In Global Biodiversity UNEP &WCMC 2000).

The richness of plants species in PVPF is closely related to constant moderately high humidity (74%), abundant rainfall (124 days a year, with average rainfall 1,556.3- 2,035.5 mm a year), warm temperatures (33 °C), geological formation and composition of the soils. The PVPF is situated primarily in lowland, with some high altitude areas on the escapment of the the Dangrek range. The composition of flora species shares affinity with those of the *Indochinese floristic province, Indo-Malayan region.*

The landscape of PVPF is composed of hill evergreen forest, lowland evergreen forest, open forest, dried deciduous forest, grassland and wetlands. A primarily seasonal network of rivers and streams flows through the PVPF, contributing ultimately to the Mekong River. Because of its diversity of vegetation environments, the PVPF is home to a mosaic of ecosystems and supports a great number of wildlife species.

Within PVPF can be found a variety of flora species useful to humans, such as:

- **Commercial Species.**
- **Medical Plants/herbs.**
- **Non-timber forest products.**

*See **Appendix 1** for detailed descriptions.*

Semi-Evergreen Forest in Preah Vihear Protected Forest

Dry Deciduous Forest during rainy season in Preah Vihear Protected Forest

1.8.2.3 Wildlife

PVPF is home to many globally threatened species and is probably the most important site globally for the critically endangered **Giant Ibis** *Pseudibis gigantea* and the most important site in south-east Asia for three critically endangered vultures. It also has important populations of **Asian Elephant** *Elephas maximus*, **Banteng** *Bos javanicus*, **Eld's Deer** *Rucervus eldii* **Fishing Cat** *Prionailurus viverrinus*, **Dhole** *Cuon alpinus* and **White-winged**

Duck *Cairinia scutata*, all of which are endangered. Other threatened species include **Gaur** *Bos gaurus*, **Bengal Slow Loris** *Nycticebus bengalensis*, **Northern Pig-tailed Macaque** *Macaca leonina*, **Malayan Sun Bear** *Helarctos malayanus*, **Green Peafowl** *Pavo muticus* and **Sarus Crane** *Grus antigone*.

From 1998 to the present, the Forestry Administration (formerly Department of Forestry and Wildlife), in cooperation with Cat Action Treasury and since 1999 the Wildlife Conservation Society, have conducted biodiversity conservation surveys in Preah Vihear. The results of these surveys have documented an impressive list of fauna which is probably unique in south-east Asia for its representation of species from dry dipterocarp forests and other habitats, many of which are in rapid decline elsewhere.

Table1.4: Numbers of wildlife species classified by taxa.
Surveys have not been conducted in PVPF for reptiles, amphibians or invertebrates.

No.	Group of Wildlife	Countrywide (species)	Within PVPF (Species)
1	Mammals	125	> 57
2	Birds	540	>255
3	Reptiles	73	58
4	Amphibians	62	No formal study
5	Insects and butterflies	400	No formal study

1.8.2.3.1 Mammals

Field surveys have documented at least 57 mammal species in PVPF (Appendix 1.5). These surveys have focused predominantly on the larger species with some work on bats. Thus, the smaller rodents and insectivores are less well known at this site. Interviews with local people indicate that other species are likely to be present, these are not a reliable source of information and these records remain to be verified. We discuss key species below, many of which are threatened.

*See **Appendix 1.5** for detailed descriptions*

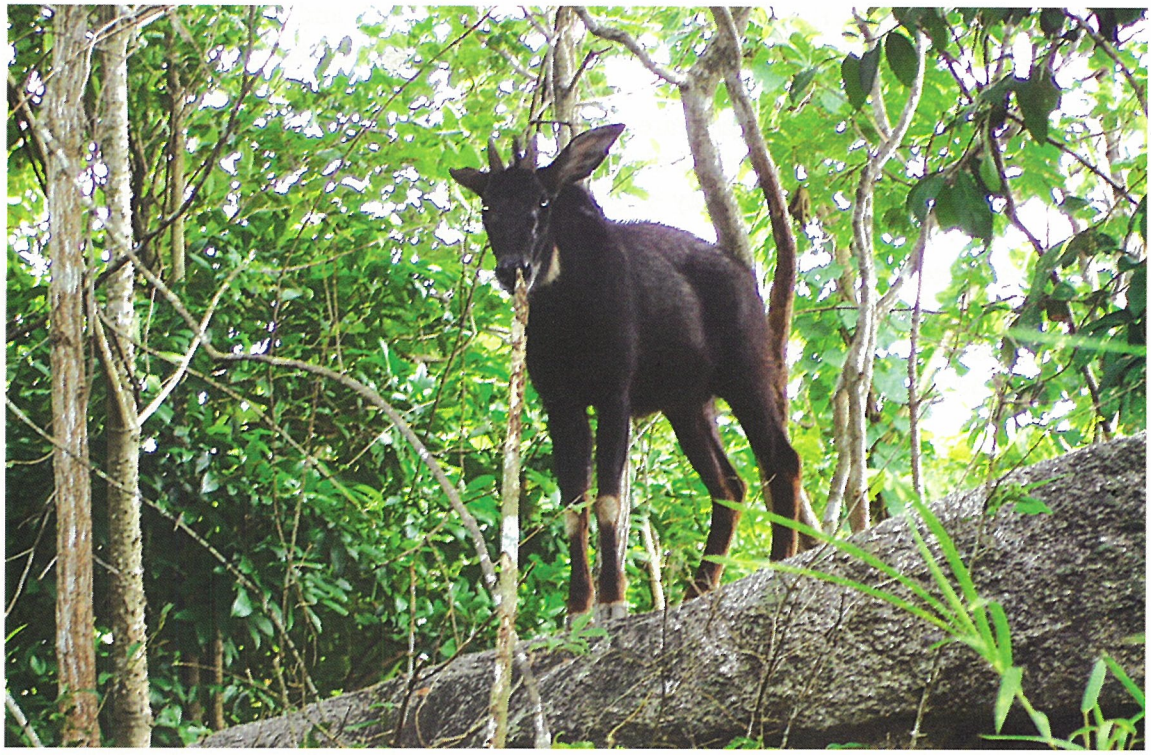
Additionally, a number of species which formerly occurred in PVPF apparently no longer do so. These include **Asian Two-horned Rhino** *Dicerorhinus sumatrensis,* **Lesser One-horned Rhinoceros** *Rhinoceros sondaicus* (last rhinoceros observed in Cambodia in 1930s), **Kouprey** *Bos sauveli* (last confirmed observation in Preah Vihear in 1964 (Wharton 1964)) and **Wild Water Buffalo** *Bubalus bubalis* (last confirmed observation in Preah Vihear in 1964 (Wharton 1964)). Taxonomy, nomenclature and order follow Francis (2008).

Asian Elephant *Elephas maximus*

Gaur *Bos gaurus*

Banteng *Bos javanicus*

Eld's Deer *Rucervus eldii*



Northern Serow *Naemorhedus sumatraensis*

Leopard *Panthera pardus*

1.8.2.3.2 Birds

Approximately 255 species of bird are known from PVPF (Appendix 1.6) including five of the rarest species in the world: Giant and White-shouldered Ibis and White-rumped, Slender-billed and Red-headed Vultures, all of which are Critically Endangered.

There are an impressive suite of other rare and threatened species which provide an important attraction to birding tourists and researchers. Many more species are likely to be identified from PVPF in the future as more survey work is carried out.

The bird nest protection project put in place across the Northern Plains of Cambodia in partnership by MAFF, WCS and local communities has been highly successful in allowing PVPF managers to monitor and protect some highly threatened species including ibises, cranes, storks and vultures.

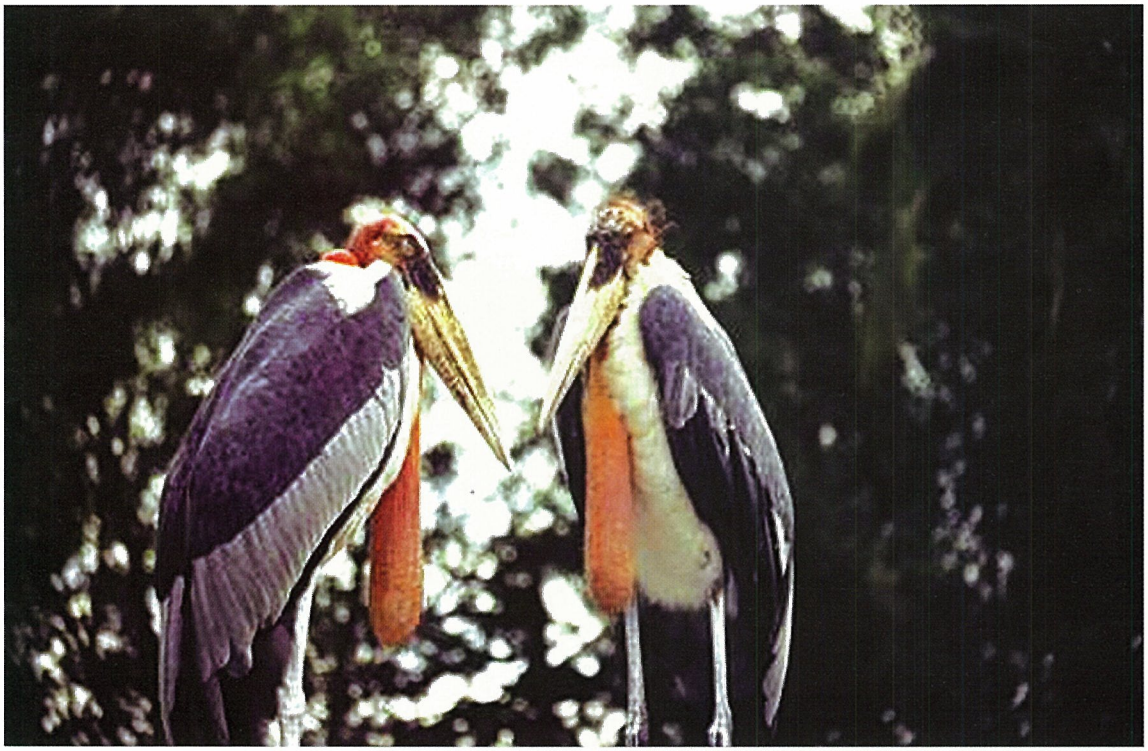
The numbers of very rare species have increased and this is an important activity for ensuring effective management of threatened birds in PVPF. It has the additional benefit of providing a small income to local community members and is thus highly popular with local people. Many of these birds are already included in the new proposed list of protected birds in Cambodia.

*See **Appendix 1.6** for detailed descriptions.*

Giant Ibis *Pseudibis gigantea*

Sarus Crane *Grus antigone*

White-winged Duck *Cairina scutulata*



Greater Adjutant *Leptoptilos dubius*

Green Peafowl *Pavo muticus*

White-rumped Vulture *Gyps bengalensis*

1.8.2.3.3 Reptiles

Some key species of reptiles within PVPF (Appendix 1.7) are crocodile, Bengal monitor, and Asiatic softshell turtle. Some Cambodian reptiles and amphibians have major economic, cultural and ecological values and medicinal importance due to high demand in local markets and abroad. FA has tentatively identified 58 species of reptiles in the PVPF, and potential additional species have been recorded through interviews with local people.

Siamese Crocodile *Crocodylus siamensis*

Bengal Monitor *Varanus bengalensis*

Elongated Tortoise *Indotestudo elongata*

Asian Box Turtle *Cuora amboinensis*

Reticulated Python *Python reticulatus*

Burmese Python *molurus bivittatus*

1.8.2.3.4 Amphibians

So far, this group of animals has received minimal attention from scientists and conservationists in Cambodia. Amphibians are good general indicators of habitat diversity and environmental degradation (so by surveying and monitoring amphibians, it is possible to evaluate and monitor ecological diversity and well-being). Amphibians play an important role

in maintaining healthy ecosystems of our planet, as predators and prey of a wide range of other animals both on land and in water.

1.8.2.3.5 Insects

Insects play a very significant role in the breakdown and recycling of dead vegetation and animals. Beneficial and harmful insects exist: some are a vital prey for birds, bats, reptiles and spiders, and some play a significant role in pollinating forest plants. Others are providers of silk, honey, wax, and food for humans as well as pharmaceutical substances. Some wasp species are acting as biological control and environmental disturbance indicator. Other species of insects are crop pests and disease transmitters, such as malaria, dengue and filariasis. Some termites are destroyers of wooden structures. It is expected that potentially the numbers could be from 200-300 species of insects within PVPF.

1.8.2.3.6 Fish

Cambodia is well known for high fish harvests in the region. Fish is the major source of proteins for Cambodian people, and Cambodian people consume an average 30-40 kg /year/person of fish (Chheang at al. 2002).

The PVPF has abundant fresh water habitat, particularly in the rainy season. During the driest part of the year, the pools and trapeangs that still have surface water, together with the pools remaining in the river channels, provide the only drinking water in the PVPF. As a result, some of these water sources are heavily utilised by people and many used as fisheries. Some are even drained to catch the fish. The physical characteristics (muddy- or grass-edged, reed abundance, canopy cover), location, dynamics of water level changes, and the abundance of fish and amphibians of each of these water bodies is likely to be the primary influence on the distribution of large water birds.

1.9 Access

1.9.1 Roads

-National Route 6 connects from the Phnom Penh capital to the intersection of two directions of the roads going to the provinces of Siem Reap (**6**) and Preah Vihear (**64**) in Kompong Svay district, Kompong Thom Province. The distance is 175 Km.

-National Route 64 connects to the national route No. 6 at the junction in Kompong Svay district, Kompong Thom Province, continuing to Thbeng Meanchey, the Provincial Town of Preah Vihear province via Salavisay commune, Prasat Balang district of Kompong Thom province. Due to bad condition of this road part, the Government is going to renovate it the entire 126 km. However, it can be used in both dry and rainy seasons.

Other Main Roads accessible from Tbeng Meanchey to PVPF:

- **Road 62**, from Tbeng Meanchey to centre of Choam Ksan District, distance 91.3 km, continuing to entrance of PVPF at Or Aban, Cha-eh village, Toeuk Kraham commune, Choam Ksan District.

- **Road 69 B**, from Choam Ksan District centre
- **Road 211**, from Choam Ksan District to Chhep District
- **Road 214**, from Tbeng Meanchey to centre of Chhep district, distance 64 km across Stung Sen River and 5 streams without bridges. Therefore, this road cannot be accessed

in the rainy season even using motorbike and boats, because the level of those waterways is unstable. It is continued by a road 15 km to the boundary of PVPF.

Map 1.11: Road Access System for the Preah Vihear Protected Forest

Source: Forestry Administration, 2002

1.9.2 Waterway systems

There are waterways that are tributaries of Stung Sen River that water original from Phnom Dangrek Mountain range. People can access by boat to Tbeng Meanchey Town only in the rainy season through Stung Sen River. Another waterway is Tonle Ropov along the border between Cambodia and Lao PDR where water original from Phnom Dangrek Mountain range flow through Labakhon, Stung Treng province.

Map 1.12: Waterways and Rivers system in PVPF

Source: Forestry Administration, 2002

1.9.3 Air Access

The nearest airport to The Preah Vihear Protected Forest is located in Tbeng Meanchey. This small airport can only used for medium aircrafts and helicopters. As of 2010, there is no scheduled air service. In Choam Ksan district, there is another airstrip long ago abandoned.

1.10 Strategic resources

Forest Resources of PVPF

The Preah Vihear Protected Forest (PVPF) predominantly consists of dry deciduous forest, although there are significant areas of other forest types. Some of the PVPF still has high commercial value, although the forest was exploited by Concession Company during 1993-2001.

The evergreen forest and semi-evergreen forest cover 18.38% of the total PVPF. These forests contain valuable species such as *Thnong, Chhoeteal, Phdeak, and Koki.* Deciduous forest covers about 67%, but these forests also contain some luxury timber such as *Neang Noung, Beng, Kro kos, Ph'chek.* Many high-value timber trees can still be found and represent a significant forest resource if managed properly.

Climate change is now a significant global concern and managing forests for carbon storage is a cost-effective strategy for reducing the emissions of greenhouse gases (GHG). Recently, the United Nations Framework Convention on Climate Change (UNFCCC) resolved to create a mechanism to certify reduced emissions from deforestation and forest degradation (REDD), and the PVPF could possibly provide significant revenues to the Cambodian government as part of a national REDD strategy.

Water Resources

Preah Vihear province has a fairly low annual rainfall as it is in the rain-shadow of the Dangrek Mountains, which trend east-west along the Cambodia-Thai border. The PVPF is part of a watershed for the people living in Preah Vihear Provinces and the Central Lowland of Cambodia.

The PVPF provides vital livelihood support through the provision of drinking-water, as well as water for agriculture and fisheries. The forested watershed reduces wet season flooding and provides opportunities for rice-growing and other agricultural activities in downstream areas. Maintenance of forest cover in the PVPF will help regulate annual flow regimes in the rivers into the reservoirs and reduce sedimentation to decrease reservoir dredging.

Agricultural Resources

Some of the soil in the lowland areas to the south of the PVPF is fertile, providing opportunities for high-value crop production (e.g., rice, fruit orchards, oil palm) in areas that are not forest estate. Some of the PVPF consists of steep-sided mountains with thin soil cover, which provides very few agricultural opportunities. It may be possible to harvest some forest products in a sustainable way. These could include relatively high-value NTFPs such as bamboo, rattan, cardamom, and resin.

Cultural Resources

Numerous sites containing the remains of ancient temples are dispersed throughout the PVPF. These sites highlight the PVPF as an area of cultural significance for Cambodia.
Although for much of the period the Angkorian empire was ruled from Angkor, important secondary centres existed. Koh Ker in southern Preah Vihear was the capital in the early 10th

century under Jayavarman IV. Preah Khan of Kampong Svay, also in southern Preah Vihear, was the largest temple complex ever constructed by the empire with an enclosure measuring 5 × 5km. Beyond these sites, northern and north-western Cambodia, and adjacent parts of Thailand and Laos are the remains of many small temple complexes, revealing a pattern of human settlements that in some areas may have been greater than the human population today.

Ecotourism resources

The PVPF can generate long-term revenues through ecotourism, particularly bird-watching, trekking on forest trails, and forest camping. The PVPF provides the potential to link ecotourism in the PVPF with cultural tourism at the Preah Vihear Temple UNESCO World heritage Site.

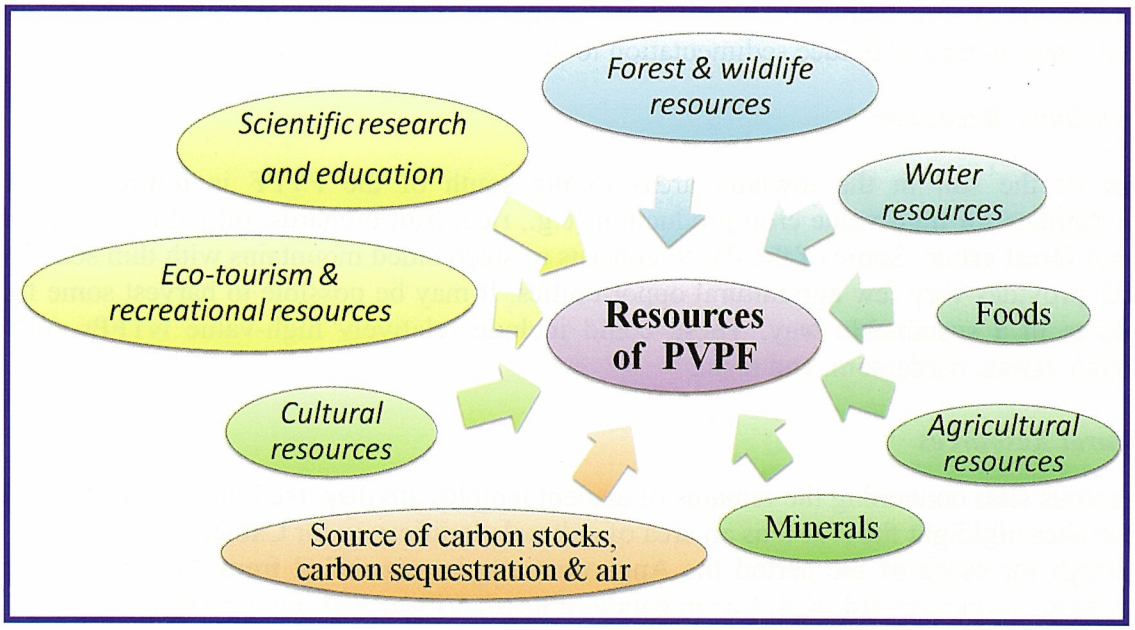
Scientific Research and Education

The PVPF contains a very high number of plant and animal species, some of which may be extremely valuable in the future for medicinal or other purposes. For example, the Red Jungle-fowl - the ancestor of domestic chickens – contains genetic material that could be vital for disease control in domestic poultry. Yet because of cross-breeding with domestic chickens, very few sites around the world now contain genetically pure populations of Red Jungle-fowl (the PVPF is one such site).

Also, medicinal plants in the PVPF may provide cures for human diseases in the future. So, the PVPF can act as a gene bank for species that could provide financial returns for Cambodia. The forest becomes increasingly valuable as other forested areas in Asia are lost and fewer countries hold these genetic resources.

Also, due to its high biodiversity, its wealth of threatened species, and its value as a pilot site to study ecosystem services and climate change issues, the PVPF could become a site of international importance for research and education. If research stations are built in the PVPF, the site could formally link its management activities with national education activities through schools and universities. It could also link formally with international research institutes, universities, museums and herbariums. This would benefit the site by providing scientific, technical and financial support.

Diagram 1.1: Resource of PVPF



Chapter 2

SOCIAL AND ENVIRONMENTAL STATUS

2.1 Social status

2.1.1 Population

2.1.1.1 Districts, communes and villages

The Preah Vihear Protected Forest (PVPF) includes portions of two districts (Choam Ksan and Chhep) with a total of 5 communes and 21 villages. Choam Ksan District is located in the northwest of the PVPF while Chhep District in the northeast. The communes and villages of the two districts are widely distributed in and around the PVPF (Appendix 2.1).

2.1.1.2 Families and population

Within and surrounding the PVPF, there are 3,042 families, equal to a population of 14,189 (1,795 families in Choam Ksan district, and 1,247 in Chhep). Approximately 97% of the population is Cambodian, while some 3% are ethnic. Life expectancy is increasing and is now 58 years for women and 54 years for men (SCW, 2006). Population density is one of the key indicators of pressure placed on the environment and its associated effects on the quality of life and standard of living (SCW, 2006).

The low population density, less than 8 pp/km^2 in the planning area, is mainly due to inaccessibility resulting from flooding in the wet season, lack of water in the dry season, lack of roads, and little land suitable for intensive agriculture. As a result of poor infrastructure there is a low level of development, resulting in very few employment opportunities.

Many people in the planning area have a high dependency on natural resources. Without greater employment opportunities for youth there will be continued pressure on the natural environment as expanding households clear new land for agriculture and forage for forest products. Rapid population growth in rural areas is likely to lead to deforestation, degradation of land, depletion of water resources and reduction in biodiversity.

Table 2.1: Population statistics of districts and communes related to the PVPF

Location	Population				Age > 18 years			Density
	Family	Female	Male	Total	Total	Female		
						Number	%	
Preah Vihear Province	**33,032**	**79,873**	**77,812**	**157,685**	**67,902**	**35,070**	**51.65**	**11.4**
Chhep District	**1,247**	**3,240**	**3,245**	**6,485**	**3,086**	**1,621**	**52.53**	
Chhep Pir commune	457	1,231	1,239	2,470	1,113	577	51.84	
Sangke Mouy commune	248	650	669	1,319	605	320	52.89	
Kampong Sralou Mouy commune	542	1,359	1,337	2,696	1,368	724	52.92	
Choam Ksan District	**1,795**	**3,867**	**3,837**	**7,704**	**3,972**	**2058**	**51,81**	
Choam Ksan commune	1,015	2,182	2,163	4,345	2,140	1,123	52.48	
Toeuk Kraham commune	780	1,685	1,674	3,359	1,832	935	51.04	
Total	***3,042***	***7,107***	***7,082***	***14,189***	***7,058***	***3,679***	***52.13***	***7.5***

Source: *Seila commune data 2007*

2.1.2 Education and training

The education system represents an important bridge between economic and social development. International evidence demonstrates that improved literacy and education amongst farmers can be a key element of improved agriculture productivity, rural employment diversification and income growth (SWC, 2006). Education also encourages and promotes the sustainable use of natural resources and lead to a greater understanding of environmental circumstances.

Based on statistics for Seila database 2004, the total of the population (age between 6-17 years old) attending school in the planning area covering two districts (Chhep and Choam Ksan) is 21%. The figure of adults (age 14-15 years old) going to school is 5%. This figure is every low. It is likely that many children of primary age remains out of schools.

Illiteracy in the planning area is high, especially for women. Female illiteracy at age 15 is 8,442 out of the total of 17,208 women. Meanwhile, male illiteracy at age 15 is 6,630 out of a total of 16,237 men in the two distiricts.

These outcomes are a combinaiton of a number of social, cultural and economic factors. Although girls enroll roughly the same age as boys, earlier drop out rate occur with the onset of puberty as family responsibilities begin to predominate. Parents are often less willing to invest in educating females, which is a critical factor when parental contributions are a large share of education spending.

In addtion, few rural villages in the planning area have secondary shcools, so attending secondary shcool typically means travelling long distances or staying away from home. This is culturally unexceptable for girls.

The shortage of teachers is particularly felt in remote areas. At present all new teacher graduates are required to complete two year postings in remote areas (SCW, 2006). However, with no provision of housing, support or adequate income, most teachers find this extremly difficult. There is a shortage of schools buildings and learning centers, class sizes are often excessive, the number of actual teaching/learning hours is inadequate, new curricula are not yet fully implemented and there is a shortage of core and supplementary teaching materials.

Teachers are often ill motivated due to low salaries and poor working conditions. The socio-economic and professional status of teachers is poor. There are few non-monetary incentives such as scholorships, training opportunities, career development or public recognition.

From generations, people in this area have received little vocational training. There has been some training by non-goverment organiznations in agricuture practice, eco-tourism, animal hustandry and other sectors. Although training centers in the two districts are lacking, people from the planning areas have been trained in the provincial capital of Preah Vihear.

Training includes fish farming technology, vegetable growing, textiles & design, hairdressing & wedding outfitting, welding, motorbike repair, electrical repair, hospitality, office and computer skills. Literacy was included in training for rural women, and STD/HIV/AIDS awareness (APHEDA, 2006).

Table 2.2: Statistics of Classroom by districts in and around PVPF

N	Districts	Kinder-garden	Primary	Secondary	High School	Other
1	Chhep	-	68	5	-	
2	Choam Ksan	-	74	11	-	
	Total	**-**	***142***	***16***	**-**	

Source: *Forest Management Plan of Chhep and Choam Ksan FA Divisions, 2007*

2.1.3 Land use and Management

- **Management of PVPF**

The Forestry Administration through Wildlife Protection Office and local Forestry Administration (Inspectorate, Cantonment, Divisions and Triages of the Forestry Administration) have the duty of managing Permanent Forest Reserves.

Currently, FA collaborates with ITTO and WCS to support the management program of the PVPF. The PVPF Management Program consists of a law enforcement component that focuses on upholding the Forestry Law. The rangers work together with military police to patrol the PVPF. There is a community outreach component, which promotes alternative livelihoods to those communities living within the PVPF and provides them with incentives to support conservation-friendly lifestyles and activities.

The program has also effectively engaged with communities in the buffer zone of the PVPF to secure the management of some border areas of the PVPF. There is an on-going program of research to ensure that the biological, ecosystem services and climate change-related values of the PVPF are better understood and properly accessed. There are monitoring components, participatory land-use planning (including residential and agriculture land mapping) and demarcation of Permanent Forest Estate), ecotourism, and information education and awareness components.

In order to properly manage the PVPF, the FA through ITTO funded project Management of the Emerald Triangle Protected Forests Complex to Promote Cooperation for Transboundary Biodiversity Conservation between Thailand, Cambodia and Laos (Phase II) has developed this management plan. In order to succeed and have effective management, planning is the primarily process to provide a road map of interrelated strategies and management activities designed to ensure the effectiveness of management and sustainable development of the natural resources in the PVPF.

- **Land use within and around PVPF**

PVPF is largely covered by deciduous dipterocarp forests while some parts are flooded in rainy seasons. Irrigated agriculture provides primary needs in inundated areas in Choam Ksan District, whereas highland agriculture is insufficient in Chhep District (Chhep FA Division, 2007).

Agriculture is predominantly organized on the basis of small farmer communities. The plight of these communities in relation to access to natural resources and land ownership is possibly one of the most significant factors facing land use issue in the planning area today. Participatory land use planning has only been formulated in one pilot village.

Land is cleared within the protected forest every year for swidden agriculture, usually the planting of rain-fed rice. Local impacts of such activity can be high because villagers often

hide their clearance by cutting and clearing areas within mixed or evergreen blocks of forest, so that their chamkar is not easily visible to patrols. Impacts of such activity include potential loss of nest trees, and disturbance to forest blocks which might be important habitats or refuges for the larger ungulates (Wharton, 1961).

Expansion of the agricultural areas adjacent to the PVPF (and for several villages within it) to grow paddy rice is an increasing problem, which the community teams are working to control through participatory mapping and planning discussions with village committees. Uncontrolled encroachment into seasonally flooded areas impacts on feeding and nesting areas for Giant Ibis, Sarus Cranes and Adjutant Storks.

2.1.4 Occupation and income

- **Occupation**

People living within and surrounding Preah Vihear Protected Forest engage in various businesses, depending on actual conditions and places. Agriculture is the main core livelihood activity. Rain fed rice cultivation in wet season is considered to be significantly important for food security. Besides rice production, community residents grow subsistent food crops and home gardens for daily consumption. Fruit trees are grown, especially around homes.

Some households fish in wet and dry season. Large permanent ponds are regarded as a main source of fish in dry season, when many streams and ponds dry up. They use traditional fishing gear to catch fish. However, some local people use electro fishing, which is considered harmful to fish productivity.

Livestock (cattle, pigs, chicken and ducks) are raised for consumption and for sale. Observations indicate that cattle are one the main income local people can generate to purchase agricultural machinery and to construct houses. Moreover, cattle including buffaloes are the main force for agriculture land preparation.

Livelihood of the people still depends on natural resources especially for those who live close to and within the planning area. The non-timber forest products they collect are resin, wildlife, honey, orchids and wild vegetables, wild fruits, fuel wood, grass for thatch, bamboos and food for house construction.

Several households are also engaged in small scale trading and wage labor. Hunting is a source of food and income among some villagers. Dogs have been used by hunters and the most common species hunted are water monitor and tortoise. Hunting is done year round but peaks during the early raining season.

Resin taping is practiced by some villagers who possess resin trees. These villages are close to areas where Dipterocarp resin-producing trees are abundant. Resin trees are claimed by individual households under a traditional tenure system. Dry resin is much less valuable than wet resin and the trees that produce it are considered common property. Wet and dry resins are considered to be the main source of income that can be generated among non-timber forest products collected.

- **Income Generation**

Surveys conducted by the Cambodian Forest Industry Association in 2002 showed income earned from the collection of timber and non-timber forest products. 49% of families earn their income of 0.4-1.3 million Riel per year from selling agricultural products. They do not rely entirely on natural resources. However, for their daily lifelivhood, they use some natural resources to reduce family spending.

Even though no specific surveys on family income generation within PVPF has been conducted, an estimate of average domestic income/person (GDP) in 2001 was about USD$259 (NPRS, 2002). A large percentage of the populatioin in Preah Vihear province lives under the poverty line (NPRS, 2002).

Income, earned from sales of timber and non-timber forest, agricultural, fish and animals products is relatively small but contributes to families living income. They are able to possess properities such as motorbikes, bicycles, boats, tractors, cars, televisions and thatched, concrete and tin houses.

Populations lives under the poverty line within Preah Vihearr province are similar to those in Kampong Thom and Siem Reap provinces, but lower than in Oddar Meanchhey.

Map 2.1: Population Under Poverty Line in PVPF

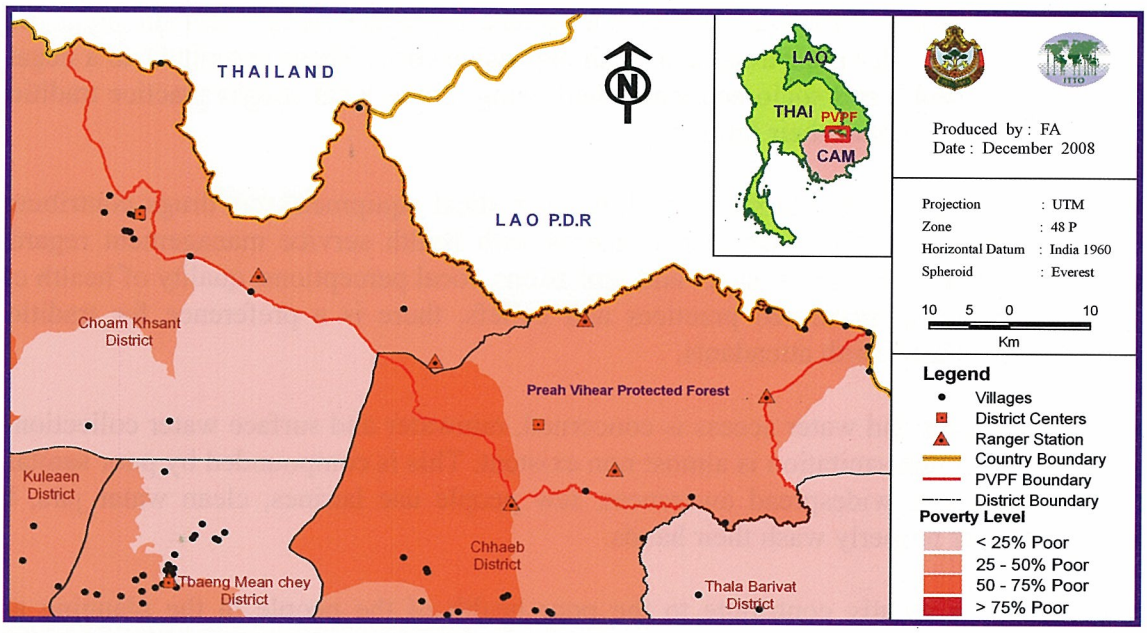
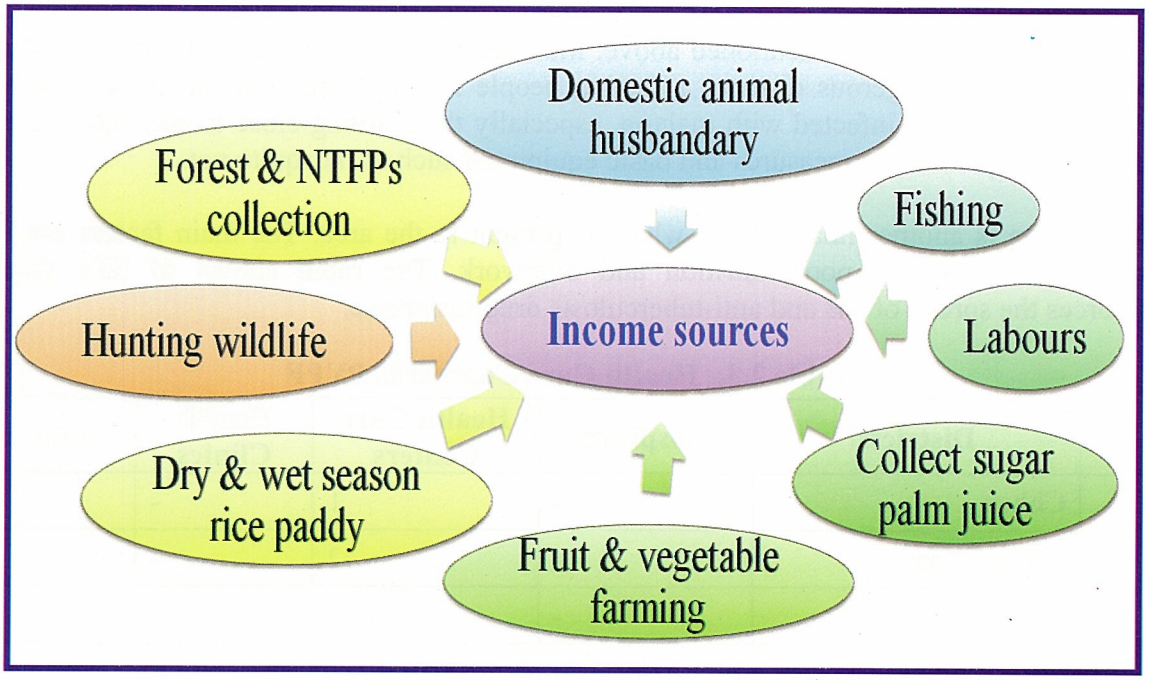


Diagram 2.1 : Income Sources



2.1.5 Health

Despite marked progress made by the Royal Government of Cambodia in the health sector, the health status of the people of Cambodia is among the lowest in the region (SCW, 2006). Maternal mortality remains high and many children die of preventable deceases. To date the publicly health funded services, especially to the rural poor, are inadequate and overall rates of utilizations are low. For most, out of pocket spending on healthcare is a key issue related to indebtedness. Within and around the planning area, there are only 3 health care centers. Hospitals and professional clinics are lacking.

A large number of people in the PVPF do not have access to health care at all. Additionally, many of those with access are unable to afford it. Moreover, the publicly funded resource-poor facilities present in the rural areas are unable to respond to all the health needs of the population, especially those households situated in remote areas.

Due to lack of health facilities and inadequate resources, people return to unskilled physicians and family pharmacy for their treatment, with expensive costs. These contribute to a negative impact on their health and socio-economic well being. Some local people practice traditional spirit pray for treatment of their families.

Low salaries for public health staff and limited medical equipment and drugs contribute to poor staff motivation. There are also concerns with health service management regarding limited capacity. Due to access issues and limitations, local perceptions, quality of health care, financial constraints, traditional practices and beliefs, there is a preference for traditional healers and traditional birth attendants.

As far as sanitation and water access is concerned, rainwater and surface water collection for their water needs and sanitation is almost non existent. This is compounded by poor sanitation practice. In spite of widespread awareness, few people use latrines, clean water jars, boil drinking water or properly wash their hands.

These conditions greatly contribute to the poor health of the people in the planning area. The main consequences of a lack of access to safe drinking water and sanitation facilities, coupled with poor hygiene practices, are communicable diseases such as cholera, fever, parasite infections and diarrhea diseases.

In addition to the diseases mentioned above, Malaria, Tuberculosis (TB), HIV and AIDS are among the most dangerous diseases affecting people in the planning area. Local people in PVPF are frequently infected with malaria, especially those living close to and within forest areas without preventive measures and basic equipment such as mosquito net.

TB infection is another fatal disease which is present in the area. The main factors are low socio-economic status, poor nutrition and overwork. The rapid spread of HIV further reinforces the spread of TB and anti-tuberculosis drug resistance.

Table 2.3: Health Care Centers in PVPF

N	Districts	Hospitals	Health Care Centers	Health Clinics	Other
1	Chhep	-	1	-	
2	Choam Ksan	-	2	-	
	Total	**-**	***3***		

Source: Forest Management Plan of Choam Ksan FA Division, 2007

2.1.6 Religion and beliefs

There are a total of 12 Buddhist pagodas within and around PVPF. Many pagodas are in poor conditions because all the believers living in PVPF are not able to renovate or rebuild them for traditional service. Within and surrounding PVPF there are no churches and mosques. No information about religious disputes and discrimination has been reported. Some pagodas are not recognized by the Department of Cult and Religion.

Table 2.4: Pagodas within and around the PVPF

N	Districts	Buddhist Pagoda	Mosque	Church
1	Chhep	4	NA	NA
2	Choam Ksan	8	NA	NA
	Total	**12**	NA	NA

Source: *Cult and Religion Office in the 2 district*

2.2 Environmental status

2.2.1 Water resources

Within and surrounding PVPF, there are many temporary streams and rivers flowing from mountains to the lowland in rainy season from June to September. In dry season, from October to May, most of the streams dry out. Two main rivers (Mekong and Ro Pov) which are located to the northeast of PVPF have permanent water.

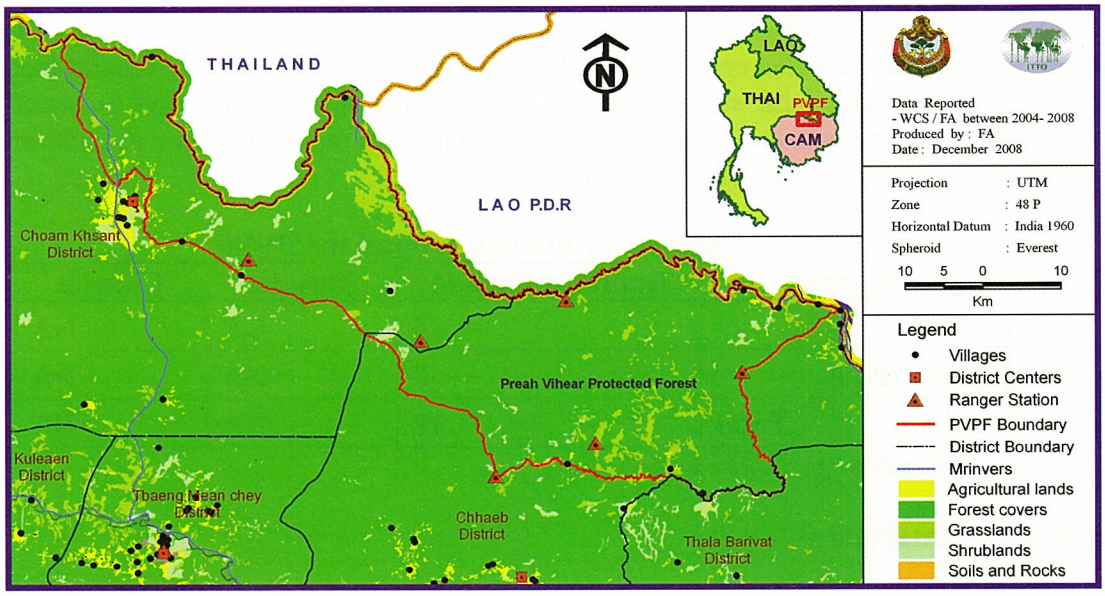
With the start of the monsoon rains in late May, the rivers and streams revive their flows and attain greatest levels in September or October. The two main rivers play an important role in the region not only in transportation but also in the social and economic sector.

2.2.2 Land cover

Table 2.5 Land cover in PVPF

N	Type	Area(ha)
1	Agricultural lands	1,485
2	Forest cover lands	174,007
3	Grasslands	10,493
4	Shrublands	3,761
5	Soils and Rock	0
6	Urban, Built-Up Areas	250
7	Water Features	31
	Total	190,027

Map 2.2: Land cover



2.2.3 Agriculture

Agriculture is central to the domestic economy of Cambodia and integral to the fabric of Cambodian rural life. According to direct government observation, people in PVPF earn their living by practicing agricultural cultivation because farm rice production remains significantly important to the food security of the largely subsistent population of farmers and their families, and rice consumption remains high.

However, agriculture in communities within and around the planning area is a low input and low output system. Low input, generally poor soil quality and the highly seasonal availability of water resources all contribute to comparatively low yields around 1.9 ton/ha. Rice production in the planning area lies in the Rain-fed Upland Rice Eco-region.

Even though agricultural statistics for 2003-2004 indicated that Preah Vihear province experienced rice surplus, a majority of the farm households find it difficult to meet their daily requirements and also have a surplus for sale and income generation. Some communities, especially in Chhep district, experience chronic shortages. Production may be considered fragile as it is highly susceptible to floods and drought.

Direct observation at communities showed that many farmers use small tractors for land preparation instead of cattle because small tractors are more convenient, powerful and time-saving and can be used for transportation of commodities and other purposes.

Apart from rain fed rice production, subsistent fishing, animal husbandry, crop cultivation and home gardens are among the options to earn a living. Communities that live in and around the planning area collect timber and non-timber forest products for customary use, and depend partly on forest resources to sustain their lifestyle.

Some of local family within and around PVPF earns their living by practicing agricultural cultivation together with fishing, but most of them collect timber and non-timber forest products for customary use and for sale as well.

Shifting cultivation. After the civil war, communities in and around the PVPF area became more reliant on shifting agriculture than in the pre-conflict era. The predominant form of shifting agriculture in the southern portion of the PVPF used to involve slash and burn forest surrounding

their villages, though this practice is rarely used now. Crops grown include: rice, sugar cane, pepper, peanuts, bananas, cassava, sweet potato, and rice. This system is now a partially swidden in nature; that is it involves the re-use of previously cleared areas within a rotation cycle.

Some communities still practice traditional shifting cultivation. However, new agricultural skills have been introduced by CEDAC, such as SRI (Single Rice Intensification). This technique is used to improve rice productivity and is widely used.

Paddy. Some areas that border and occupy the PVPF were once areas of larger-scale paddy production. Several factors account for the lower current level of paddy agriculture at this time. The civil war resulted in the deserting of the area's rice paddies and the loss of the bulk of the water buffalo population. The re-use of these paddy areas has subsequently been prevented by the difficulty of turning the compacted paddy fields after several decades of non-use, and the lack of tillage animals.

Crop cultivation and fruit tree orchards. In the PVPF, these have been small-scale and limited to only a few crops, such as bananas and pineapples, which have been historically important to village well-being. As the lands south of the PVPF have developed reliable transport access to district and provincial markets, and as food prices have increased, crop cultivation (e.g., peanuts) and fruit orchards around the PVPF have moved into commercial-scale operations. This expansion poses a threat to forested areas of the PVPF situated on fertile soils, and has been a major driver of deforestation in this area.

Livestock raising. Most of the animal rearing in and around the PVPF is linked to the supply of household needs and the sale of surplus livestock to other villagers. The typical animals raised by villagers include chickens, pigs, cattle and water buffalo and ducks and geese.

Fertilization. Cambodian farmers know how to manage their crops via the use of natural fertilizers, but vaguely understand the utilization of chemical fertilizers. Natural fertilizers include animal dung, kitchen waste, ashes, leaves, straw and salt. They do not clearly know and understand how chemical fertilizers are used in term of quantity, timing, and soil types for various crops. The majority of rice paddy are sterile, thus the utilization of agricultural fertilizers is very important for enhancing a high yield of crops to ensure food security during population growth.

Chemical fertilizers have been used in the cultivation of long and short term crops to improve growth, and insecticides have also been utilized with fruit trees. In some cases, herbicides are used in fruit tree plantations. Recently, education and awareness raising on the potential dangers of the utilization of chemical fertilizers and insecticides and the significance of the use of natural fertilizers (compost or EM fertilizers) have been carried out by the Ministry of Agriculture Forestry and Fisheries and some NGOs. Local communities realize that the use of chemical fertilizer can result in land degradation which is unfavourable to rice production in the long term.

2.2.4 Handicraft and industry

There are no legal handicraft and wood processing industry in and around PVPF. However, Recently, there are three sites of mine exploration located in four communes including Toeuk Kraham in Chaom Ksan district and Kampong Sralou Mouy, Chhep Pir, Sangke Mouy in Chhep district.

2.2.5 Social and Environmental Issues

A number of Social and Environmental problems affect the management and conservation of forest resources within the PVPF. The main problems are:

Poverty and lack of sustainable agriculture practices. Poverty is one cause of degradation of forest and wildlife within the PVPF. Local people do not have sufficient food supply through their current agriculture practices and therefore seek additional food sources by hunting and collection of forest products for sale.

Social instability. Between the years 1979 and 1998, civil war pushed locals to re-settle in pristine forest areas. The settlements have ever expanded due to shifting cultivation. The construction of houses, land clearing for agriculture, poaching and hunting contributed to deforestation and loss of wildlife.

Population growth and new settlement. Communities around the PVPF are growing rapidly due to high birth rates and in-migration. These impacts the forests within the PVPF that lie close to these expanding communities, because the demand for land pushes the village boundaries closer to the protected forest. Limited agricultural land and pre-designated communal lands mean that many in-migrants have nowhere to settle, so they are liable to clear and burn forest land.

Lack of conservation awareness. The socio-economic survey conducted by the ITTO and CALM project teams in the PVPF revealed a lack of knowledge of local people about the importance of saving wildlife and forest. There have been limited information campaigns to educate villagers about forestry and wildlife laws and the land law. Approximately one third of people interviewed (who were not commercial poachers) said that the interview conversation helped them understand the importance of saving large mammals like elephant, tiger, gaur, Asiatic black bear, and Banteng.

They said they knew that commercial poachers were causing the disappearance of these species and, because of this disappearance; poachers were now targeting Deer species, Sunda Pangolin, Bengal Monitor, Water monitor, Malayan sun bear, and other primate species instead. They thought that, soon, very few or no larger mammals such as elephant, tiger, Asiatic black bear, Malayan sun bear, Gaur, or Banteng would be left. (In fact, there have been no confirmed records of tiger in the PVPF since 2003.)

Habitat loss and degradation. Land encroachment, expanding cultivated areas into forest areas or cutting trees for charcoal manufacturing potentially impacts the integrity of forests, ecosystem and wildlife habitat within the PVPF and surrounding areas.

The clearance of forest for agriculture is a traditional activity for local communities who live in and around the PVPF. They typically clear and burn land for their crop production in a 2-4 year cycle. The predominant form of shifting cultivation involves clearing communal land for agricultural purpose.

These activities put pressure on the PVPF forests which lie on communal land within the protected area borders. Local communities are eligible to engage in shifting cultivation within communal land, but it is prohibited in natural intact forest (according to Article 37 in the Law on Forestry).

Land clearance for shifting agriculture (slush and burn cultivation) in some places within the PVPF is a potential threat. This activity would destroy the habitat for wildlife directly and also results in increased human activity in adjacent areas that pushes large mammals out of the area. Soil erosion can cause degradation of small wetlands and streams as well.

Loss of habitat impacts wildlife within the planning area, especially large mammals such as the Asian elephant, and Indochinese tiger. For example, fragmentation of habitat has caused the Asian elephant to live in much smaller herds and isolated from other groups, thus reducing the chances of breeding, and compromising genetic viability. Fragmentation of habitat has reduced the roaming range of the tiger, which needs to cover up to 30 kilometers a day to find enough food.

Most locals residing in the area burn the land for cultivating crops (shifting cultivation). The nutrient-deprived soil can only be cultivated for crops for two or three years before new land needs to be cleared. The abandoned land, once rich in flora and fauna, is then overgrown by bamboo, vines, thatch grasses, and other small plants. Every year this kind of shifting cultivation impacts hundreds of hectares of forestland in Cambodia.

Non Timber Forest Product (NTFP). According to Article 40 of the Law on Forestry, local communities living within or near Permanent Forest Reserves have customary user rights and are allowed to collect certain NTFPs, such as dead wood, honey, resin, wood to build houses, etc. It is evident from livelihoods analyses in local communities around the PVPF that natural resources are fundamental to peoples' livelihoods.

Participatory Rural Appraisal (PRA) activities with local communities identified over 25 different NTFPs that are utilized for food, income, fence-building, basket-weaving, boats, fish traps, medicine, string, fuel etc. The use of these products represents a wealth of indigenous ecological knowledge. Probably the most important NTFP is resin, which is the third most important livelihood activity for all local communities in and around the PVPF (behind plantations and rice).

NTFP collection by local communities exerts a relatively small pressure on the forests of the PVPF due to the low numbers of people involved and their low impact, sustainable approach to NTFP collection. The main threat comes when NTFP collectors engage in illegal hunting while they are in the forest, or when they take dogs with them. Dogs pose significant risks to wildlife, both in terms of disturbing or catching wildlife, and of the risk of disease transmission to the Asian Wild Dog *Cuon alpinus.*

Hunting for local consumption, commercial trade and medicine. Evidence shows that the harvesting of wildlife continues in the PVPF. Behind this practice appears to be three main drivers:

- The indirect harvest of animals predating on village chamkars and rice fields,
- Harvesting for domestic use, and
- Harvest of animals for wildlife trade.

Snares and the use of primitive weapons, such as cross-bows, are the primary devices used in the harvest of wildlife. Common forest animals, such as wild pigs and monkeys are the primary harvest species. In both cases, the overall lack of protein sources in the PVPF means that these harvest activities offer a supplementary source of animal protein.

Larger animals in the past were killed by more sophisticated weaponry such as AK 47's. Harvest rates for larger mammals have significantly declined in the past few years, such as for elephant, tiger, gaur, banteng, due to law enforcement efforts combined with low numbers of animals which make hunting a problematic activity.

There is no data available for the harvest of bird species, although where it occurs primitive sling-shots are the main harvest tool.

There are dozens of communities situated inside and surround the planning area. Members of these communities, including many of armed forces, hunt with snares and sometimes guns. Hunters not only poach to provide meat to their families but also occasionally for sale at the local markets, selling meats, skins, antlers, ivories, canines, and furs.

Overall, however the PVPF is considered to represent one of the most intact and species-rich extents of dry forests in the region and is very suitable for landscape conservation.

Land Mines. The PVPF contains a relatively large area near the international border that has been affected by land-mines. They are predominantly concentrated in the northernmost areas of PVPF. A very low number of mines are also located in a small area in the central-eastern region of the PVPF, in an area that was once a Khmer Rouge stronghold. Land-mine clearance is ongoing, with emphasis on clearing the mines near the road that runs parallel to the northern border of the PVPF. Threats from land mines impact monitoring and management activities in affected areas of the PVPF.

Logging. Prior to the 1980s, commercial timber extraction was not a prominent factor in the PVPF. Harvesting for local village needs was the main harvest motivator (house construction). The PVPF was established in 2002, and during the 90's the area was part of a logging concession. During the 1980s, Khmer Rouge forces occupied and controlled most of what is now the PVPF.

In the 1990s, formalized systems of commercial concessions were issued over much of the forests in the PVPF. These concessions gave harvesting rights to particular companies. Following the announcement of a moratorium on all timber harvest concessions in Cambodia in 2002, these rights were suspended. In the PVPF and were effectively ended when the Protected Forest was promulgated in 2002.

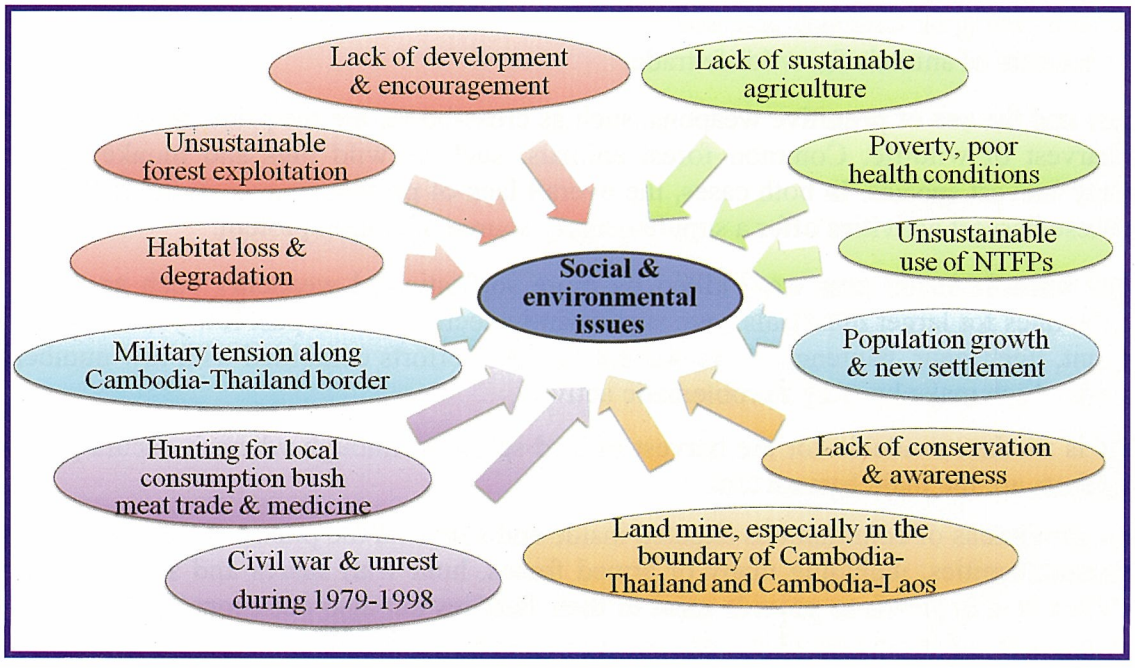
Villagers still look to the forest to supply timber for domestic needs. Trees are cut, for example, to provide for the repair of local bridges and the building of houses and community buildings (e.g., schools and pagoda structures).

Road construction The World Bank Provincial and Rural Infrastructure Project (PRIP) include plans to rehabilitate roads in Preah Vihear Province. .

The continuation of PR 214 from Chhep to Kampong Sralou follows the line of a road built in 1937 and displayed on the old 1960s maps of Cambodia. This road has since been abandoned and is overgrown. It is not currently used by people, and there are no communities present.

The FA proposed that the alternative route, which local people do use, which passes two communities (Kunakpheap and Narong), would be a better choice as it would reduce impact on important areas of the PVPF, and would provide benefits to the existing villages. The World Bank agreed to the proposed change in route in March 2007, so this threat has receded.

Diagram 2.2: Social & Environmental Issue



2.3 Non-Timber Forest Products

2.3.1 Estimation of the need for NTFPs

Utilization of timber and NTFPs by local people is common. Within and around PVPF and in other forested areas across the country of Cambodia, there has been little systematic and specific study of the annual needs for timber and NTFPs utilization, especially for wood construction materials, furniture, agricultural equipment/tools, art /musical instrument materials, souvenirs, fuel wood/firewood, charcoal and other NTFPs.

There was a survey of timber supply and consumption in selected provinces of Cambodia conducted by DFW in cooperation with GTZ in 2002. In order to improve understanding and accuracy of the calculation of annual needs for timbers and NTFPs utilization, specific surveys are urgently needed in Preah Vihear Province and across the country.

The importance of non-timber forest Products (NTFP) to the livelihood strategies of many Cambodians is widely recognized. However, the actual value of these products within the total value of a household's economic activities is more difficult to determine (SCW, 2006). NTFPs include fuel-wood/firewood, charcoal, vine, mushroom, bamboo shoot, wild fruits and wild vegetables, medicinal plants for traditional use, poles, bamboo, *resin*, and rattan. The products are regularly used by local communities within and surrounding PVPF for their daily living and income generation.

Rural people have a number of different livelihood strategies, including collection of NTFPs, rice farming, livestock, home gardens, employment and small business. Results of the survey mentioned above established that NTFPs dominated in their contribution to livelihood strategies of these households compared to all other activities. This is true of both the medium and low income groups. These results dispute the notion that NTFPs mainly provide a safely net in times of hardship and clearly establish the fact that they play an intrinsic role in the lives of those surveyed.

The report estimated the average firewood utilization was 0.6 m^3 / person / year. It was approximately a total of 6 million cubic meters per year, (DFW, 1996). According to the Institute of Statistics that classified the energy supply for cooking food in Koh Kong province, firewood consumption in the urban and the rural (and remote) areas was 71.8%, and for charcoal utilization in the urban and the rural (and remote) areas was 24.2%, *(the Ministry of Planning, 1999)*.

The need of charcoal utilization for an average family of 7 persons was 52 kilograms (kg) per month, so 1 person per day needed an average charcoal use as much as below:

$$\frac{52 \text{ kilograms}}{7 \text{ persons x } 30 \text{ days}} = 0.2476 \text{ kg/person/day}$$

2.4 Industries, Manufacturing, Wood Processing, Depots, and Kilns

Within and surrounding PVPF, there are no wood prcessing fascilities, industries, manufacture, depots, and kilns that use firewood because of the lack of legal resouces for supplying raw materials (timber and NTFPs). In 2002 logging operations by forest concession companies have been temporarily suspended by the Royal Government of Cambodia. This temporary suspension of timber harvest in the forest concessions across the country is an attempt to study and develop an accurate Forest Concession Strategic Management Plan to enable sustainable forest management practice in Cambodia.

For the supply of timbers and NTFPs to meet the needs at provincial level and across the country, the establishment of wood processing industries, and potential forest compartments should be considered by the RGC through MAFF/FA utilizing tools to promote best practice in forest managment consistent with Code of Practice for Forest Havesting and Guidelines for Sustainable Forest Managment.

Table 2.6: Estimate of the need for Timber and NTFP

Year	PVPF				Preah Vihear Province			
	Population (person)	Construction Material (m^3)	Firewood (m^3)	Charcoal (ton)	Population (person)	Construction Material (m^3)	Firewood (m^3)	Charcoal (tone)
2007	14,189	150	8,513	1,277	157,685	1,671	94,611	14,192
2008	14,423	153	8,654	1,298	160,287	1,699	96,172	14,426
2009	14,661	155	8,797	1,319	162,932	1,727	97,759	14,664
2010	14,903	158	8,942	1,341	165,620	1,756	99,372	14,906
2011	15,149	161	9,089	1,363	168,353	1,785	101,012	15,152
2012	15,399	163	9,239	1,386	171,130	1,814	102,678	15,402
2013	15,653	166	9,392	1,409	173,954	1,844	104,372	15,656
2014	15,911	169	9,547	1,432	176,824	1,874	106,095	15,914

Notes:

- *The total amount of needs of firewood, and charcoals for consumption may be more than the quantities shows in the table 2.6 as much as + 25-35%, if the calculation includes the consumption of firewood and charcoals by industrial or fabrication kilns (bricks, tobacco, fish sauce, soybean sauces, kilns, etc.) as well as the households those use the natural gas for cooking.*

- *The total amount needs of woods for constructions may be more than the quantities shows in the table 2.6 as much as 20%, if the calculation includes the woods used for furniture, agricultural tools, handicrafts, art and souvenir objects, etc.*

Cha-es Community Rice Bank supported by FA-ITTO PD 289/04 Rev.1 (F) Trans-boundary Biodiversity Conservation in Emerald Triangle between Cambodia-Laos and Thailand

Meeting between FA (Project Team) and local community committee members and local authority to facilitate biodiversity conservation in Cha-es Village, Teuk Kraham Commune, Chaom Ksan district, Preah Vihear province

Seven Water pumping wells provided to Chaes, and Chunh Robunh communities by FA-ITTO PD 289/04 Rev.1 (F) Trans-boundary Biodiversity Conservation in Emerald Triangle between Cambodia-Laos and Thailand

Meeting between FA Project Team, Preah Vihear Forestry Administration Cantonment and Toeuk Kraham commune authority to facilitate law enforcement and biodiversity conservation activities in Preah Vihear Protected Forest

Awareness Raising on processes to preserve Preah Vihear Protected Forest through local community participation

Exchange study tour on participatory land use planning, community-based ecotourism development and community cooperative for 11 local community committee members conducted at Dang Plet community of Chhep district in January 2010

H.E Chheng Kimsun, Delegation of the Royal Government of Cambodia in Charge as Head of Forestry Administration, FA and Project staffs visited the Robohn primary school supported by FA-ITTO PD 289/04 Rev.1 (F) Trans-boundary Biodiversity Conservation in Emerald Triangle between Cambodia-Laos and Thailand (May 2010)

ITTO PD 289/04 Rev. 1 (F) Transboundary Biodiversity Conservation in Emerald Triangle provides fruit trees to local community in Cha-es village, Teuk Kraham Commune, Chaom Ksan district, Preah Vihear Province between Cambodia-Laos and Thailand

Drilling a pumping well for Ranger Outpost at Mombei in the Preah Vihear Protected Forest near the Cambodia – Lao – Thai Tri-Border

H.E Chheng Kimsun, Delegation of the Royal Government of Cambodia in Charge as Head of Forestry Administration, and FA staffs visited the construction of Ranger Station at Mombei (May 2010)

H.E Ty Sokhun, Delegation of the Royal Government of Cambodia in Charge as Head of Forestry Administration, and FA staff visited the construction of Preah Vihear Forest and Wildlife Research Station at O Chunh (February 2010)

Inauguration of Preah Vihear Forest and Wildlife Research Station presides over by H.E Chheng Kimsun, Delegation of the Royal Government of Cambodia in Charge as Head of Forestry Administration, and H.E. Um Mara Governor of Preah Vihear Province (May 2010)

Chapter 3

ZONING AND CLASSIFICATION OF PERMANENT FOREST ESTATE

3.1 Forest Zonation

The UTM coordinates of the boundary points of the Preah Vihear Protected Forest (PVPF) are provided in Table 3.1. The points in the table that represent each of the area's boundaries are summarized below:

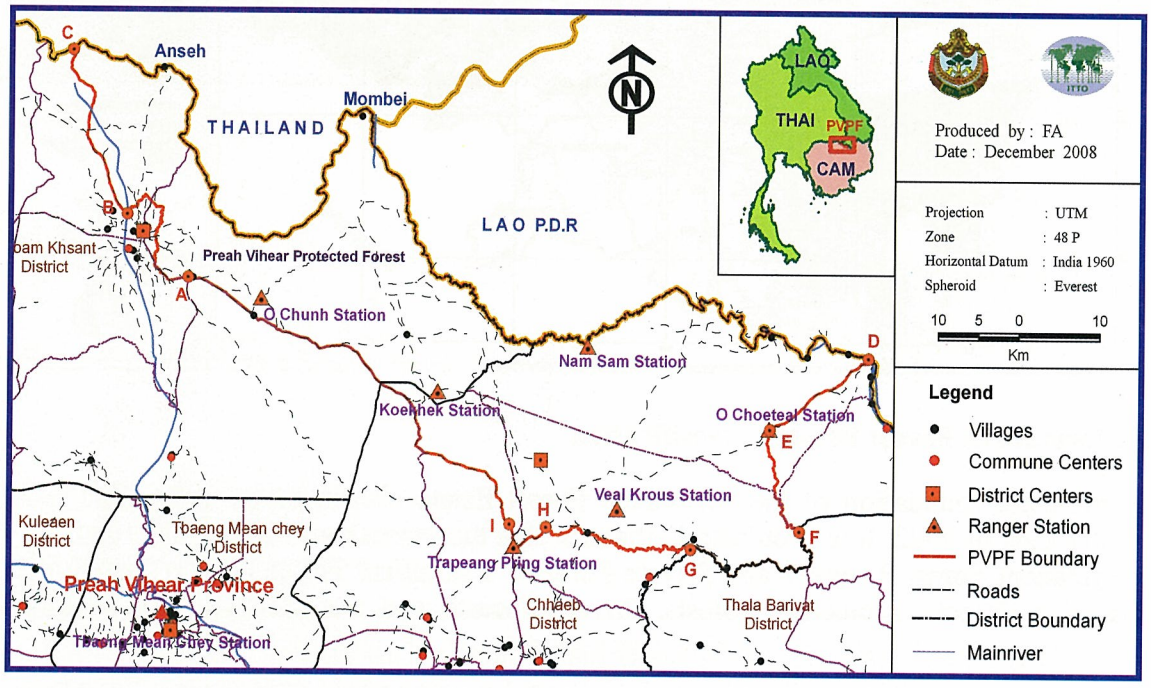
- Northern Boundary Points (C - D): Thailand and Lao PDR.
- Eastern Boundary (D -G): Kampong Sralau Muoy and Chhep Pir Commune of Chhep District.
- Southern Boundary (G- A): Chendar Plywood Forest Concession area.
- Western Boundary Points (A - C): Choam Ksan and Toeuk Kraham Commune, Choam Ksan District.

Table 3.1: UTM coordinates of the PVPF boundary points

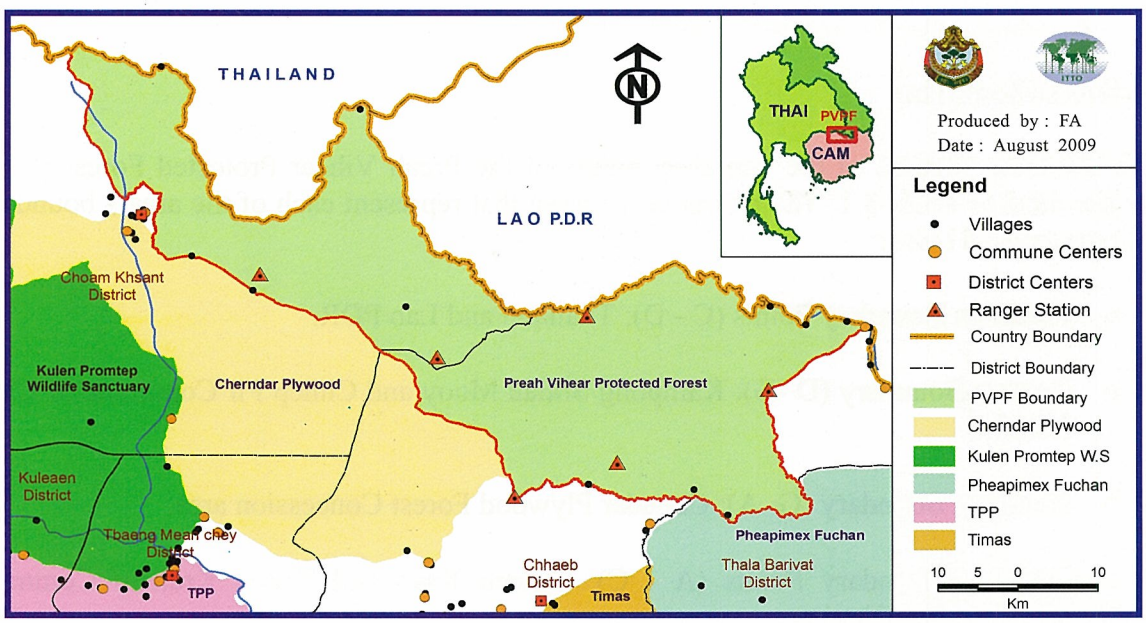
N	Point	UTM		N	Point	UTM	
		X	Y			X	Y
1	A	499912	1566180	6	F	576118	1536860
2	B	492324	1573505	7	G	562677	1534721
3	C	485465	1592638	8	H	544670	1537216
4	D	584589	1557069	9	I	540110	1537537
5	E	572384	1548694				

Source: RGC Sub-decree No. 76 Ar Nor Kror, Bor.Kor. 30 July 2002

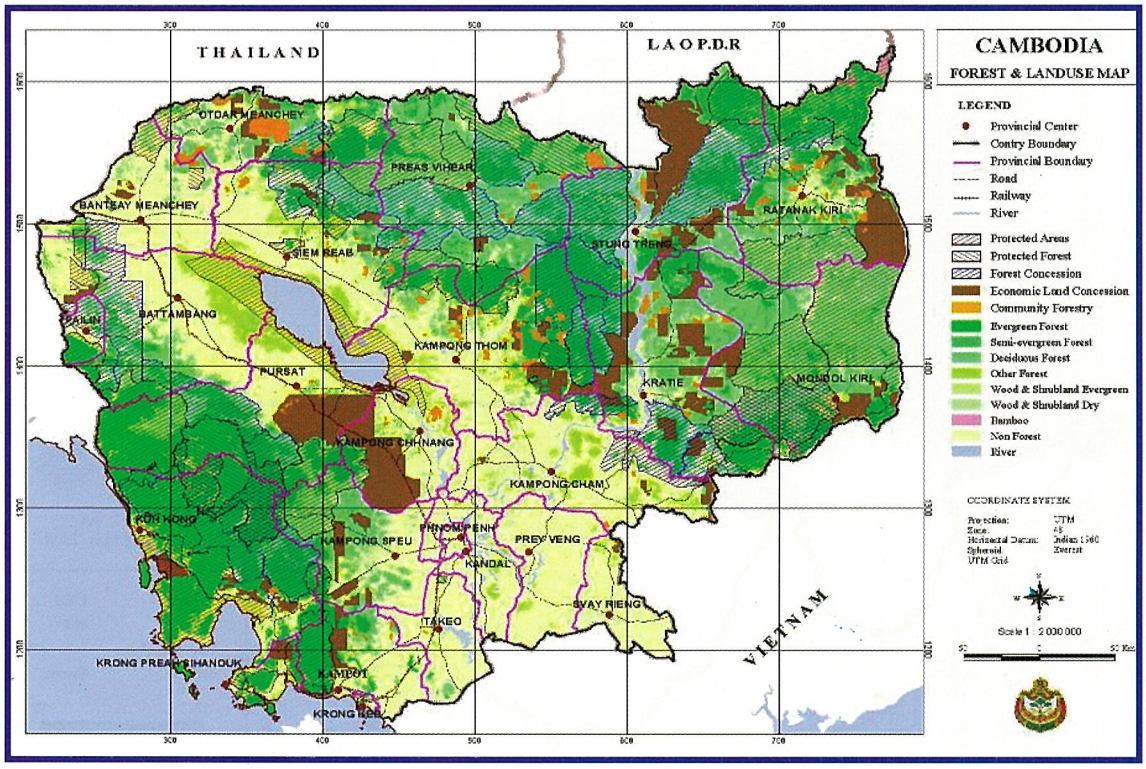
Map 3.1: Boundaries of the PVPF



Map 3.2: Forest Land Use in PVPF after July 2002



Map 3.4: Forest Land Use in Cambodia 2008

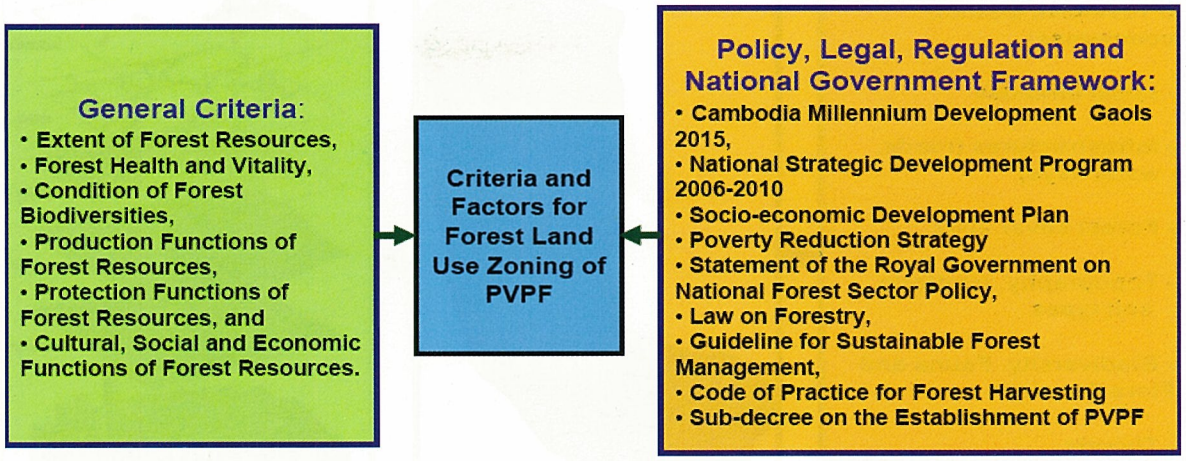


3.2- Permanent Forest Estates Classification

The principal foundation of the Permanent Forest Estate classification in Cambodia is the Forestry Law of 2002. It is stipulated in that law that the Permanent Forest Estate shall consist of Permanent Forest Reserves and Private Forests. Permanent Forest Reserves shall include Production Forests, Protection Forests, Private Forests, and Converted Forestland that has been reassigned to some other development purpose (see Appendix 1.1).

The project team proposes using the following criteria and factors in planning the patterns of forestland utilization for the PVPF.

Diagram 3.1 Criteria and Factors for Forest Land Use Zoning



Zoning and Zoning Objectives

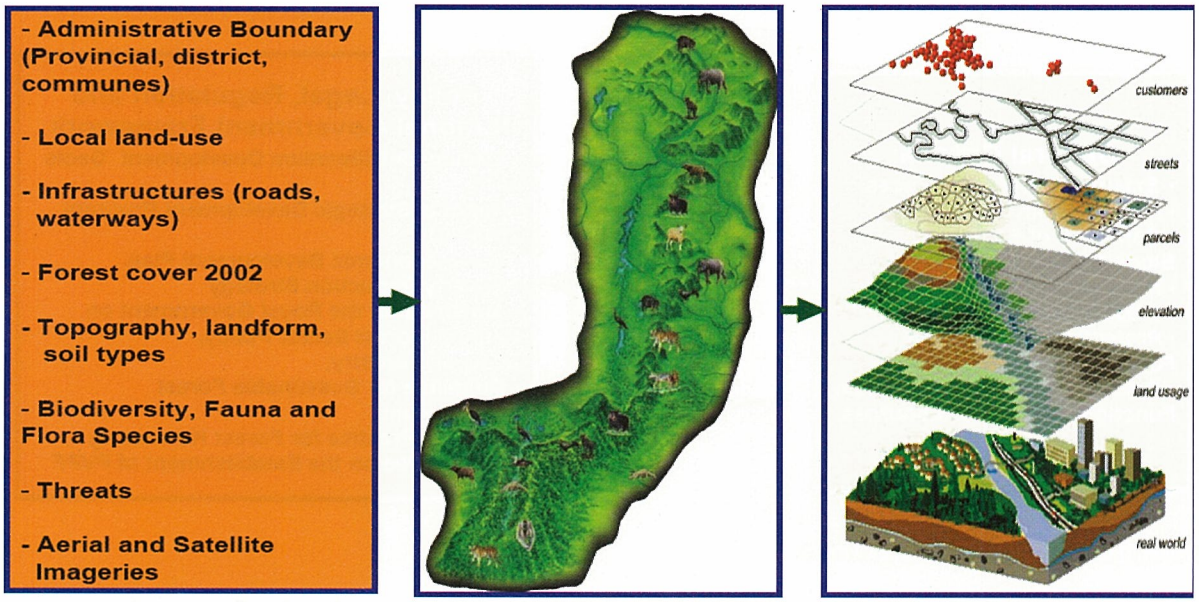
Zoning is the most practical means for achieving an appropriate level of protection of the natural values of protected areas and for managing activities that may have adverse impacts on those values. The number of management zones in a protected area will usually vary depending on both biophysical features and management objectives, but at least three-quarters of the area of the PVPF for Forest and Wildlife Genetic Resources Conservation should reflect the primary objectives of its establishment. These objectives are described in the Introduction of the management plan.

The zoning plan for the PVPF should not only respond to management objectives, but also should support biodiversity conservation across boundary lines. Long-term survival of the wildlife species in the PVPF is predominantly dependent on the cooperation of stakeholders who reside outside of the area's boundaries. Indeed, not only do the results and conclusions of GIS models indicate that suitable habitats for several target species are not completely circumscribed within the boundaries of the PVPF, but it is also recognized that wildlife seasonally migrate from one location to another irrespective of boundary designations. It is essential to define proper ecological management zones to conserve biodiversity in the PVPF.

The objectives of developing a comprehensive zoning system include the following:

- To provide protection of critical or representative habitats, ecosystems, and ecological processes in the PVPF;
- To protect natural and cultural qualities while allowing reasonable human use of the PVPF; and
- To facilitate animal migration and plant and animal dispersal patterns in a fragmented landscape.

Diagram 3.2: Zoning



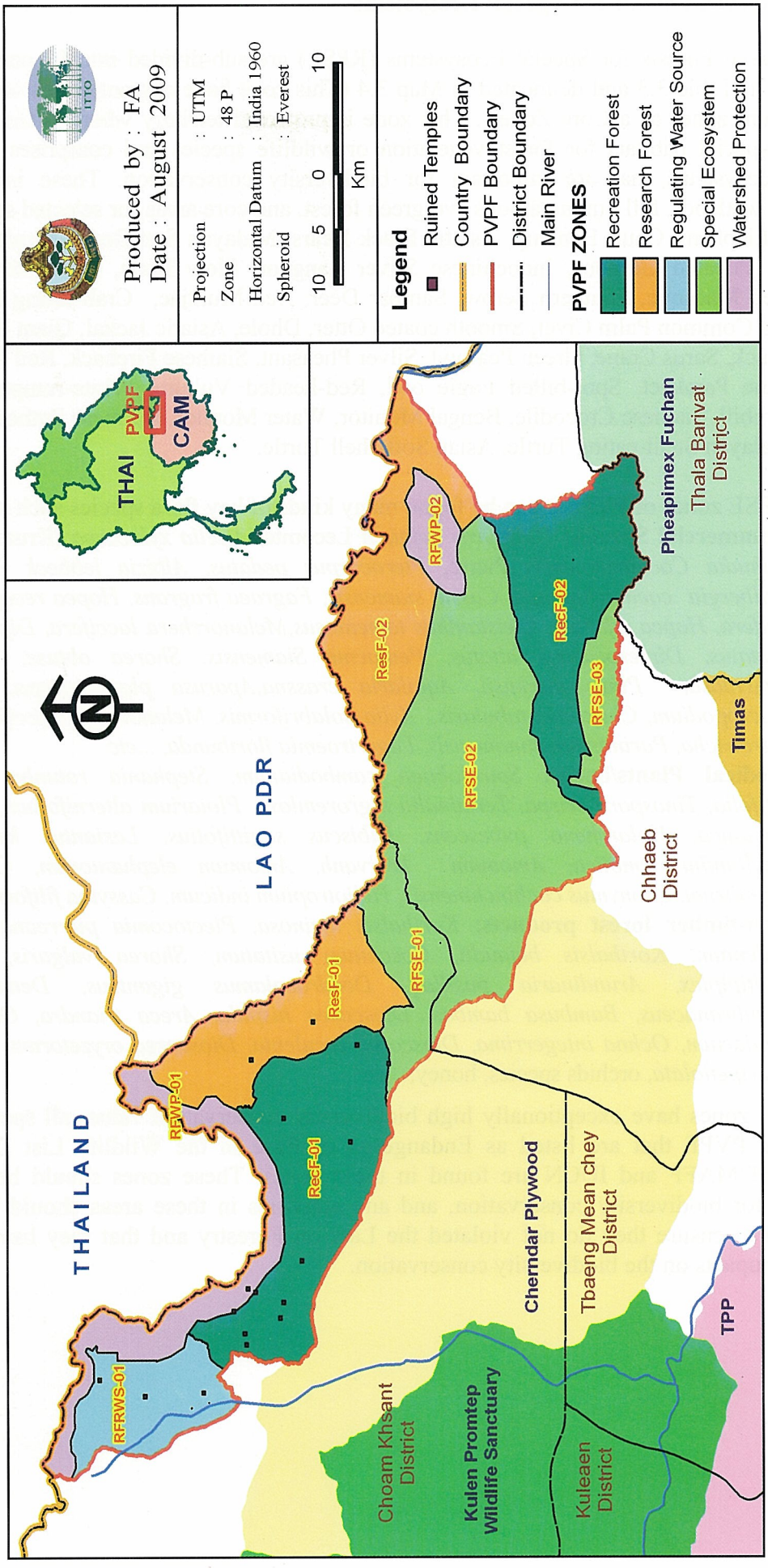
3.3 Protected Forests

In accordance to Forestry Law 2002, Article 10 stated that "*The Protected Forests shall be maintained primarily for protection of the forest ecosystems and natural resources therein*", the management team proposes use of the following subdivisions of protected forest zones:

- Research Forests.
- Reserved Forests for regulating water source
- Reserved Forests for watershed protection.
- Recreation Forest.
- Religious and Cultural Forests.
- Reserved Forests for Community Zones (rice field, crop farming, chamkar and village settlement).

Table 3.2: PVPF Zone Types and Compartment Numbers

Code Zone & Compartment	Sub-zone Type	Number of Compartment	Compartment Surface (ha)
	Protected forest		
1	Reserve Forests for special ecosystems (RFSE)	03	67,459.6
2	Research Forests (ResF)	02	39,310.41
3	Forests for regulating water sources (RFRWC)	01	12,312.16
4	Watershed Protection (RFWP)	02	18,659.71
5	Recreation Forest (RecF)	02	52,285.74
	Total	***10***	***190,027.62***


Produced by : FA
Date : August 2009
Projection : UTM
Zone : 48 P
Horizontal Datum : India 1960
Spheroid : Everest
10 5 0 10
Km
Legend
Ruined Temples
Country Boundary
PVPF Boundary
District Boundary
Main River
PVPF ZONES
Recreation Forest
Research Forest
Regulating Water Source
Special Ecosystem
Watershed Protection
THAI
PVPF
CAM
THAILAND
LAO P.D.R
RFRWS-01
RFWP-01
RecF-01
ResF-01
RFSE-01
ResF-02
RFWP-02
RFSE-02
RecF-02
RFSE-03
Pheapimex Fuchan
Thala Barivat
District
Timas
Chhaeb
District
Cherndar Plywood
Tbaeng Mean chey
District
Kuleaen
District
Kulen Promtep
Wildlife Sanctuary
Choam Khsant
District
TPP

3.3.1- Reserved Forests for Special Ecosystems

The Reserved Forests for Special Ecosystems (RFSE) are sub-divided into 03 compartments described in Table 3.3 and delineated in Map 3.4 (This zone have characteristics of ecological management zones as a Core Zone) . This zone is protected territory where is the ecosystem provides special habitats for forest vegetation or wildlife species and comprises areas with special ecosystems that are important for biodiversity conservation. These include high elevation, wetlands, hill / mountainous evergreen forest, and core-areas for selected species such as Asian Elephant, Gaur, Banteng, Asiatic Black Bears, Malayan Sun Bears, Sunda Pangolin, Leopards, Pileated Gibbons, Indochinese Silver Languor, Slow Loris, Pig-tailed Macaque, Long-tailed Macaque, Southern Serow, Sambar Deer, Red Muntjac, Crab-eating Mongoose, Binturong, Common Palm Civet, Smooth coated Otter, Dhole, Asiatic Jackal, Giant Ibis, White-winged Duck, Sarus Crane, Green Peafowl, Silver Pheasant, Siamese Fireback, Red Junglefowl, Alexandrine Parakeet, Spot-billed Eagle owl, Red-headed Vulture, White-rumped Vulture, Great Hornbill, Siamese Crocodile, Bengal Monitor, Water Monitor, Burmese Python, Elongate Turtle, Malayan Snail-eating Turtle, Asian Soft-shell Turtle.

Within RFSE zones of PVPF it can be found many kinds of key flora species such as:

- **Commercial Species:** *Diospyros bejaudii* Lecomte, *Afzelia xylocarpa* (Kruz.) Craib. or *Pahudia Cochinchinensis* Pierre, *Pterocarpus pedatus, Albizia lebbeck* (L.) Benth, *Dalbergia cochinchinensis, Cassia siamensis, Fagraea fragrans, Hopea recopei, Hopea helfera, Hopea odorata, Cleistanthus tomentosus,Melanorrhera laccifera, Dipterocarpus costatus, Dipterocarpus altatus, Pentacme Siamensis, Shorea obtuse, Terminalia tomentosa, Pinus merkusii, Aquilaria crassna,Aporusa planchoniana, Scaphium macropodium, Chukrasia tabularis, Xylia dolabriformis, Melanorrhera laccifera, Vatica astrotricha, Parinarium annamensis, Lagertroemia floribunda, ...etc.*
- **Medical Plants/herbs:** *Spirolobium cambodianum, Stephania rotunba, Cananga latifolia, Tinospora crispa, Terminalia nigroremlosa, Ploiarium alternifolium, Pouzulzia zeylanica, Holarrheno pubescens, Hibiscus sagittifolius, Lasiantus kamputensis, Phyllanthus emblica, Amomum krervanh, Amomum elephantorum, Cenolophon oxymitrum, Euonymus cochinchinensis, Heliotropium indicum, Cassytha filiformis,...etc.*
- **Non-timber forest products:** *Korthalsis lacinosa, Plectocomia pierreana, Calamus rudentum, Korthalsis bejaudii, Coscinium usitatum, Shorea vulgaris, Bambusa multiplplex, Arundinaria pusillaq, Dendrocalamus giganteus, Dendrocalamus membranaceus, Bambusa bambos, Dioscorea hispida, Areca triandra, Oncosperma tigillarium, Ochna integerrima, Dioscorea esculenta, Dioscorea oryzetorum, Dioscorea brevipetiolata,* orchids species, honey,...*etc.*

The RFSE zones have exceptionally high biodiversity conservation value; all species found within the PVPF that are listed as Endangered or Rare in the Wildlife List Declaration (Prakas) of MAFF and IUCN are found in these zones. These zones should be managed primarily for biodiversity conservation, and any activities in these areas should be closely controlled to ensure they do not violated the Law on Forestry and that they have minimal negative impacts on the biodiversity conservation.

Table 3.3: Compartments of the Reserved Forests for Special Ecosystems

Code Zone	Sub-zone Type	Compartment Surface (ha)	DFA	TFA	Admin Location (District)
	Reserved Forests for Special Ecosystems RFSE				
2.2.4.2	Reserved Forests for Special Ecosystems RFSE-01	10,144.94	Choam Khsan	Rumdos Sre-Pring Thom	Choam Khsant
2.2.1.1	Reserved Forests for Special Ecosystems RFSE -02	52336.29	Chheb	Kampong Sralau-Mlou Prey	Chheb
2.2.1.1	Reserved Forests for Special Ecosystems RFSE -03	4978.367	Chheb	Kampong Sralau-Mlou Prey	Chheb
	Total	**67459.60**			

3.3.2- Research Forests

The Research Forests (ResF) are sub-divided into 02 compartments described in table 3.4 and delineated in Map 3.4. These zones are part of the PVPF where has been established for the purpose of research studies, experiments or demonstration of silvi-culture techniques or forestry science. The PVPF contains a high number of plant and animal species, some of which may be valuable in the future for medicinal, captive breeding, eco-tourism or other purposes. Also, medicinal plants in the PVPF may provide cures for human diseases in the future. So, the PVPF can act as a gene bank for species that could provide financial returns for Cambodia in the future. The site becomes increasingly valuable as other forested areas in Asia are lost and fewer countries hold these significant genetic resources.

Within ResF zones of PVPF it can be found many kinds of key flora species such as: *Diospyros bejaudii* Lecomte, *Dalbergia cochinchinensis, Pterocarpus pedatus, Afzelia xylocarpa* (Kruz.) Craib. or *Pahudia Cochinchinensis* Pierre, *Disoxylon bariensis, Shorea obtuse, Xylia dolabriformis, Hopea helfera, Hopea ferrea Laness., Dipterocarpus costatus, Dipterocarpus altatus, Tarrietia javanica, Hopea pierrei, Fagraea fragrans, Irvingia malayana, Hopea recopei, Cleistanthus tomentosus, Nephelium lappaceum, Nephelium hypoleucum, Dipterocarpus turberculatus, Dipterocarpus obtusifoliius.* Hundred of year's local community have been used and continue to using hundred of plant species both for their livelihood and for traditional medicine to cure disease

These ResF. zones also home for some key species of wildlife such as Asian Elephant, Gaur, Banteng, Asiatic Black Bears, Malayan Sun Bears, Sunda Pangolin,Leopards, Pileated Gibbons, Indochinese Silver Languor, Slow Loris, Pig-tailed Macaque, Long-tailed Macaque, Southern Serow, Eld's Deer, Sambar Deer, Red Muntjac, Hog badger, Crab-eating Mongoose, Binturong, Common Palm Civet, Smooth coated Otter, Asian Wild Dog (Dhole), Asiatic Jackal, Giant Ibis, White-winged Duck, Sarus Crane, Green Peafowl, Silver Pheasant, Siamese Fireback, Red Junglefowl, Alexandrine Parakeet, Spot-billed Eagle owl, Red-headed Vulture, White-rumped Vulture, Crested Serpent Eagle, Greater Spotted Eagle, Great Hornbill, Oriental Pied Hornbill, Adjutant, Lesser Adjutant, Grey Heron, Alexandrine Parakeet, Bengal Monitor, Water Monitor, Reticulated Python, Elongate Turtle, Malayan Snail-eating Turtle,...etc.

Beside of documented and currently known species of plants and wildlife of PVPF, there are also several hundreds or thousands of species of flora and fauna that not yet identified. Though, more researches to discover those unknown species of flora and fauna to be conducted in near future as needed and funding are available to do so. Both of sites of ResF are accessible, so it help cut cost of expenses for transport and time for travel to these sites. These sites becomes increasingly valuable as other forested areas in Asia are lost and fewer countries hold these significant genetic resources and naturalness condition.

Table 3.4: Compartments of Research Forests

Code Zone	Sub-zone Type	Compartment Surface (ha)	DFA	TFA	Admin Location (District)
	Research Forest				
2.2.4.2	Research Forest ResF-01	18,074.20	Choam Khsan	Rumdos Sre-Pring Thom	Choam Khsant
2.2.1.1	Research Forest ResF-02	21,236.21	Chheb	Kampong Sralau-Mlou Prey	Chheb
	Total	**39,310.41**			

3.3.3- Reserved Forests for Regulating Water Resources

The PVPF have one compartment that classified as the forests reserved for regulating water resources (PFWR) described in Table 3.5 and delineated in Map 3.4. This zone has its function of regulation to the priority of water resources and water cycle.

The most significant ecosystem/forest services provide by PVPF's forest cover are carbon sequestration, fresh-air, prevention land degradation-erosion and siltation of rivers, regulating water sources and high quality drinking-water.

PVPF's watershed provides vital livelihood support through the provision of high quality drinking-water for thousands of local people, as well as water for agriculture and fisheries activities in downstream areas for community in Preah Vihear province as well as for the northern flood plain Tonle Sap Great Lake and the Tonle Sap Great Lake. PVPF's watershed also source of water for the Tonle Sap Great Lake and Mekong River. The high density of forest cover of the PVPF about 98% of its total land and with annual rainfall from 1,345.5-2,035.5 mm ensures an evenly regulated flow regime for the rivers and reduces wet season flooding. The high density of forest covers of PVPF can support high carbon storage from all plants bio-mass and reduction of carbon emission to the atmosphere. The effective management of the PVPF as a carbon storehouse could generate significant revenue for Cambodian society as part of a national strategy to reduce emissions from deforestation and forest degradation. The emphasis in Cambodia is now evolving from a circumscribed definition of forests as a commodity provider (i.e., timber) to a broader ecosystem/forest service role in the ecosystem/forest marketplace for carbon trading.

Maintenance of the forest covers in the PVPF therefore provide numerous opportunities for national economic growth through the development of irrigation system, high quality drinking-water, human health and sanitation, prevent siltation of rivers as well as water for agriculture and fisheries activities in downstream areas of northern plain of Cambodia and high potential value as ecotourism attractions development, e.g., guided boat rides and rafting. It ensures a regulated supply of high quality drinking water for three provinces. It reduces the risk of flooding, especially in PreahVihear Province, by regulating the river flow regimes. Deforestation of the PVPF could endanger all these ecosystem/forest services beyond the imminent threat to high value biodiversity, impacting populations living in downstream areas.

Table 3.5: Compartments of Reserved Forests for Regulating Water Resources

Code Zone	Sub-zone Type	Compartment Surface (ha)	DFA	TFA	Admin Location (District)
	Reserved Forests for Regulating Water Resources				
2.2.4.2	Water Source Regulating PFWR-01	12,312.16	Choam Khsant	Rumdos Sre-Pring Thom	Choam Khsant
	Total	**12,312.16**			

3.3.4- Reserved Forests for Watershed Protection

The Reserved Forests for Watershed Protection (RFWP) are sub-divided into 02 compartments described in Table 3.6 and shown in Map 3.4. This zone is part of the PVPF that has with the priority use to meet its protection functions of the forest areas and steep slope that easily to worn out by erosion or called Watershed Catchments. Most of these zones consist of all mountain areas of watershed class II and III along Cambodia-Thai border that provide watershed values to lowland areas of northern Great Lake of Beung Tonle Sap and neighboring provinces. This zone covers most of the PVPF, confirming the important role of the PVPF for watershed management in Northern Cambodia. Management should ensure that activities within this zone have minimal negative impact on the watershed value and minimally affect the role of the PVPF in regulation of water sources. This is especially important given the significant investment in irrigation, agriculture, forestry and freshwater fisheries. Therefore, the entire watershed has been chosen as a protection and conservation target because it is an important indicator of the ecosystem/forest services provided by the PVPF.

Table 3.6: Compartments of Reserved Forests for Watershed Protection

Code Zone	Sub-zone Type	Compartment Surface (ha)	DFA	TFA	Admin Location (District)
	Reserved Forests for Watershed Protection RFWP				
2.2.4.2	Watershed Protection RFWP -01	14,273.61	Choam Khsant	Rumdos Sre-Pring Thom	Choam Khsant
2.2.1.1	Watershed Protection RFWP-02	*4,386.11*	Chhaeb	Kampong Sralau-Mlou Prey	Chhaeb
	Total	***18,659.72***			

3.3.5- Recreation Forests

The Reserved Forest for Recreation (RecF) are sub-divided into 02 compartments described in Table 3.7 delineated in Map 3.4. This zone is part of the PVPF that has Special Natural Landscape and have been established for recreation service and eco-tourist. It comprises areas with high potential value for ecotourism activities such as boat rides, hiking, wildlife watching, village stays, guest houses, and eco-lodges. Management of these areas should recognize these values. Potentially damaging activities that jeopardize the value of the Recreation Zone, such as incompatible development, excessive exploitation, forest clearing, pollution, and forest fires, should be restricted according to Article 32 of the Forestry Law. The PVPF can generate long-term revenues through ecotourism. The PVPF has a wide range of eco-tourism features including wildlife viewing, bird-watching, trekking, and mountain biking, boating and rafting, and here is potential for high-end eco-lodges, helicopter over-flights, and other services. The PVPF is included in national plans to expand eco-tourism in Cambodia, and the PVPF provides the ideal location to link ecotourism in the Preah Vihear province with tourism along the mountain range of northern Cambodia, such as at the Preah Vihear Temple.

Key areas that have potential for eco-tourism activities with the PVPF are **O'Kaki** area that visitor can be experience of seeing magnificent of wildlife species such as Asian Elephant, Gaur, Banteng, Southern Serow, Sambar Deer, Red Muntjac, Sunda Pangolin, Pileated Gibbons, Slow Loris, Indochinese Silver Languor, Pig-tailed Macaque, Crab-eating Mongoose, Small Indian Civet, Binturong, Common Palm Civet, Wild Dog (Dhole), Giant Ibis, Great Hornbill, Oriental Pied Hornbill, Sarus Crane, White-winged Duck, Green Peafowl, Silver Pheasant, Red Junglefowl, Alexandrine Parakeet, Red-headed Vulture, White-rumped Vulture, Spot-billed Eagle owl, Changeable Hawk Eagle, Greater Adjutant, Lesser Adjutant, Grey Heron, Great Slaty Woodpecker, Bengal Monitor, Water Monitor, Reticulated Python, Burmese Python, Elongate Turtle, Asian Box Turtle and the 17 sites of ruined temples as described in section 3.3.6.

The reserved forest for recreation areas of PVPF would provide wide range recreation activities to visitors, those want to wild experience in touch with nature, forests, flora, mountains, wildlife, boating and riding along rivers (Steung Sen and Ropov River), wildlife viewing in wetland or grassland areas, to get breath with fresh air. Though the PVPF would be one of tourism destination that can provide range of recreation activities such as visiting cultural and historical sites (ruined temples), fishing, swimming, boating, and rafting along the remoteness rivers. Eco-lodge would be encouraged and permitted within the PVPF for providing eco-friendly accommodation to the visitors. Cultural and traditional recreation activities also encouraged and promoted for visitor to visit local villages within PVPF to experience with tradition, customary ethnic minority communities and ways of life of local community.

The PVPF is included in national plans to expand cultural and eco-tourism in Cambodia, and the PVPF provides the ideal location to link ecotourism in the Preah Vihear province with cultural tourism activities northern plain of Cambodia, such as at the Preah Vihear and Koh Ker temple, and as well the ruined temple within the PVPF and visiting it natural forests and wildlife etc.

Table 3.7: Compartments of the Recreation Forests

Code Zone	Sub-zone Type	Compartment Surface (ha)	DFA	TFA	Admin Location (District)
	Recreation Forests				
2.2.4.2	Recreation Forest PFRe-01	28,808.37	Choam Khsant	Rumdos Sre-Pring Thom	Choam Khsant
2.2.1.1	Recreation Forest PFRe-07	23,477.36	Chhaeb	Kampong Sralau-Mlou Prey	Chhaeb
	Total	**52,285.73**			

3.3.6- Religious and Cultural Forests

The Religious and Cultural Forests (RCF) are part of the PVPF where is local community has retained belief/ spirits in accordance with their tradition and culture, and have been kept as religious and cultural forest. The PVPF contains many sites with cultural significance, such as ancient temples and sacred forests. Currently the project team with assistance of local community has been indentified 17 sites of ancient ruined temple within the PVPF. Those ruined temples some are grounded and some still remain in original and in good form. Some local people have been reported that, within PVPF there are remain several site that have small temples. However, it is quite difficult access to those sites, because of land-mines and unexploded ordnance around those site. Some of those temples have been destroyed may cause by wars, forest fires, no maintenance, root of plants the growth on top of the structure of temples and some destroyed and illegal excavation to find of ancient stuffs around those temples. Those ruined temples of PVPF would be eco-cultural tourism destinations in the near future.

3.3.7- Community Use Zones

Within PVPF there are several small village settlements located in RFSE 01 and 03; RecF 01, 02; ResF 01 and 02 and agricultural land (rice fields and farm land for local community), swidden/slash and burn (chomkar velchum) areas located in RFSE 01, 02 and 03; RecF 01 and 02, ResF 01; RFRWS 01. Local people from around and within the PVPF are regularly collecting forest and non-forest products for their subsistence use from forests areas of PVPF. Within the PVPF local communities have customary user rights to collect forest and non-forest products to use in their families in accordance with the Forestry Law and shall be with the sustainable manner and cooperate responsibility and transparency. As the PVPF is classified as permanent forest estate (PPE) or state land, though in order to obtain legal status to tenure or

use the PPE or state land, local community within and around PVPF can submit a formal request through local authorities such as commune council, district and provincial authorities and shall have formal endorsement from Forestry Administration and the competent government agencies for the request of land tenure registration in accordance to the evolving Land Law, Commune Land Use Planning Sub-decree and other relevant land use legislations.

Chapter 4

MANAGEMENT STRATEGIES

The Management Strategies for the Preah Vihear Protected Forest are presented in accordance with zones and sub-zones defined in Chapter 3 and objectives outlined in introduction.

Vision

To conserve the Preah Vihear Protected Forest by establishing a sustainable equilibrium between Economic, Social, and Ecological demands consistent with the National Forest Policy Statement, National Strategic Development Plan, National Poverty Reduction Strategy and the Cambodian Millennium Development Goals.

4.1. Management Strategies

In order to realize this vision, the Taskforce underscored the importance of five priority mid-term programs to manage the PVPF. The central themes of these priority programs include the following:

- Natural Resource Conservation and Management.
- Recreation and Ecotourism Management.
- Integrated Community Livelihood Development and Cooperation.
- Institutional and Human Resource Development.
- Research and Monitoring.

4.2. Management Programs

4.2.1. Natural Resource Conservation and Management

4.2.1.1. Protection

Protection initiatives will be directed to the demarcation and control of forest estate boundaries and the protection of critical habitats, wildlife protection, the control of illegal forest clearing and encroachment, and pest and disease control.

4.2.1.1.1. Demarcation and Control of Forest Estate Boundaries and the Protection of Critical Habitats

- The Forest Estates Boundary Demarcating and Mapping Project conducted in the PVPF with the collaboration of the local Forestry Administration should be accelerated so that the designations of the boundaries are completed within the time-frame for implementation of the *Preah Vihear Protected Forest Management Plan 2010–2014.*

- It is of critical importance that the demarcation and mapping exercises, including land use surveys and the mapping of community zones and disputed areas, are executed with the participation of local communities so that local people will appreciate the reasons for the designations of protected areas and learn to respect the use of the public resources that are located within the demarcated boundaries of those areas.

- Those sections of the protected areas along the boundaries that have been used by local people to maintain their traditional ways of life should be excluded from the legal boundaries in order to reduce potential sources of conflict between local communities and the authorities. This will reduce pressure on critical habitats wildlife. With the completion of the demarcation and mapping exercises, strict control over forest land encroachment should be exercised.

- The capacity of the five patrolling stations should be strengthened by allocating equipment, including vehicles and field communication and enforcement equipment, as well as more staff, to reach the maximum number per unit cost specified by the government of 8 employees per station.

4.2.1.1.2. Wildlife Protection

- Cooperation should be strengthened with local authorities and communities to control illegal wildlife marketing activities and public access to areas suitable for wildlife habitat. Law enforcement patrolling in critical habitats and control over illegal logging, wildlife poaching and the illegal trade in wildlife should be further developed.

- The carrying of firearms should be strictly controlled. Specifically, provincial authorities should be urged to more strictly regulate the use of firearms in order to control the opportunities for hunting activities.

- Campaigns against poaching and the illegal trade in wildlife, including the consumption of bush meat, should be enhanced. Environmental education should also be promoted in order to strengthen understanding and increase awareness of the consequences of these illegal activities.

- Cooperation with the international community, particularly the bordering countries of Thailand and Laos , should be encouraged to support wildlife protection and enforce control of the illegal wildlife trade across the boundaries of the PVPF using national and international conventions such as CITES as a means for organizing action programs.

4.2.1.1.3. Control of Illegal Forest Clearing and Encroachment

- Illegal forest clearing and encroachment control within PVPF is the responsibility of the Forestry Law Enforcement Unit assigned to the PVPF. However, there is a real need to increase the exchange of information between the Forestry Law Enforcement Units and relevant stakeholders and enforcement agencies to prevent and control illegal forest clearing and encroachment activities.

- The participation of local authorities and communities in efforts to control the incidence of illegal forest clearing and encroachment activities should be promoted.

- Activities that impact resources that might spread the incidence of fire, such as burning agricultural wastes or burning grass to improve hunting or livestock-grazing opportunities, should be strictly controlled.

4.2.1.1.4. Disease and Pest Control

- In-depth research on diseases and pests should be conducted regularly to determine the underlying causes that serious problems of diseases and pests might arise.

- Efforts to control diseases and pests should be centered on hunting dogs and livestock-grazing activities within the boundaries of the protected forest.

4.2.1.2 Wildlife Management

Wildlife management programs will include both species management and habitat management components.

4.2.1.2.1 Species Management

Species management strategies should include both in-situ and ex-situ components. The in-situ component should emphasize strict control over the exploitation of biodiversity within the protected area. The ex-situ component, where feasible, should be directed to the rescue and propagation of rare and endangered wildlife species and efforts to reintroduce rescued and propagated species into the wild. The ex-situ management of plant species should be promoted in the same manner with a special emphasis on the experimental propagation of wild orchid species.

4.2.1.2.2 Habitat Management

- Degraded forest areas should be rehabilitated and strict control over encroachment in those areas that are rehabilitated should be exercised.

- Forest enrichment planting and investments in community forest plantations in degraded forest areas and forestlands confiscated as a result of encroachment activities should be encouraged when natural succession is insufficient.

- Forest tree and edible fruit tree nursery stations should be established to support forest rehabilitation efforts. Native species should be emphasized inside the PVPF.

- Management strategies to improve the quality of wildlife habitat and the requirements for wildlife survival should be developed.

- Management strategies to maintain a viable habitat corridor for wildlife movements between the southwestern protected forest and key portions of the former Chendar Plywood Concession outside the boundary of the PVPF.

4.2.2. Recreation and Ecotourism Management

Recreation and ecotourism management programs will be directed to the management of ecotourism resources and activities, ecotourism markets, and interpretative programs and services.

4.2.2.1. Management of Ecotourism Resources and Activities

- Wildlife viewing activities should be promoted at those sites within the PVPF that are considered to have the greatest potential for ecotourism development.

- No tourism activities, other than non-intrusive forms of nature studies, should be promoted in the areas that are not compatible with the management objectives of the PVPF.

- Community-based ecotourism to support alternative livelihood opportunities should be facilitated through home-stays, guesthouses, and low-impact eco-lodges.

- Forest trekking should be encouraged as a means of improving local livelihoods and efforts should be made to improve trails and collaborate with local communities to control livestock grazing in those areas designated for trekking to enhance the ecotourism appeal.

- Mass tourism and general nature-based recreational activities should be developed to serve the requirements of diverse groups of visitors.

- Historical and cultural sites should be strictly protected and efforts extended to collaborate with the provincial Department of Cultural and Fine Arts to restore deteriorated artifacts, including ancient remains within the PVPF.

4.2.2.2. Ecotourism Markets

- Coordinated efforts should be made to collaborate with the provincial Department of Tourism to increase public awareness of ecotourism destinations in the PVPF.

- Local authorities should assume a role in promoting ecotourism in local tourism markets.

4.2.2.3. Interpretative Programs and Services

- A comprehensive survey of local cultures and traditional knowledge should be conducted to provide important sources of information on local communities for use in interpretative programs.

- Nature and cultural interpretative programs should be strengthened to enhance visitors' tourism experiences, as well as their understanding and appreciation of natural and cultural resources. The programs should include on-site interpretation through the use of interpretive signs and labels, visitor center and wayside exhibits, and brochures, booklets, and guidebooks, as well as personal interactions as a channel for local people to be involved in providing interpretive services to tourists.

- Critical information on the status of biodiversity and the impacts of tourism activities on biodiversity conservation should be directed to tour leaders and tour operators, as well as to tourists.

4.2.3. Integrated Community Development and Cooperation

Integrated community development and cooperation programs will be directed to reducing dependency on natural resources and resolution of conflicts, enhancing local cooperation in protected area management, and raising awareness.

4.2.3.1. Reducing Dependency on Natural Resources and Resolution of Conflicts

- Coordinated efforts to collaborate with local authorities, nongovernmental organizations, and other development partners to increase alternative income opportunities for local people should be encouraged. Relevant training opportunities should be provided to local people to strengthen their capacity to take advantage of these, as well as other, sustainable livelihood opportunities.
- Community-based natural resources management in and around the PVPF should be actively supported to reduce the unsustainable utilization of forest resources.

- The planting of trees and other plant species that support local livelihoods, including rattan and bamboo, should be encouraged. So, too, should the growing of edible plants, such as mushrooms, in order to reduce local people's dependency on wild plants. Regulated seasonal collecting of wild plants from forest areas for domestic consumption should, however, continue to be allowed.

- Practical land use options should be introduced to local communities to facilitate the development of areas for livestock-grazing outside the boundaries of the PVPF.

- Sustainable agriculture and agro-forestry in community forests, as well as in other agricultural use zones, should be promoted.

4.2.3.2. Enhancing Local Cooperation in Protected Forest Management

- The use of social mechanisms that encourage the participation of local people in the management of the PVPF, such as the establishment of local advisory boards or committees to ensure local participation in management decisions that affect local communities, should be institutionalized.

- Sufficient opportunities to increase local incomes should be provided for local people to share in the benefits associated with the establishment of the PVPF by employing local people in day-to-day management operations and encouraging the use of their tourism services.

- Local community-initiated activities should be supported as much as possible in order to establish strong and mutually beneficial working relationships between local authorities and local communities. Public relations should be enhanced to strengthen the development of those relationships.

4.2.3.3. Awareness Raising

- Environmental education programs describing the purposes of the PVPF should be developed and implemented. These programs should incorporate relevant information on the environmental effects associated with the unsustainable use of natural resources and the rights and responsibilities of local people with regard to the management of those resources in the PVPF. The rules and regulations for different zones should be clearly explained.

- Workshops, meetings, and training programs involving local communities should be organized to facilitate biodiversity conservation, community-based ecotourism, and community forestry initiatives in accordance with national forest and tourism development policies and plans.

4.2.4. Institutional and Human Resource Development

Institutional and human resource development programs will be directed to institutional improvement, human resource development, and internal cooperation.

4.2.4.1. Institutional improvement

- Management policies at the national level should be developed to provide appropriate guidelines for implementing management programs in the PVPF.
- Good governance should be promoted in every aspect of implementing management programs.
- The roles and responsibilities of each of the PVPF stakeholders should be explicitly identified and supported.
- Clear, complete, and unambiguous descriptions of each of the management tasks in the PVPF should be prepared.

4.2.4.2. Human Resource Development

- A mass media campaign should be organized to increase the public's understanding of the importance of conserving biodiversity in the PVPF.
- A reward system should be established for outstanding conservation efforts, including identifying and informing eligible categories of individuals and organizations.
- Training should be provided on biodiversity conservation management and ecotourism management to the local Forestry Administration staff and operational management staff of the PVPF. Workshops should also be organized on law enforcement and international conventions related to biodiversity conservation.
- Conservation education activities should be organized, such as nature conservation camps for youths in primary and secondary school.

4.2.4.3. Internal cooperation

- Mechanisms for improving internal cooperation between government and non-government institutions involved with development and conserving biodiversity in the PVPF should be developed and promoted.
- A facilitator of FA should to assure that one person with decision-making authority is responsible for coordinating cooperation among agencies and organizations associated with the PVPF.
- An interactive database linking agencies and organizations associated with the management of the PVPF should be established and used to facilitate information exchange.

4.2.5. Research and Monitoring Programs

Further research and monitoring programs will be directed to the development of a GIS database, natural resources and biodiversity, recreation and ecotourism management, and local communities.

4.2.5.1. GIS Database

- The current Technical Section of the PVPF should assure provision of Geographical Information System (GIS) information to all interested parties. One technical representative should be specifically designated to be responsible for providing spatial data to interested individuals and organizations.

- A minimum of one Global Positioning System (GPS) should be allocated to each ranger station in the PVPF.

- Current GIS facilities and the GIS personal computer-based station should be upgraded to accommodate additional functions for printing and data dissemination.

- GIS training should continue to be provided as a means of strengthening the technical capacities of rangers and officials with management responsibilities that are assigned to the PVPF.

- The GIS functions, particularly spatial and attributes data should be updated every five years.

- Removable media, such as a CD-ROM and removable drive, or thumb drive, will be appropriate for data storage during the five-year period of the initial PVPF management plan. The area is remote and there is a lack of sufficient infrastructure for transferring GIS data effectively in non-removable media.

4.2.5.2. Natural Resources and Biodiversity

- Natural resources and biodiversity research results conducted by several institutions in the past should be further analyzed and the information applied to the management of the PVPF.

- Research should be conducted on the key fauna species such as Leopard, Elephant, Gaur, Banteng, Eld's deer, otter, White wing ducks and other water birds, especially storks, cranes, and ibis, as well as flora species wild orchids, insectivorous plant species, medicinal plants, and other rare, endangered and endemic wildlife and plant species.

Other research topics should include:

- Relationship between plant communities and wildlife.

- Sustainable utilization of some endemic plant species.

- Seasonal use by wildlife of various vegetation types.

- Status and dynamics of land use and natural resources management.

- Status and impacts of alien species invasions.
- Market value, economic value, and intrinsic value of biodiversity..
- Maintenance of a viable habitat corridor for wildlife movements between the PVPF and key portions of the former Chendar Plywood Concession.
- Local organizations and NGOs should participate in research projects as means of sharing information on conserving biodiversity and transferring technical skills.
- Research on the ecological threats to biodiversity conservation should be conducted.
- A biodiversity research network between Cambodia, Thailand, and Laos should be developed and promoted.

4.2.5.3. Recreation and Ecotourism Management

- Recreation and ecotourism research results conducted by several institutions in the past should be further analyzed and the information applied to the management of the PVPF.
- Research and monitoring the impacts of recreation and ecotourism on natural areas and local communities should be conducted every three years, especially in areas where the most intensive recreation and ecotourism activities have been occurring.
- Local organizations and NGOs should be allowed to participate in research projects on recreation and ecotourism management as a means of enhancing the understanding of the consequences of ecotourism development.

4.2.5.4. Local Communities

- Research on local communities conducted by several institutions in the past should be further analyzed and the information applied to the management of the PVPF.
- A socio-economic survey, similar to those conducted in the past under the PVPF Program, should be organized every three years to monitor variations in the socio-economic characteristics of local communities who live in and around the PVPF.
- In-depth research on the cultural resources and traditional knowledge of local people who live in and around the PVPF should be conducted and the research results disseminated.
- A survey of the attitudes of those local communities toward protected areas and biodiversity should be conducted and the results used in environmental education and public relations programs.
- Research on herbs and ingredients utilized by local people should be conducted and each variety that has potential health benefits should be further examined and certified.

Chapter 5

ACTION PLAN AND BUDGET

5.1 Management Activities for Targets proposed: 2010–2014

Table 5.1: Natural Resource Conservation and Management Program

Project / Management activity	Year of operation					Responsible agencies*	Supporting agencies*	Source	Budget M Riel
	1st	2nd	3rd	4th	5th				
1. Land use surveys and mapping all disputed areas and community zones. Installation of Protected Forest entrance gates, cement posts and road signs.	320	240	180	140	140	FA, PV-CFA, Chhep & CK-DFA	Local authorities, NGOs	RGC, Donors, NGOs	**1020**
2. Strengthening protected forest management by allocating more staff and constructing forest and wildlife research stations.	500	450	360	300	300	FA, PV-CFA, Chhep & CK-DFA	NGOs	RGC, Donors, NGOs	**1910**
3. Patrolling in critical habitats, strictly controlling the carrying of firearms into the PVPF and control over illegal land grabbing, logging and wildlife trade. Operating at least 5 patrol stations including allocating more staff.	200	200	200	200	200	FA, PV-CFA, Chhep & CK-DFA	NGOs Local authorities	RGC, Donors, NGOs	**1000**
4. Cooperating with related stakeholders to share information to prevent and control forest fire & illegal forestry and wildlife related activities.	40	30	30	30	30	FA, PV-CFA, Chhep & CK-DFA	Local authorities & communities, NGOs	RGC, Donors, NGOs	**160**
5. Establishing forest tree and edible fruit tree nursery stations.	30	25	20	15	10	MAFF, FA	PS, Donors, NGOs	RGC, Donors, PS, NGOs	**100**
6. Encouraging Investment in Forest Plantations (family and community) in the Degraded Forestland Areas and in forest areas that need restoration, as well as the forestland areas that have been confiscated from illegal forestland encroachment within the PVPF.	30	25	20	10	0	FA	PS, Donors, NGOs	RGC, Donors, PS, NGOs	**85**
7. Improving quality of wildlife habitats.	80	75	75	70	70	FA	ITTO, FAO PS, NGOs	RGC, Donors, PS, NGOs	**370**
8. Conducting forest enrichment planting in natural forest areas where degraded, when appropriate.	45	40	20	20	20	FA	PS, Donors, NGOs	RGC, Donors, PS, NGOs	**155**
Totals	**1,245**	**1,085**	**905**	**785**	**770**				**4,790**

***Agencies**: *FA=Forestry Administration, PV= Preah Vihear, CFA= Cantonment Forestry Administration, CK= Choam Ksan, DFA= Division Forestry Administration, RGC= Royal Government of Cambodia, NGOs=Non-Governmental Organizations.*

Table 5.2: Recreation and Ecotourism Management Program

Projects/Management activity	Year of operation					Responsible agencies*	Supporting *agencies	Source	Budget M Riel
	1st	2nd	3rd	4th	5th				
1. Developing international standard ecotourism activities and facilities including: Accommodations, wildlife viewing, visitor centres and forest trails for trekking, etc.	40	35	30	25	25	FA, PV-CFA, Chhep CK-DFA	Local authorities & communities, Donors, NGOs, PS	RGC, Donors, PS, NGOs	**155**
2. Promote Community Based Ecotourism (CBET) for alternative livelihood development through home-stay, guesthouses, cycling, culture experience and trekking.	25	25	20	20	15	FA, PV-CFA, Chhep CK-DFA , NGOs, PS	Local authorities, & communities, NGOs	RGC, Donors, PS, NGOs	**105**
3. Strictly protecting historical and cultural sites in PVPF.	25	25	20	15	15	FA, MoC	Local authorities, NGOs	RGC, Donors, PS, NGOs	**100**
Total	**90**	**85**	**70**	**60**	**55**				**360**

***Agencies**: *PS=Private Sector, MoC=Ministry of Culture, FA=Forestry Administration, PV= Preah Vihear, CK= Choam Ksan, CFA= Cantonment Forestry Administration, DFA= Division ForestryAdministration, RGC= Royal Government of Cambodia, MoT=Ministry of Tourism, NGOs=Non-Governmental Organizations.*

Table 5.3: Integrated Community Development and Engagement Program

Project / Management activity	Year of operation					Responsible agencies*	Supporting agencies*	Source	Budget Million (Riel)
	1st	2nd	3rd	4th	5th				
1. Organize meetings and workshops among officers, local communities and NGOs in biodiversity conservation, protected forest management, CBET and CF process in accordance with national forest and tourism development policy.	40	35	30	25	25	FA, PV-CFA, Chhep CK-DFA	NGOs, local authorities and communities	RGC, Donors, NGOs	**155**
2. Establishing and strengthening capacity of local committees or volunteers and provide relevant training to facilitate biodiversity conservation, CBET and CF development.	25	20	15	10	10	FA, PV-CFA, Chhep CK-DFA NGOs, PS	NGOs, local authorities and communities	RGC, Donor, PS, NGOs	**80**
3. Encouraging and promoting sustainable agriculture and agro-forestry practices within the designated commune agricultures zones by providing equipment and training.	20	20	15	15	10	FA, PV-CFA, Chhep CK-DFA NGOs, PDA	NGOs, local authorities & communities, PS	RGC, Donors, PS, NGOs	**80**
4. Developing regulations and criteria on appropriate access to non-timber forest products for local livelihoods support and sustainable utilization of natural resources.	50	45	45	40	40	FA, PV-CFA, Chhep CK-DFA NGOs	NGOs, local authorities and communities, CP	RGC, Donors, NGOs	**220**
5. Organizing mutual visits by Local Forestry Administration, protected forest staffs and local communities to exchange skills, experience and information related to biodiversity conservation and forest management.	15	10	10	10	10	FA, PV-CFA, Chhep CK-DFA NGOs	local authorities & communities, NGOs, PS	RGC, Donors, PS, NGOs	**55**
6. Raising awareness in local people on the environmental impact from over-utilization of natural resources.	15	10	10	10	10	FA, PV-CFA, Chhep CK-DFA, NGOs	CP, local authorities & communities NGOs, PS	RGC, Donors, NGOs	**55**
Total	**165**	**140**	**125**	**110**	**105**				**645**

***Organizations**: *NGOs=Non-Governmental Organization, RAMSAR=RAMSAR Convention, RIs=Research Institutes, CITES=Convention on International Trade in Endangered Species of Wild Fauna and Flora, CBD=Convention on Biological Diversity, CP=Concerned Parties, CF= Community Forestry, PS=Private Sector, CBET= Community-based Ecotourism, FA=Forestry Administration, PV= Preah Vihear, CFA= Cantonment Forestry Administration, CK= Choam Ksan, DFA= Division Forestry Administration, RGC= Royal Government of Cambodia*

Table 5.4: Institutional and Human Resource Development Program

Project / Management activity	Year of operation					Responsible Organizations*	Supporting Organizations	Source	Budget M Riel
	1st	2nd	3rd	4th	5th				
1. Publicizing the value of biodiversity via mass media.	**15**	**00**	**00**	**00**	**00**	FA, PV-CFA, Chhep CK-DFA	CP, RUA, RIs, NGOs ,PS	RGC, Donors, PS, NGOs	**15**
2. Establishing reward system for outstanding conservation efforts.	**60**	**60**	**60**	**60**	**60**	FA, PV-CFA, Chhep CK-DFA	MAFF, CP, RUA, RIs, NGOs	RGC , Donors, PS, s	**300**
3. Training protected forest and local forestry administration staff at operational level in forest management and biodiversity conservation.	**20**	**15**	**15**	**10**	**10**	FA, PV-CFA, Chhep CK-DFA	RUA, RIs, NGOs	RGC, Donors, NGOs	**70**
4. Conducting training for local communities on sustainable livelihood practices in agriculture, CBET and basic biodiversity conservation, land use planning, sustainable agro-forestry practices and partnership in forest management.	**10**	**10**	**10**	**10**	**10**	FA, PV-CFA, Chhep CK-DFA	JICA, PDA, RUA, RIs, NGOs	NGOs, Donors, NGOs	**50**
5. Providing training in ecotourism management to local forestry administration protected forest staff and concerned stakeholders.	**10**	**10**	**10**	**10**	**10**	FA, PV-CFA, Chhep CK-DFA	MoT, MoE, PDA, RUA, JICA, RIs, NGOs	NGOs, Donors, NGOs	**50**
6. Conducting workshops on law enforcement and international conventions related to biodiversity conservation (CITES, CBD, RAMSAR, climate change, REDD/CDM), etc.	**40**	**40**	**35**	**35**	**30**	FA, PV-CFA, Chhep CK-DFA NGOs	PS, local authorities & communities, NGOs, PS, CP	RGC, Donors, PS, NGOs	**180**
Total	**150**	**125**	**120**	**115**	**110**				**620**

*** Organizations***: *NGOs=Non-Governmental Organizations, MoT=Ministry of Tourism, RUA=Royal University of Agriculture, FA=Forestry Administration, RIs=Research Institutes, CP=Concerned Parties, RGC= Royal Government of Cambodia, PV= Preah Vihea, CFA= Cantonment Forestry Administration, CK=Choam Ksan, DFA= Division Forestry Administration, PS=Private Sector, MAFF=Ministry of Agriculture, Forestry and Fisheries, PDA=Provincial Department of Agriculture, MoE=Ministry of Environment, JICA=Japanese International ICF Cooperation Agency, REDD=Reduce Emissions from Deforestation and Degradation, CDM=Clean Development Mechanism.*

Table 5.5: Research and Monitoring Program

Project / Management activity	Year of operation					Responsible Organizations*	Supporting Organizations	Source	Budget Million (Riel)
	1st	2nd	3rd	4th	5th				
1. Conducting research on herbal and medicinal plants, rare and endangered species, edible and commercial species and growth rate of trees in each forest region.	50	25	20	15	15	FA, PV-CFA, Chhep CK-DFA	NGOs, JICA, DAD, RUA, RIs, DTM	RGC, Donors, PS, NGOs	**125**
2. Conducting research on ecology, habitat uses and conservation status of key species: Mammals: Primates, Gaur, Banteng, Leopard, Asian Elephant, Eld's deer, Bears, Dholes, Otters. Forest birds: stork, crane, Giant ibis, Horn-bill, White-winged Duck). Reptiles: Turtles and tortoises	100	70	70	70	70	FA	RUA, RIs, NGOs	RGC, Donors, NGOs	**380**
3. Conducting research on status and dynamics of land use and natural resource management in and around protected forest and permanent forest estate and carbon credit potential	60	20	20	20	20	FA	RUA, RIs, NGOs	RGC, Donors, NGOs	**140**
4. Conducting research on existing and newly identified species of timber and genetic resources in and around PVPF.	10	5	5	5	5	FA	RUA, RIs, NGOs	RGC, Donors, NGOs	**30**

5. Collect Data of Forest in Model /sample areas (seedlings, rate of death, growth and total volumes of timber)	20	15	10	10	10	FA, PV-CFA, Chhep CK-DFA	Donors, JICA, DANIDA, NGOs, RUA, RIs	RGC, Donors, NGOs	**65**
6. Conduct research on disease transmit ion from domestic animals to wildlife and its movement, fire biology and invasive species	20	15	10	10	10	FA, PV-CFA, Chhep CK-DFA	Donors, JICA, DANIDA, NGOs, RUA, RIs		**65**
7. Conduct research on less known species: plants, reptiles, amphibians, insects and small mammals.	20	15	10	10	10	FA, PV-CFA, Chhep and Choam Ksan CK-DFA	Donors, JICA, DANIDA, NGOs, RUA, Ris		**65**
Total	**280**	**165**	**145**	**140**	**140**				**870**

***Organizations** *CFA= Cantonment Forestry Administration, CK= Choam Ksan, DFA= Division Forestry Administration, FA=Forestry Administration, JICA=Japanese International Cooperation Agency, NGOs=Non-Governmental Organizations, PS=Private Sector, PV= Preah Vihear RIs=Research Institutes, RGC= Royal Government of Cambodia, RUA=Royal University of Agriculture.*

5.2. Annual Operational Plan and Budget

Table 5.6: Annual Operational Plan and Budget

Operational Plan	Timeframe												Budget (Million Riel)
	1	2	3	4	5	6	7	8	9	10	11	12	
A. Natural Resource Conservation and Management Program													***1245***
1. Land use surveys and mapping all disputed areas and communities zones. Installation of Protected Forest entrance gates, cement posts and road signs.													320
2. Strengthening protected forest management by allocating more staff and constructing forest and wildlife research stations.													200
3. Patrolling in critical habitats, strictly controlling the carrying of firearms into the PVPF and control over illegal land grabbing, logging and wildlife trade. Operating at least 5 patrol stations including allocating more staff.													500
4. Cooperating with related stakeholders to share information to prevent and control forest fire & illegal forestry and wildlife related activities.													40
5. Establishing tree and edible fruit tree nursery stations.													30
6. Encouraging investment in forest plantations (family and community) in the Degraded Forestland Areas and in the forest areas that need restoration as well as the forestland areas that has been confiscated from illegal forestland encroachment within the PVPF.													30
7. Improving quality of wildlife habitats.													80
8. Conducting forest enrichment planting in natural forest areas where degraded, when feasible and appropriate.													45
B. Recreation and Ecotourism Management Program													***90***
1. Developing international standard ecotourism activities and facilities including: Accommodations, wildlife viewing, trekking, and visitor centres.													40
2. Promote Community Based Ecotourism (CBET) for alternative livelihood development through home-stay, guesthouses, cycling, culture experience and trekking.													25
3. Strictly protecting historical and cultural sites in PVPF													25

C. Integrated Community Development and Engagement Program													***165***
1. Organizing meetings and workshops among officers, local communities and NGOs in biodiversity conservation, protected forest management, CBET and CF process in accordance the national forest and tourism development policy.													40
2. Establishing and strengthening capacity of local committees and volunteers. Provide relevant training to facilitate biodiversity conservation & CBET development.													25
3. Encouraging and promoting sustainable agriculture and agro-forestry practices within the designated commune agricultures zones by providing equipment and training.													20
4. Developing regulations and criteria on appropriate access to non-timber forest products for local livelihoods support and sustainable utilization of natural resources.													50
5. Organizing mutual visits of Division Forestry Administration, protected forest staffs and local communities to exchange skills, experience and information related to biodiversity conservation and forest management.													15
6. Raising awareness of local people on the environmental impact of over-utilization of natural resources.													15
D. Organization and Human Resource Development Program													***150***
1. Publicizing the value of biodiversity via mass media													20
2. Training protected forest and local forestry administration staff at operational level in forest management and biodiversity conservation.													60
3. Conducting training for local communities on sustainable livelihood practices in agriculture, CBET and basic biodiversity conservation, land use planning, and sustainable agro-forestry practices.													20
4. Providing training in ecotourism management to local forestry administration protected forest staff and concerned stakeholders.													10
5. Conducting workshops on law enforcement & international conventions related to biodiversity conservation (CITES, CBD, RAMSAR, Climate Change, REDD/CDM etc.)													40

E. Research and Monitoring Program													***240***
1. Conducting research on herbal and medicinal plants, rare and endangered species, edible and commercial species and growth rate of trees in each forest region.													50
2. Conducting research on ecology, habitat uses and conservation status of key species: **Mammals:** Primates, Gaur, Banteng, Leopard, Asian Elephant, Eld's deer, Bears, Dholes, Otters .**Forest birds:** stork, crane, Giant ibis, Horn-bill, White-winged Duck). **Reptiles:** Turtles and tortoises													100
3. Conducting research on status and dynamics of land use and natural resource management in and around protected forest and permanent forest estate and carbon credit potential.													60
4. Conducting research on the existing and new species of timber and genetic resources in and around PVPF.													10
5. Collecting forest data in model /sample areas (seedlings, rate of death, growth and total volume of timber).													20
6. Conduct research on disease transmit ion from domestic animals to wildlife and its movement, fire biology and invasive species													20
7. Conduct research on less known species: plants, reptiles, amphibians, insects and small mammals.													20

Chapter 6

CONCLUSIONS

The Preah Vihear Protected Forest (PVPF) is located in Northern Cambodia, an important component of the Indo-Burma Biodiversity Hotspot. The forests and forest resources of the PVPF will continue to have vital national socio-economic and biodiversity protection roles and will contribute to the mitigation of climate change not only in Cambodia, but throughout the region.

The forest resources in the PVPF are capable of providing fuel-wood, charcoal, wood for construction and other uses in Preah Vihear and neighboring provinces if the utilization of these resources is accountable and in accordance with the Cambodian Code of Practice for Forest Harvesting and the Guidelines for Sustainable Forest Management.

The ***Preah Vihear Protected Forest Management Plan 2010 - 2014*** describes the objectives, zoning classifications, and main program activities and budget requirements for conserving the resources and maintaining the biodiversity of the PVPF. Immediate interventions included as part of a comprehensive package of appropriate management measures will be required to protect, maintain, and implement this management plan.

The budget requirements for funding the main elements of the PVPF are 7,285 million Riels (equivalent to US$ 1,776,830) over a period of five years. The implementation of the Program activities described below is expected to provide:

- Employment to 150 local people.
- Income of US$ 1.20 million for the improvement of living standards and the local economy.
- Two Nursery Stations capable of producing 200,000-350,000 seedlings per year of fast- and medium-growing tree species.
- The Preah Vihear Forest and Wildlife Research Station with equipment for supporting planned research and monitoring activities.
- Protection to 200,000 hectares of Permanent Forest Reserve.
- Planting of more than 500 hectares with fast-growing trees that will yield 5,000 m^3 worth more than $US 75,000-100,000 million from year 6 through year 10 during the implementation of the second phase of this management plan.
- Increased Government revenues through the collection of taxes, royalties on forest plantations, eco-tourism services, and other infrastructure constructed while implementing this management plan.

Managing the natural resources in the Preah Vihear Protected Forest in a sustainable manner that is consistent with the socio-economic goals of the National Forestry Policy and Cambodia's Millennium Development Goals will require:

- Participation, manpower, funding, and political support from concerned institutions and stakeholders to implement the five Programs activities that are outlined in Chapter 4 and Chapter 5 of this management plan.

- Training of local Forestry Administration officers, protected forest rangers and other stakeholders in natural resources and forest management, watershed protection and biodiversity conservation, community-based eco-tourism and community-based natural resources management.
- Supplies, equipment, and facilities, as well as additional staff for managing the PVPF.

Implementation of these Program activities over the long term will:

- Improve the standard of living of local communities living in and around the planning area, as well as ensure food security in the region.
- Strengthen the capacity of forestry officers, local communities and involved authorities to practice transparent forest resource management and contribute to the development and use of natural resources in a sustainable and equitable manner.
- Strengthen good governance associated with forest resource management and enhance the effectiveness of law enforcement.
- Increase the productivity of forests and forest resources.
- Assure protection of wildlife biodiversity

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b) Construction Guidelines for Forest Engineering Works;
c) Guidelines for Special Management Area Management;
d) Bio-diversity Conservation Guidelines for the Managed Forests;
e) Guidelines for Socio-Economic Surveys of Communities Surrounding Forest Concession Areas.
f) Guidelines for Environmental Impact Assessment for Forest Concessions;
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Cambodian Code of Practice for Forest Harvesting, (1999, Department of Forestry and Wildlife). Phnom Penh Cambodia

a) Harvesting planning which includes annual coupe plan and block plan;
b) Guidelines for Tree Selection including minimum standard for tree retention and for cutting;
c) Guidelines for Special Management Areas which includes management of exclusion areas, buffer zones, and water courses;
d) Construction Works for Logging which includes road design, haul tracks, water course crossing for roads and haul tracks, logs landing , skid tracks, and maintenance;
e) Logging operation which includes preparation for felling, felling, stump height, using machinery for felling, logs presentation, skidding, truck loading and hauling, river barging and rafting;
f) Logs scaling which includes measuring of logs and logs ownership;
g) Weather Limitation on Loggings which includes limits on operations;
h) Forest and Camp Hygiene which includes equipment, management, servicing and camp hygiene;
i) Stabilization of Logged Areas which includes temporary crossing, tracks, landings, roads, quarries and borrow pits, rubbish dumps, and camp areas;
j) Training;
k) Supervision of Operations which includes supervisory of staff, number and skill of supervisory staff, frequency of inspections, duties and responsibilities, and liaison.
l) Equipment and Safety which includes chainsaws, operator safety equipment, Equipment skidding and roading.
m) Evaluation of Logging Operations including who evaluates the operations? When and how are evaluations done? Who sees the evaluations?

Forest Concession Management Planning Manual (2000, Department of Forestry and Wildlife). Phnom Penh Cambodia

Appendix 1.1: Glossary used in the Management Plan of the Preah Vihear Protected Forest for Plant and Wildlife Genetic Resources Conservation

Classification of Forest Types

Forest Definition
According to FAO Forest definition, forest cover is defined as follow:

- An area is considered as forest if the tree cover (= crown cover) is more than 10% and area of more than 0.5 hectares. The trees should be able to reach height 5 meters.

The 1996/1997 interpretation of MRC/GTZ contained eighteen categories, including structure and density elements. These were, of necessity, merged in this study into five global Cambodia forest and land cover types 2002. These included evergreen forest (evergreen dense, disturbed and mosaic), semi-evergreen forest (semi-evergreen dense, disturbed and mosaic), deciduous forest (including deciduous mosaic), other forest (including re-growth, wood and shrubland, stunted, plantations, mosaic of cropping, bamboo, and mangrove forest) and non-forest (including grassland, wetland, agriculture land, water body and urban areas).

Evergreen Forest: Evergreen forests are usually multi-storied with trees that maintain their leaves throughout the year. They are usually sited on hilly plateaus and along streams and rivers (gallery forest). The identification of evergreen forests on satellite images is facilitated by the appearance of a particular dark red tone and medium to rough texture that is characteristic of this forest type.

Semi-(or Mixed) Evergreen Forest: *Semi*-evergreen forests contain variable percentages of evergreen and deciduous trees, the percentage of evergreen trees varying from 30 to 70%. Semi-evergreen forests continue to appear evergreen throughout the year, even when the percentage of deciduous trees is high. Since deciduous trees drop their leaves in the dry season, the spectral signature at that time of the year generally appears more brownish or grayish. The variability of this land cover type class is high and depending on the proportion of leaf shedding trees and overall appearance, some parts of dry evergreen forests may have been mapped into this land cover type.

Deciduous Forest: This land cover type contains dry mixed deciduous forests and dry Dipterocarp forest. Deciduous forests drop their leaves more or less completely during dry season. Its spectral signature varies from brownish green to bluish grey during the dry season with a medium to smooth texture. The incidence of human impacts, including fire, is usually much higher in deciduous forests than in other forest types. Dry Dipterocarp forests naturally have an open character. Since, undisturbed, they may have a crow cover of only 40%, soil and grass may have a significant impact on reflections from these from these forests. As a result, it is almost impossible to separate deciduous forest from shrubland during the dry season.

Other Forest: This land cover type included re-growth, wood and shrubland, stunted forest, bamboo forests, mangrove forests, inundated forests, and industrial forest plantations. Re-growth of secondary forest is representative of a continuous, usually dense, layer of smaller trees. Stunted forests grow very slowly because of poor site conditions on hydromorphic soils and rock outcrops.
Heavily disturbed forest like mosaic of forest is more than 40%, and areas of old re-growth and young secondary forest in the process of regenerating after clear cutting, are also included in this category.
Non Forest: This category merges agriculture areas, urban areas, bodies of water, and grassland.

The Permanent Forest Estates consist of:

1- Permanent Forest Reserves; and
2- Private Forests

The Permanent Forest Reserves consist of three categories:

1- Production Forests shall be maintained in a manner to allow for the sustainable production of Forest Products and By-products, and their protection function considered as a secondary priority. Production Forests consist of the following:
- Forest Concessions;
- Production Forests not under concession;
- Forests rehabilitated;
- Reserve Forestland for reforestation or tree plantation;
- Reserved forestland for forest regeneration;
- Degraded Forestland; and
- Community Forests under agreement.

2- Protection Forests shall be maintained primarily for protection of the forest ecosystems and natural resources therein. Protection Forests consist of the followings:
- Reserve Forests for special ecosystems;
- Research forests;
- Forests for regulating water sources;
- Forests for watershed protection;
- Recreation forests;
- Botanical gardens; and
- Religious forests.

Local communities have customary user rights to collect Forest Products& By-products within the Protection Forest with minor impact of the forests.

3- Conversion Forestland for other development purposes is idle land, comprised mainly of secondary vegetation, not yet designated for use by any sector that shall be classified as Permanent Forest Reserves until the Royal Government decide to use and develop the land for another purpose.

Private Forest shall be maintained by the owners with the interesting rights to manage, develop, and harvest, use, sell and distribute the products by themselves.

Production Forest: Forest area having the primary function for sustainable production of Timber and Non-Timber Forest Products. Production forest includes forest concession; forest permitted for harvesting, degraded forest, forest to be rehabilitated, reserved area for forest regeneration or forest plantation, reforested areas and forest areas under agreement between the Forestry Administration and the local community.

Protection Forest: Forest area having the primary function for protecting the forest ecosystem including the water resources regulation; conservation of biodiversity, land, water, watershed and catchments areas; wildlife habitat, fishes, prevention of floods, erosions, sea water intrusion; soil fertility and valuable for cultural heritage which serve the public interests. Protection forest under this Law does not include the protected areas under the jurisdiction of Ministry of Environment pursuant to the Environmental Protection and Natural Resources Management Law.

Conversion forestland for other development purposes: Idle forestland, covered mainly by secondary vegetation that is not yet designated for any use, and shall be classified temporarily as Permanent Forest Reserve. Private Forest shall be maintained by the owners with the

interesting rights to manage, develop, and harvest, use sell and distribute the products by themselves. It is also idle area, comprised mainly of secondary vegetation, not yet designated for use by any sector that shall be classified as Permanent Forest Reserves until the RGC decides to use and develop the land for another purpose.

Permanent Forest Reserve: State forest covered on lands, excluding land that is privately owned, and categorized as production forest, protection forest and conversion forestland for other development purposes.

Forest Concessions: A part of State Production Forests and having potential product supply that the RGC may grant temporary (or can be suspended) to any person, legal entity who is professional career and personal resource through public bid in order to obtain sustainably the rights of management, development and harvesting of forests within specific term based on Investment Agreement and the Forestry Law and Related Regulations under the law,

Production Forests not under Forest Concession: A part of Production Forests that is not under Forest Concession or Production Forests have been prepared for annual forest coup by the Forestry Administration with the priority use to meet domestic annual consumption for Forest Products and By-products (NTFPs).

Forests Rehabilitated: A part of Production Forest territory that is under low degraded condition and require to intervene silviculture through Enrichment Tree Planting of indigenous species or maintaining Natural Regeneration.

Degraded Forestland: A part of Production Forests which is forest cover and forest resources have been continuously decreased for a long period, including the changing of Forest Structure.

Reserved Forestland for Reforestation or Tree Planting: A part of Production Forest territory that is under a very long time degraded condition and have been reserved for Forest Re-growth by Tree Planting or Seed Sowing.

Reserved Forestland for Regeneration and Seed Source: A part of Production Forest territory or In-Situ Ecosystem where are abundant valuable forest genetics and have potential seed supply that have been reserved for Mother Trees and conservation of genetics, valuable substances for generation, and potential for supply as seed source, silviculture or for generation naturally.

Community Forests under Agreement - State Forest which has been provided to community under an Agreement between Cantonment of Forestry Administration and CF committee based on the concept of Forests for livelihood and Traditional Use of Local People and have been agreed on sustainable management and utilization of the forests.

Private Forests: Dimensioning/ demarcating on the map and at the field site as Forest Cover, Area, Forest Types, Stock, and Boundary and attach map.

Private Forest: Forest plantation or trees, whether planted or naturally grown on private land under registration and legal title in pursuant to authorized legislation and procedures.

Reserve Forests for Special Ecosystems - A protected territory where is the ecosystem provides special habitats for forest vegetation or wildlife species.

Research Forests: A part of Protection Forests where has been established for the purpose of research studies, experiments or demonstration of silvi-culture techniques or forestry science.

Forests for Regulating Water Resources: A part of Protection Forests that has its function of regulation to the priority of water resources and water cycle.

Forests for Watershed Protection: A part of Protection Forests that has with the priority use to meet its protection functions of the forest area and steep slope easily to worn out by erosion or called Watershed Catchments.

Recreation Forests: A part of Protection Forests that has Special Natural Landscape and have been established for recreation service and eco-tourist.

Memorial Gardens: An area or station for tree planting in the occasion of National Anthem or Wedding Ceremony…

Botanical Gardens: An area or Experimental Station for planting indigenous species represented various environment both in-situ & ex-situ. The botanical garden can be forested area represented forest ecology that is conserved origin plant composition as sample.

Spirit and Religious Forests: A part of Protection Forests where is local community has retained belief/ spirits in accordance with their tradition and culture, and have been kept as religious forest.

Forestland for converting to Other Development Purposes: Forestland for converting to other Development Purposes is idle land, comprised mainly of secondary vegetation, not yet designated for use by any sector that shall be classified as Permanent Forest Reserves until the RGC decides to use and develop the land for another purpose.

Forest Resources: Biological resources within a specific forest area including forest vegetation and wildlife resources, all categories and species and other non-biological resources located therein, except mines under ground.

Forest: A unit of natural or artificial forest ecosystem, in the form of wet, inundated or dry land, covered by mixed vegetation, either natural or planted, including wildlife and other natural resources located therein, which the main utilizations are the production of Timber Products and Non-Timber Forest Products, and other forest services. Lands to which this law does not apply include all land designated by the State as permanent agricultural land, including: farms, idle land to be designated for other agriculture production than timber production, industrial areas, and land for urbanization and construction.

Forest Products & By-products: Products provided by the forest including Timber Products and Non-Timber Forest Products, their processed products and other services provided by the forest.

Forestry Administration: The government authority at all level with the mandate to manage the forest consistent with the National Forest Policy and this law.

Permanent Forest Estate: The overall forest complex, natural and planted, in the Kingdom of Cambodia, including State and Private, designated as two main categories: the Permanent Forest Reserve and Private Forest, to be maintained to ensure a sustainable permanent forest cover and use.

Local Community: Community tribe or a group of people whose home residence is inside or nearby the State forest and having their custom, religious belief and culture that depend on Forest Products& By-products for their subsistence.

Forestry Community: A voluntary community that assembles under a Community Forest Agreement for implementing the sustainable use and development of forest resources conforming to the provision of this law.

Non-Timber Forest Products: Products other than timber that are extracted from the forest including Non-Timber plant products, Wildlife products and services provided by forests. These products shall be determined by Prakas of Ministry of Agriculture, Forestry and Fisheries.

Land of Indigenous Community: Land eligible for registration by the State as community property under the Land Law.

Forest Ecosystem: The community dynamic complex and interaction of living (Forest and Wildlife vegetation and microorganism) and non-living (climate, microclimatic, soil and water) organism within a specific forest area that contributes to its edification and plays the role as a functional unit on the planet. Humans with their economic, traditional, cultural and environmental needs are also an integral part of forest ecosystem.

- Permanent Forest Reserves can be declassified to develop other development sectors such as Industrial Crops, Agro-Industrial Crops or other sectors which are higher economical and social benefits than previous demands of forest products. The Ministry of Agriculture, Forestry and Fisheries may request the RGC to designate other idle forestland for the purposes of protection and reforestation to replace areas of Permanent Forest Reserves that have been declassified.

IUCN Endangerment Status Categories

- **Extinct (Ex)**
  A species is Extinct when there is no reasonable doubt that the last individual has died.
- **Extinct in the Wild (EW)**
  A species is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A species is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal annual throughout its historic range have failed to record an individual. Surveys should be over a timeframe appropriate to the species' life cycle and life form.
- **Critically Endangered (CR)**
  A species is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered (EN)**
  A species is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
- **Vulnerable (VU)**
  A species is vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.
- **Lower Risk (LR)**
  A species is Lower Risk when it has been evaluated, but does not satisfy the criteria for any of the categories of Critically Endangered or Vulnerable.
- **Data Deficient (DD)**
  A species is Data Deficient when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. A species in this category may be well studied and its biology well known but appropriate data on abundance and/or distribution are lacking Data Deficient is therefore not a category of threat or Lower Risk. Listing of species in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many eases, great care should be exercised in choosing between DD and threatened status. If the range of a species is suspected to be relatively circumscribed, or if a considerable period of time has elapsed since the last record of the species, threatened status may well be justified.
- **Not Evaluated (NE)**
  A species is Not Evaluated when it has not yet been assessed against the criteria.

The CITES appendix

These categories reflect the level of threat posed by international trade. Unlike global and national threat categories, CITES categories have a regulatory effect in trade between countries that are parties to the Convention on International trade in Endangered Species of Wild Fauna and Flora. Cambodia is one of these countries, having signed an agreement to be part of this convention.

Appendix I: Species threatened with extinction that are or may be affected by trade. Trade in specimens between parties is only authorized in exceptional circumstances (such as import and export of scientific purposes).

Appendix II: Species, which although not necessarily now threatened with extinction may become so unless trade in specimens is subject to strict regulation in order to avoid over-utilization. Species may also be listed in Appendix II because their similarity to more threatened species, as an aid to enforcement. Commercial trade in wild specimens listed on Appendix II is permitted between members of the convention, but is controlled and monitored through licensing system.

Appendix III: Species for which trade in wild specimens is permitted, but for which in certain CITES signatory countries requires appropriate regulation and documentation.

Appendix 1.2: Monthly Rainfall from 2002-2007

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2002	0	0	5.0	129.0	191.0	256.5	114.5	328.5	337.5	54.0	78.5	17.0	**1,511.5**
2003	0	13.0	48.0	56.5	301.0	227.0	194.0	208.0	286.0	100.0	29.0	7.0	**1,469.5**
2004	0	16.0	27.0	51.5	84.5	219.0	178.0	234.0	317.5	195.0	23.0	0	**1,345.5**
2005	0	0	11.0	74.0	166.0	190.0	233.0	195.0	327.0	146.0	64.0	46.0	**1,452.0**
2006	0	34.0	79.0	86.0	127.0	154.0	282.5	258.5	201.0	264.5	0	38.0	**1,524.5**
2007	0	0	14.0	89.5	319.5	134.0	457.0	590.5	257.5	107.0	66.0	0	**2,035.5**
Total	**0**	**63.0**	**184.0**	**486.5**	**1,189.0**	**1,180.5**	**1,459.0**	**1,814.5**	**1,726.5**	**866.5**	**260.5**	**108.0**	**9,338.0**
Monthly mean	**0**	**10.5**	**30.0**	**81.1**	**198.2**	**196.8**	**243.2**	**302.4**	**287.8**	**144.4**	**43.5**	**18.0**	**1,556.3**
Max	**0**	**34.0**	**79.0**	**129.0**	**319.0**	**256.5**	**457.0**	**590.5**	**337.5**	**264.5**	**78.5**	**46.0**	**2,035.5**

Source: Meteorology Station in Preah Vihear Province, 2008

Appendix 1.3: **Monthly Temperature from 1994-2003**

A-Monthly Maximum Temperature from1994-2003

Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1994	31.0	32.9	34.3	37.8	35.2	32.5	32.5	32.9	31.5	32.0	29.3	29.0	32.5
1995	31.2	32.3	32.6	38.9	35.0	34.5	32.0	30.6	31.3	30.2	30.0	29.0	32.3
1996	31.6	32.5	33.2	37.5	36.9	33.6	32.6	31.5	32.0	29.8	30.2	29.1	32.5
1997	31.2	32.0	33.6	36.8	36.5	33.8	30.3	31.0	31.0	29.0	30.1	30.0	32.1
1998	31.5	33.2	34.5	35.9	34.6	35.6	32.2	31.5	32.0	29.6	29.8	30.6	32.6
1999	31.4	32.3	35.2	35.6	35.6	33.4	32.5	31.6	31.5	30.0	29.0	30.2	32.4
2000	30.3	35.2	35.3	35.6	35.4	33.1	32.6	31.3	30.6	30.5	29.5	30.5	32.5
2001	31.5	34.4	36.2	35.7	35.6	33.0	32.0	32.0	30.4	30.6	29.6	30.0	32.6
2002	34.7	35.5	37.9	38.6	37.7	37.0	34.7	34.0	32.5	32.5	32.6	32.7	35.0
2003	33.2	34.5	36.2	37.8	38.5	36.5	35.6	34.7	33.0	0	0	0	35.6
Monthly Total	317.6	333.9	349.0	370.2	361.0	343.0	327.0	321.1	315.8	274.2	270.1	271.1	330.0
Monthly Mean	31.8	33.4	34.9	37.0	36.1	34.3	32.7	32.1	31.6	30.5	30.0	30.1	33.0
Max	34.7	35.5	37.9	38.9	38.5	37.0	35.6	34.7	33.0	32.5	32.6	32.7	35.6

Source: Forest Management Plan of Choam Ksan and Chhep Forestry Administration Division, 2007

B. Monthly Minimum Temperature from 1994-2003

Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1994	20.9	21.9	25.5	23.8	24.5	24.4	24.9	25.0	25.1	23.2	24.2	24.0	24.0
1995	22.2	21.4	23.6	25.3	25.1	24.7	24.7	24.7	24.6	24.4	24.0	23.5	24.0
1996	20.3	22.1	24.4	25.7	25.5	24.7	25.0	25.0	25.1	25.1	24.7	23.5	24.3
1997	19.8	22.0	27.4	25.0	25.2	24.6	24.8	24.8	24.4	24.0	22.8	21.3	23.8
1998	19.4	22.1	29.5	24.8	25.5	24.7	24.5	24.5	23.8	23.2	21.6	20.6	23.7
1999	19.8	18.8	23.6	24.6	24.7	24.8	24.7	24.7	24.6	23.5	21.4	19.3	22.9
2000	19.6	20.8	24.7	25.6	26.1	24.9	24.9	25.2	24.7	24.6	22.8	20.1	23.7
2001	19.9	20.5	25.2	25.3	25.5	25.0	25.1	25.4	24.9	24.3	23.2	19.8	23.7
2002	29.5	31.5	31.7	32.3	28.5	30.8	30.0	27.6	28.5	29.0	27.2	28.9	29.6
2003	26.8	29.5	29.8	31.3	31.5	31.6	29.9	28.8	30.0	-	-	-	29.9
Monthly Total	**218.2**	**230.6**	**265.4**	**263.7**	**262.1**	**260.2**	**258.5**	**255.7**	**255.7**	**221.3**	**211.9**	**201.0**	**249.5**
Monthly Mean	**21.8**	**23.1**	**26.5**	**26.4**	**26.0**	**25.9**	**25.9**	**25.6**	**25.6**	**24.6**	**23.5**	**22.3**	**25.0**
Max	**19.4**	**18.8**	**23.6**	**23.8**	**24.5**	**24.4**	**24.5**	**24.5**	**23.8**	**23.2**	**21.4**	**19.3**	**22.9**

Source: Forest Management Plan of Choam Ksan and Chhep Forestry Administration Division, 2007

Appendix 1.4: List of Timber and Non-timber forest product in Preah Vihear Protected Forest

No	Name in Khmer	Scientific Name Tree	Family
		Forest Plant Species	
1	បេង	*Afzelia xylocarpa* (Kruz.) Craib. or *Pahudia Cochinchinensis* Pierre	Fabaceae
2	នាងនួន	*Disoxylon bariensis*	Caesalpinioideae
3	ធ្នង់	*Pterocarpus pedatus,*	Papilionaceae
4	ក្រញូង	*Dalbergia cochinchinensis*	Leguminosae
5	តាត្រាវ	*Fagraea fragrans*	Loganiaceae
6	ធ្នឹក	*Shorea obtuse*	Diperocarpaceae
7	អង្កត់ខ្មៅ	*Diospyros bejaudii* Lecomte	Ebenaceae
8	គគីរដែក	*Hopea helfera*	Dipterocarpaceae
9	គគីរមេ្យា	*Hopea odorata*	Dipterocarpaceae
10	ច្រែស	*Albizia lebbeck* (L.) Benth	Fabaceae
11	អង្កាញ់	*Cassia Siamea*	Caesalpinioideae
12	ឈើខ្មៅ	*Diospyros sp*	Ebenaceae
13	ជើងចាប	*Dasymachalon lamentaceun*	Annoceae
14	គ្រៃល	*Melanorrhera laccifera*	Anacarliaceae
15	ត្រយឹង	*Diospyros helferi*	Ebenaceae
16	ក្រឡាញ់	*Dialium cochinchinensis*	Caesalpineae
17	ម៉ែសាក់	*Tectona grandis*	Verbenaceae
18	ពពេល	*Hopea recopei*	Caesalpinioideae
19	ពពួល ឬ ភ្នែល	*Vitex sp*	Verbenaceae
20	រាំងភ្នំ	*Pentacme Siamensis*	Dipterocarpaceae
21	សុក្រម	*Xylia dolabriformis*	Minosoideae
22	ត្រសែក ឬ ត្រាំកង់	*Peltophorum ferruginium*	Caesalpinioideae
23	វល្លីយោង	*Chukrasia tabularis*	Meliaceae
24	ឈ្លីក	*Terminalia tomentosa*	Combretaceae
25	ឈើទាលបង្គួយ ឬ នាងដែង	*Dipterocarpus costatus*	Diperocarpaceae
26	ឈើទាលទឹក	*Dipterocarpus altatus*	Diperocarpaceae

No	Name in Khmer	Scientific Name	Family
27	ជីរចុង	*Shorea vulgaris*	Diperocarpaceae
28	ច្រម៉ាស់	*Vatica astrotricha*	Diperocarpaceae
29	ខ្ឆង	*Dipterocarpus turberculatus*	Diperocarpaceae
30	ត្បែង	*Dipterocarpus obtusifoliius*	Diperocarpaceae
31	ផ្ដៀក	*Anisoptera glabra*	Diperocarpaceae
32	ស្រគុំ	*Payena elliptica*	Sapotaceae
33	ត្រាច	*Dipterocarpus intricatus*	Dipterocarpaceae
34	ច័ន្ទគ្រីះស្នា	*Aquilaria crasnaPierre*	Thymeliaceae
35	ខ្នុរព្រៃ	*Artocarpus chaphash* Roxb	Moraceae
36	ព្រីង	*Eugenia sp.*	Myrtaceae
37	ចំបក់	*Irvingia malayana*	Simaroubaceae
38	ស្នាច់ដោម	*Eugenia zeylaca*	Myrtaceae
39	ធ្លក	*Parinarium annamensis*	Rosacees
40	ត្របែកព្រៃ	*Lagertroemia floribunda*	Lythraceae
41	សេមាន់	*Nephelium hypoleucum*	Sapindaceae
42	សារមាវព្រៃ	*Nephelium lappaceum*	Sapindaceae
43	ពង្រ	*Scheicheria trijuga*	Sapindaceae
44	ស្វាយព្រៃ	*Mangifera indica*	Anacardiacees
45	សំរ៉ង	*Scaphium macropodium*	Sterculiaceae
46	ទេព ពិរូ	*Cinnamomum cambodianum*	Lauraceae
47	ភ្លៅនាង	*Cleistanthus tomentosus*	Euphorbiaceae
48	រំដួល	*Miliusa mesnyi*	Annonaceae
49	កន្ធតព្រៃ	*Phyllanthus emblica*	Euphorbiaceae
50	ជើងគោ	*Tetracera scadens*	Dilleniaceae
51	ពពាលខែ	*Alstonia scholaris*	Apocynaceae
52	មានព្រៃ	*Aporusa planchoniana*	Euphorbiaceae

No	Name in Khmer	Scientific Name	Family
		Medicinal Plant Species	
1	កំរើកគុម្ព	*Spirolobium cambodianum*	Apocynaceae
2	គោមួយ	*Euonymus cochinchinensis*	Celastraceae
3	កុមារពេជ្រ	*Stephania rotunba*	Menispermaceae
4	ឆ្កែស្រែង	*Cananga latifolia*	Annonaceae
5	បណ្តូលពេជ្រ	*Tinospora crispa*	Menispermaceae
6	ស្រម៉ពិភេទ	*Terminalia bellirica*	Combretaceae
7	ស្វែង	*Strychnos nux-vomica*	Loganiaceae
8	កន្ធួតព្រៃ	*Phyllanthus emblica*	Euphorbiaceae
9	ក្រវ៉ាញ	*Amomum krervanh*	Zingiberaceae
10	ក្រកោដីរ	*Amomum elephantorum*	Zingiberaceae
11	រំលាយឈាម	*Lasiantus kamputensis*	Rubinaceae
12	ដីរប្រាំដក់	*Ploiarium alternifolium*	Theaceae
13	កណ្តៀបចង្អេរ	*Pouzulzia zeylanica*	Urticaceae
14	អង្រែដែក	*Dracaena cambodiana*	Agavaceae
15	ព្រះភ្នៅ	*Terminalia nigroremlosa*	Combretaceae
16	ប្រម៉ោយដីរ	*Heliotropium indicum*	Boraginaceae
17	បញ្ចើក្អែក	*Helixanthera longispicata*	Loranthaceae
18	រំយោលភ្នំ	*Hibiscus sagittifolius*	Malvaceae
19	ទឹកដោះខ្លា	*Holarrheno pubescens*	Apocynaceae
20	វល្លិ៍យាវ (ថ្នាំ ត្រជាក់)	*Stryehnos axillaris*	Logariaceae
21	ដោះគន់ (វល្លិ៍)	*Tetraceae scandens*	Dalleniaceae
22	វល្លិ៍អំពិលស្វឹក (ថ្នាំឈឺឆ្អឹង)		
23	កញ្ជើបាយដាច (ថ្នាំកែរោគទាស់)	*Capparis micracantha*	Cappparidaceae
24	វល្លិ៍តាលឹង (ថ្នាំត្រជាក់)		
25	វល្លិ៍ចូត (ថ្នាំត្រជាក់)		
26	សង្ឃ័រ (វល្លិ៍)	*Zizyphus oenoplia*	Rhamnaceae
27	ញូភ្នំ (ថ្នាំក្អក)	*Morinda tomentosa*	Rubiaceae
28	វល្លិ៍មាស (បំបាត់ ហេវបាត់)	*Cassytha filiformis*	Lauraceae

No	Name in Khmer	Scientific Name	Family
29	វល្លីភ្លូ	*Cyclea peltata*	Menispermaceae
30	ប្រង់	*Cibotium baromet*	Disksoniaceae
31	ប័ប្រក	*Drynaria quereigolia*	Lepidopteridaceae
32	បញ្ជើក្អែក	*Viscum articulatum*	Loranthaceae
36	បញ្ជើក្អែកធំ	*Scurrula ferruginae*	Loranthaceae
Non Timber Forest Products			
1	ឫស្សីខ្ចី	*Bambusa bambos*	Gramineae
2	ឫស្សីតែស្រុកចិន	*Bambusa multiplplex*	Gramineae
3	ឫស្សីព្រិច	*Arundinaria pusillaq*	Gramineae
4	ឫស្សីព្រៃ	*Dendrocalamus giganteus*	Gramineae
5	ឫស្សីស្រុក	*Dendrocalamus membranaceus*	Gramineae
6	ផ្តៅសោម	*Korthalsis lacinosa*	Palmae
7	ព្រះផ្តៅ	*Korthalsis bejaudii*	Palmae
8	ផ្តៅស្ន	*Myrialepis paradoxa*	Palmae
9	ផ្តៅដំបង	*Calamus rudentum*	Palmae
10	ផ្តៅឈ្វាង	*Calamus cochinchinensis*	Palmae
11	ស្លាព្រៃ	*Areca triandra*	Palmae
12	ផ្តៅទឹក	*Calamus godefroyi*	Palmae
13	ផ្តៅក្រែក	*Calamus viminalis*	Palmae
14	ផ្តៅអាចម៏មាន់	*Plectocomia pierreana*	Palmae
15	ស្លាតាឱន	*Oncosperma tigillarium*	Palmae
16	ត្រែក	*Livistona saribus*	Palmae
17	ជ័រចុង	*Shorea vulgaris*	Diperocarpaceas
18	វល្លីរមៀត	*Coscinium usitatum*	Menispermaceae
19	គុយ(វល្លី)	*Willughbeia edulis*, Roxb	Apocynaceae
20	ក្រការដីរ	*Amomum elephantorum*	Zingiberaceae
21	ក្រវ៉ាន់	*Amomum krervanh*	Zingiberaceae
22	កាកី	*Cenolophon oxymitrum*	Zingiberaceae

No	Name in Khmer	Scientific Name	Family
23	សេមាន់	*Nephelium hypoleucum*	Sapindaceae
24	ស្ដៅ	*Azadirachta indica*	Meliaceae
25	អង្គាសីល	*Ochna integerrima*	Ochnaceae
26	ក្ដួច(វល្លី)	*Dioscorea hispida*	Dioscorea
27	ដំឡូងសា	*Dioscorea esculenta*	Dioscoreaceae
28	ដំឡូងទ្បែន	*Dioscorea brevipetiolata*	Dioscoreaceae
29	ដំឡូងជ្រូក	*Dioscorea oryzetorum*	Dioscoreaceae
30	វល្លីអង្គញ់	*Entada pursaetha*	Papilionoideae
31	ទឹកឃ្មុំ	*Homey bees*	
32	ប្រង់	*Cycas siamensis*	Cycadaceae
33	ប៉ប្រក	*Drynaria fortunei*	Lepidopteridaceae
34	បញ្ចើក្អែក	*Viscum articulatum*	Loranthaceae
35	បញ្ចើក្អែកធំ	*Scurrula ferruginae*	Loranthaceae
36	កែសរកូល (អរគីដេ)	(more than 7 Species)	

Key Forest Trees Species of PVPF

In accordance with Species Monograph of 21 Priorities Forest Trees Species for Forest Gene Conservation in Cambodia (Chheang Dany 2002), the PVPF contains several priority forest tree species.

***Dalbergia oliveri* (IUCN:** EN)
Taxonomy and Commercial Grade

Cambodian name	: Neang Nuon
Scientific name	: *Dalbergia oliveri*
Synonym	: *Dalbergia dongnaiense* Pierre
	: *Dalbergia bariensis* Pierre
Family	: Fabaceae
Sub-family	: Faboideae
Commercial Grade-Cambodia	: Luxury

Distribution and Habitat: Present throughout Cambodia, Laos, Thailand and Vietnam (Dy Phon, 2000), trees of *Dalbergia oliveri* occur individually or in groups of 5 to 10 trees, and usually in evergreen tropical forests or semi-deciduous forests that are dominated by *Lagerstroemia* and dipterocarps. The species is usually found at low altitudes (< 900 m), and generally in moist areas, along streams and rivers, and on hill sides. Trees can tolerate some level of shade at an early age, but they generally prefer light. Individuals of this species often produce many seeds, but natural regeneration is often poor due to low germination rates or disadvantageous weather and site conditions. Trees generally grow slowly in both natural and man-made forests (CTSP, 2001).

Within Cambodia, this species is found in Kratie, Preah Vihear, Kampong Thom, Ratanakiri, Stung Treng, Pursat and Siem Reap (Khorn, 2002), Kampong Speu and Koh Kong province.

Uses: Easy to polish, the wood is widely used for making high quality furniture, luxury cabinets, art and handicrafts, decorations etc.

Current Status: Due to its economic value, *Dalbergia oliveri* is facing serious depletion by illegal cutting. The number of remaining individual trees is very low, and these are disappearing on a local level. In many areas of its natural range, mature and large sized trees are rarely to be found. Efforts to regenerate the species on a large scale have been few and limited. The species is facing the possibility of extinction if no effective protection measures are taken (CTSP, 2001).

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Dalbergia oliveri* as a priority species, and one that is in need of immediate conservation interventions and appropriate protection. This species is protected by Cambodian Forestry Law.

***Dalbergia cochinchinensis* Pierre (IUCN:** VU)
Taxonomy and Commercial Grade

Cambodian name	: Kra-nhourng
Scientific name	: *Dalbergia cochinchinensis* Pierre.
Synonym	: *Dalbergia cambodiana* Pierre.
Family	: *Fabaceae*
Sub-family	: *Faboideae*
Commercial Grade-Cambodia	: Luxury

Distribution and Habitat: Native to Indochina and adjacent countries, this tree species is shade-tolerant when young. It usually occurs sparsely in open and semi-deciduous forests from 400 to 500 m a.s.l., and prefers deep sand, clays, or calcareous soils (Khorn, 2002). This rosewood prefers uniform rainfall that ranges from 1200-1650 mm per year. The species requires high amounts of light to thrive, and is drought tolerant and able to grow on most soils (DFSC, 2000). Within Cambodia, the species is found in Kampong Thom, Preah Vihear, Ratanakiri, Pursat, Siem Reap, Kratie, Koh Kong, Stung Treng, and Modulkiri Province (Khorn, 2002).

Uses: Wood can be exported at a high price, and is used for making high quality furniture, art handicrafts, and musical instruments. The root base and root can also be used for high quality art handicrafts (CTSP, 2001).

Current Status: *Dalbergia cochinchinensis* has been found during field surveys in concessions (commercial forest), protected areas, and various regions in the Northern Highlands of Cambodia. Illegal cutting in many areas has resulted in few and sparse populations of this species. This presents difficulties in finding germplasm sources within and outside protected forests/national parks.

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Dalbergia cochinchinensis* Pierre as a priority species in need of immediate conservation intervention and appropriate protection. This species is protected by Cambodian Forestry Law.

***Afzelia xylocarpa* (Kruz.) Craib (IUCN:** EN A1cd)
Taxonomy and Commercial Grade

Cambodian name	: Beng
Scientific name	: *Afzelia xylocarpa* (Kruz.) Craib.
Synonym	: Pahudia cochinchinensis Pierre
Family	: *Fabaceae*
Sub-family	: *Caesalpinioideae*
Commercial Grade-Cambodia	: Luxury

Distribution and Habitat: This species is found in Laos, Thailand, Cambodia and Vietnam. It is a light demanding species, occurring on well-drained flatlands or transitional zones between evergreen and dry open dipterocarp forest, usually from 500 to 700 m a.s.l. The species also occurs above 900 m (Dy Phon, 2000) in mixed forest. The tree is often associated with *Dalbergia oliveri, Pterocarpus macrocarpus, Lagerstroemia calyculata, Dipterocarpus tubinatus* and *Tetrameles nudilora.* Trees occur in a scattered manner in mixed forests, and do not usually form pure stands. Within Cambodia, this species is found in Kampong Thom, Kratie, Stung Treng, Preah Vihear, Siem Reap, Battambang, Ratanakiri, Mondulkiri, Kampot and Pursat province (Khorn, 2002).

Uses: The wood beng is valuable on account of its rich dark or light-red colours, prominent veins, hardness and durability. The wood is used in various ways, including house construction, cabinet and furniture-making, and high quality handicrafts (CTSP, 2001). The bark is used for tanning animal skins, and also in local medicine and also in veterinary medicine (Dy Phon, 2000). The fatty cotyledons of young seeds are edible (DFSC, 2000).

Current Status: Because the wood of *beng* is very valuable, this species is over-exploited and in danger of extinction if adequate protection measures are not implemented. Within most of its area of distribution, mature trees have been reduced dramatically, and sometimes it is very difficult to find them for seed collection. The number of mature trees has been reduced significantly and it is now difficult to find significant sources of germ-plasm.

In 2002, the second meeting on the Forest Gene Conservation Strategy defined *Afzelia xylocarpa* (Kruz.), Craib Pierre as a priority species in need of immediate protection and conservation. This species is protected by Cambodian Forestry Law No.35.

***Pterocarpus macrocarpus* Kurz (IUCN:** VU A1d)
Taxonomy and Commercial Grade

Cambodian name	: Thnong
Scientific name	: *Pterocarpus macrocarpus* Kurz
Family	: Fabaceae
Commercial Grade-Cambodia	: Luxury

Distribution and Habitat: This species is a common constituent of tropical deciduous forests in Cambodia, Laos and Vietnam (FIPI, 1996). In Cambodia the species usually occurs in dense deciduous or cleared forests up to 700 m a.s.l. (Dy Phon, 2000). The species is rarely found in primary forests. The tree is often mixed with many other species, but often occurs as a dominant plant. It is a light-demanding, drought tolerant tree that is suitable for well drained, light textured soils with shallow depths and little humus (Khorn, 2002). It is found in Kampong Thom, Stung Treng, Preah Vihear, Rattanakiri, Kratie, Siem Reap, Kampot, Pursat and Mondulkiri (Khorn, 2002), Kampong Speu and Koh Kong province.

Uses: This species is used in making luxury furniture, cabinetwork, art handicrafts, musical instruments and flooring (FIPI, 1996).

Current Status: In Cambodia, *Pterocarpus macrocarpus* occurs mostly in the North. Most timber is harvested from natural forests and the species is suffering from over-exploitation and agricultural expansions (CTSP, 2001). Its natural habitats are being destroyed, and the species is facing the possibility of extinction if protection measures are not taken.

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Pterocarpus macrocarpus* as a priority species in need of immediate conservation intervention and appropriate protection. This species is protected by Cambodian Forestry Law.

***Diospyros cruenata* Thwaites**
Taxonomy and Commercial Grade

Cambodian name	: Cheou kmao
Scientific name	: *Diospyros cruenata Thwaites*
Family	: Ebanaceae
Commercial Grade-Cambodia	: Luxury

Distribution and Habitat: Found in dense and mixed forests of Eastern Asia.

Uses: The wood of *Diospyros cruenata* is valued for the manufacture of ornamental trinkets, and is excellent for firewood (Dy Phon, 2000).

Current Status: Because the wood is very valuable and has very high demand in the market, this species is over-exploited and in danger of extinction if adequate protection measures are not implemented. Its distribution is scattered and its habitats have been destroyed by forestland conversions and clear-cutting. Moreover, trees are selectively cut. The number of mature trees has been reduced significantly and it is now difficult to find significant sources of germplasm.

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Diospyros cruenata* Thwaites Pierre as a priority species in need of immediate protection and conservation. This species is protected by Cambodian Forestry Law.

***Diospyros bejaudii* Lecomte**

Taxonomy and Commercial Grade

Cambodian name	: Angkat khmao
Scientific name	: *Diospyros bejaudii* Lecomte
Family	: Ebenaceae
Commercial grade-Cambodia	: Luxury

Distribution and Habitat: *Diospyros bejaudii* Lecomte is found in dense and semi-dense forests of Cambodia, where it is a narrow endemic (Dy Phon, 2000).

Uses: This species is much in demand for the manufacture of knife handles, and often, musical instruments (Dy Phon, 2000).

Current Status: Because its wood has a high value, this species is over-exploited and in danger of extinction if adequate protection measures are not implemented. Its distribution is scattered and its habitat is destroyed through forestland conversion, selective illegal logging. The number of mature trees has been reduced significantly and it is now difficult to find significant sources of germplasm.

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Diospyros bejaudii* Lecomte as a priority species in need of immediate conservation intervention and appropriate protection. This species is protected by Cambodian Forestry Law.

***Fagraea fragrans* Pit**

Taxonomy and Commercial Grade

Cambodian name	: Ta trao
Scientific name	: *Fagraea fragrans* Pit
Family	: Loganiaceae
Commercial grade-Cambodia	: Luxury

Distribution and Habitat: This species is widely distributed in Vietnam, Cambodia, Laos, Thailand, Java, Sumatra, Malaysian Peninsular, and India. In Cambodia, it is usually found in semi-deciduous forests and rarely in dense or open forests (FA, 1997). The tree prefers sandy soils that are periodically inundated along streams or rivers, usually below 800 m a.s.l. This is a pioneer species in burnt forestlands (FIPI, 1996). It is found in Koh Kong, Pursat, Stung Treng, Kratie, Kampong Thom, Mondulkiri and Preah Vihear province (Khorn, 2002; see map).

Uses: The wood is used for house pillars in construction, but also in the manufacture of furniture coffins (FIPI, 1996). In Khmer culture, *Fagraea fragrans* Pit is used for making doors and doorframes, particularly in some historic temples (FA, 1997). The bark is used in traditional medicine. The tree can be planted to provide shade (FIPI, 1996).

Current Status: Because this wood is very valuable and in high demand, the species is over-exploited and in danger of extinction if adequate protection measures are not implemented. Its distribution is scattered and its habitats are being destroyed by forestland conversion and selective, illegal logging. The number of mature trees has been reduced significantly and it is now difficult to find significant sources of germplasm.
In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Fagraea fragrans* Pit as a priority species, in need of immediate protection and conservation intervention. This species is protected by Cambodian Forestry Law No.35.

***Pinus merkusii* Jungh et de Vries**

Taxonomy and Commercial Grade

Cambodian name	: Sral
Scientific name	: *Pinus merkusii* Jungh et de Vries
Family	: Pinaceae
Commercial grade-Cambodia	: 2nd Grade

Distribution and Habitat: This species occurs throughout South-East, including Myanmar, Cambodia, Laos, Vietnam, Indonesia (Sumatra) and Philippines (Luzon and Mindoro islands). *Sral* was probably introduced onto the island of Hainan (China) (Hidayat and Hansen, 2002). In Cambodia it is found in large stands or small groups, and usually in mixed deciduous or evergreen forest. The largest stands of *sral* in Cambodia are found on the Kirirom Plateau, and cover a total of 12,000 hectares (Dy Phon, 2000). The species occurs from 30-1800 m a.s.l.. It is a light-demanding, heat- and drought-tolerant tree, growing well on many different types of soil, such as sandy and red soils, and in varying climates (Hidayat and Hansen, 2002). It is slow-growing during the first five years, but grows quickly as an adult (Khorn, 2002). Experience suggests that this is one of the principal tree species to plant on bare or bushy hills, as it provides protection against erosion and land-deformation (FIPI, 1996). It is found in Preah Vihea, Kampong Thom, Koh Kong, Pursat, Kampong Speu, Koh Kong and Mondulkiri province.

Uses: The wood is used in house construction, joinery, match-making, pulp, common furniture, pit props, electricity poles, shipbuilding, chopsticks, and vehicle-building (FIPI, 1996). The species provides high resin yields and commercial tapping is often practiced. Old trees can yield 30-60 kg of crude gum per year, equalling 20-40 kg of pure resin and 7-14 kg of turpentine (Hidayat and Hansen, 2002). The resin is also used in medicine, paints, printing and the perfume industry. In Cambodia, the resin is also used to make torches. In traditional medicine, the decoction of the dried out resin is used to treat diseases such as furunculosis, abscesses, and bad blood circulation (Dy Phon, 2000). This species is often used for the rehabilitation of degraded areas due to its tolerance to fire and poor soil conditions (Hidayat and Hansen 2002).

Current Status: As this wood is very valuable and has very high demand in markets, this species is over-exploited and in danger of extinction if adequate protection measures are not implemented. Distribution is scattered and its habits have been destroyed by forestland conversions and selective illegal logging. The number of mature trees has been reduced significantly and it is now difficult to find significant sources of germplasm.

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Pinus merkusii* Jungh et de Vries as a priority species in need of immediate conservation intervention and appropriate protection. Resin tapping (harvesting) is prohibited by Cambodian Forestry Law (1988) unless special permission is granted by MAFF.

***Cinnamomum cambodianum* Lecomte**

Taxonomy and Commercial Grade

Cambodian name	: Tep porou
Scientific name	: *Cinnamomum cambodianum* Lecomte
Family	: Lauraceae
Commercial Grade-Cambodia	: Unclassified

Distribution and Habitat: This species is distributed in wet, dense, piedmont forests from 600-700 ma.s.l. (Dy Phon, 2000). It is also plentiful on the upper slopes of the Bokor and Cardamom Mountains. It has disjunct populations in Ratanakiri and Kampong Thom, as illustrated on the map. This species is endemic to Cambodia (FA, 2000). It is a shade-

demanding tree when young, growing well in deep soil. It usually grows in clusters of 5-10 trees in the primary of secondary forest, at altitudes below 1,500 m above sea level (Khorn, 2002).

Uses: Timber of this species is used in house construction and as fuelwood (FA, 2000). The bark can be chewed with betel, or used in the kitchen. In traditional medicine, it is used against a variety of diseases, such as indigestion, tuberculosis, and regulation of periods (Dy Phon, 2000).

Current Status: As the wood is very valuable and in high demand. This species is under high pressure from over-exploitation and is in danger of extinction unless measures are taken to provide adequate protection illegal logging. The number of mature trees has been reduced significantly and it is now difficult to find significant sources of germplasm.

In 2002, the second CTSP meeting on the Forest Gene Conservation Strategy defined *Cinnamomum cambodianum* Lecomte as a priority species in need of immediate conservation intervention and appropriate protection.

Orchids

The PVPF contains a wide range variety of orchid species that are targeted for collection for trade both locally and internationally. Orchids were yet chosen as a conservation target because too little are known about the distribution and conservation status species and the severity of threats to these species at this time.

Appendix 1.5: List of Mammals of Preah Vihear Protected Forest

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
PHOLIDOTA						
Manidae						
1	ពង្រួស	Sunda Pangolin	*Manis javanica*	EN	II	Rare
CHIROPTERA						
Pteropodidae						
2	ជ្រើង	Flying Fox sp.	*Pteropus sp.*	?	II	
Rhinolophidae						
3	ប្រច្រៀវ	Shamel's Horseshoe Bat	*Rhinolophus shameli*	LC		
4	ប្រច្រៀវ	Acuminate Horseshoe Bat	*Rhinolophus acuminatus*	LC		
5	ប្រច្រៀវ	Intermediate Horseshoe Bat	*Rhinolophus affinis*	LC		
6	ប្រច្រៀវ	Indochinese Horseshoe Bat	*Rhinolophus chaseni*	LC		
Hipposideridae						
7	ប្រច្រៀវ	Diadem Roundleaf Bat	*Hipposideros diadema*	LC		
Verspertilionidae						
8	ប្រច្រៀវ	Peter's/Asian Whiskered Myotis	*Myotis ater/muricola*	LC		
9	ប្រច្រៀវ	Greater Asian House Bat	*Scotophilus heathii*	LC		
10	ប្រច្រៀវ	Least False-Serotine	*Hesperoptenus blanfordii*	LC		
11	ប្រច្រៀវ	Hardwicke's Woolly Bat	*Kerivoula hardwickii*	LC		
Molossidae						
12	ប្រច្រៀវភ្នំត្បែង	Wroughton's Free-tailed Bat	*Otomops wroughtoni*	DD		
PRIMATES						
Lorisidae						
13	រញ្ជីប្រផេះ	Slow Loris	*Nycticebus coucang*	DD	II	Rare
Cercopithecidae						
14	ស្វាព្រោង	Indochinese Silvered Langur	*Trachypithecus germaini*	NT	II	Common
15	ស្វាត្រាស	Pig-tailed Macaque	*Macaca nemestrina*	VU	II	Common

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
16	ស្វាក្តាម	Long-tailed Macaque	*Macaca fascicularis*	N-t	II	Common
			Hylobatidae			
17	ទោចម្មុដ	Pileated Gibbon	*Hylobates pileatus*	VU	I	Rare
			CARNIVORA			
			Canidae			
18	ឆ្កែចចក	Golden Jackal	*Canis aureus*		III	Common
19	ឆ្កែព្រៃ	Dhole	*Cuon alpinus*	VU	II	Common
			Ursidae			
20	ខ្លាឃ្មុំតូច	Sun Bear	*Ursus malayanus*	DD	I	Rare
21	ខ្លាឃ្មុំធំ	Asian Black Bear	*Ursus thibetanus*	VU	I	Endangered
			Mustelidae			
22	សំពោចកលឿង	Yellow-throated Marten	*Martes flavigula*		III	Common
23	ធ្លូក	Ferret-Badger sp	*Melogale sp*			Common
24	ជ្រូករោន	Hog Badger	*Arctonyx collaris*	NT		Rare
25	ភេខ្លួនរលោង	Smooth coated Otter	*Lutrogale perspicillata*		II	
			Viverridae			
26	ខ្ទីន	Large Indian Civet	*Viverra zibetha*	NT	III	Common
27	សំពោចធំ	Large-spotted Civet	*Viverra megaspila*		III	Common
28	សំពោចវល្លី	Small Indian Civet	*Viverricula indica*	LC	III	Common
29	សំពោចក្រអូប	Common Palm Civet	*Paradoxurus hermaphroditus*	LC	III	Common
30	សំពោចភ្នំ	Binturong	*Arctictis binturong*	VU	III	Common
			Herpestidae			
31	ស្វាតូច	Small Asian Mongoose	*Herpestes javanicus*	LC		Common
32	ស្វាធំ	Crab-eating Mongoose	*Herpestes urva*		III	Common
			Felidae			
33	ខ្លាធំ	Tiger	*Panthera tigris*	EN	I	Endangered
34	ខ្លារខិន	Leopard	*Panthera pardus*	NT	I	Rare
35	ខ្លាភ្លីថ្លុកែវ	Marbled Cat	*Pardofelis marmorata*	VU	I	Rare

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
36	ខ្លាឈ្មែងមាស	Asiatic Golden Cat	*Pardofelis temminckii*	NT	I	Rare
37	ឆ្មាដាវ	Leopard Cat	*Prionailurus bengalensis*		II	Common
38	ខ្លាត្រី	Fishing Cat	*Prionailurus viverrinus*	EN	II	Common
39	ឆ្មាព្រៃ	Jungle Cat	*Felis chaus*	LC	II	Common
PROBOSCIDEA						
Elephantidae						
40	ដំរី	Asian Elephant	*Elephas maximus*	EN	I	Endangered
ARTIODACTYLA						
Suidae						
41	ជ្រូកព្រៃ	Eurasian Wild Pig	*Sus scrofa*	LC		Common
Tragulidae						
42	ក្តាន់ឡេងតូច	Lesser Mousedeer	*Tragulus kanchil*	LC		Common
Cervidae						
43	ប្រើស	Sambar	*Rusa unicolor*	VU		Common
44	រមាំង	Eld's Deer	*Rucervus eldii*	EN		Endangered
45	ឈ្លូស	Red Muntjac	*Muntiacus muntjak*	LC		Common
Bovidae						
46	ទន្សោង	Banteng	*Bos javanicus*	EN		Rare
47	ខ្ទីង	Gaur	*Bos gaurus*	VU	I	Rare
48	កែះ	Southern Serow	*Naemorhedus sumatraensis*	VU	I	Rare
RODENTIA						
Scuiridae						
49	កំប្រុកធំ	Black Giant Squirrel	*Ratufa bicolor*	NT	II	Rare
50	កំប្រុកពណ៌	Variable Squirrel	*Callosciurus finlaysonii*			Common
51	កង្ហិចកម្ពុជា	Cambodian Striped Squirrel	*Tamiops rodolphi*			Common
52	កង្ហែន	Indochinese Striped Squirrel	*Menetes berdmorei*			Common
53	ឆ្មាបាកន្ធុយខ្មៅ	Indian Giant Flying Squirrel	*Petaurista philippensis*			Rare
54	កំប្រុក	Small Flying Squirrel sp	*Hylopetes sp*			

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
Hystricidae						
55	ប្រមាំ	East Asian Porcupine	*Hystrix brachyura*	VU		Common
56	ប្រមោញ	Asian Brush-tailed Porcupine	*Atherurus macrourus*	LC		Common
LAGOMORPHA						
Leporidae						
57	ទន្សោយគល់	Burmese Hare	*Lepus peguensis*	LC		Common

Critically Endangered	CR
Endangered	EN
Vulnerable	VU
Near-threatened	NT
Data Deficient	DD
Least Concern	LC

Key mammal species

PHOLIDOTA
Manidae
Sunda Pangolin *Manis javanica* (EN)
This species is rarely observed and has been recorded in a camera trap with other observations from Buffer Zones 1 and 2 (WCS 2008). It is now endangered as a result of hunting for the trade in traditional medicines.

CHIROPTERA
Molossidae
Bats were studied in PVPF by Walston & Bates (2000) who recorded 10 species during a short study (see Appendix 1.6) in 2000. The most notable finding was the capture of Wroughton's Free-Tailed Bat *Otomops wroughtoni* (DD) south of Kahkeuk sub-station in the Chhep district area of PVPF close to Cherndar concession. This species was previously only known from north-east India (Walston & Bates 2000). This extraordinary record indicates how little we know about the bats of south-east Asia. Additionally, one Flying Fox species *Pteropus* sp. is known to occur in PVPF, but it has not been identified to species.

PRIMATES
Lorisidae
Bengal Slow Loris *Nycticebus bengalensis* (VU)
There are a small number of records of this species in PVPF which is widely hunted in south-east Asia for traditional medicine (WCS 2008). Thus it is rapidly disappearing from most its known range. Protection of large areas of habitat, such as the forests of PVPF, will ensure the survival of the loris in Cambodia.

Cercopithecidae
Indochinese Silvered Langur *Trachypithecus germaini* (EN)
Known from the O Koki riverine forest and from two areas in the Buffer Zone 2, of which one is in Cherndar concession (WCS 2008). Found mostly within evergreen, semi-evergreen and riverine forest which is being cleared rapidly outside protected forests. Like other large mammals, it is also vulnerable to hunting, particularly where habitat is fragmented. It has a small global distribution, thus PVPF is of global importance for the conservation of this species as it is well protected at this site.

Northern Pig-tailed Macaque *Macaca leonina* (VU)
Found near O Koki and also quite numerous records in the Cherndar Plywood concession (WCS 2008). This species relies on large areas of high forest for its survival. Forest clearance is probably the main threat to this species in Cambodia. Although it is not a popular hunting quarry species, hunting may also pose a threat where habitat is fragmented.

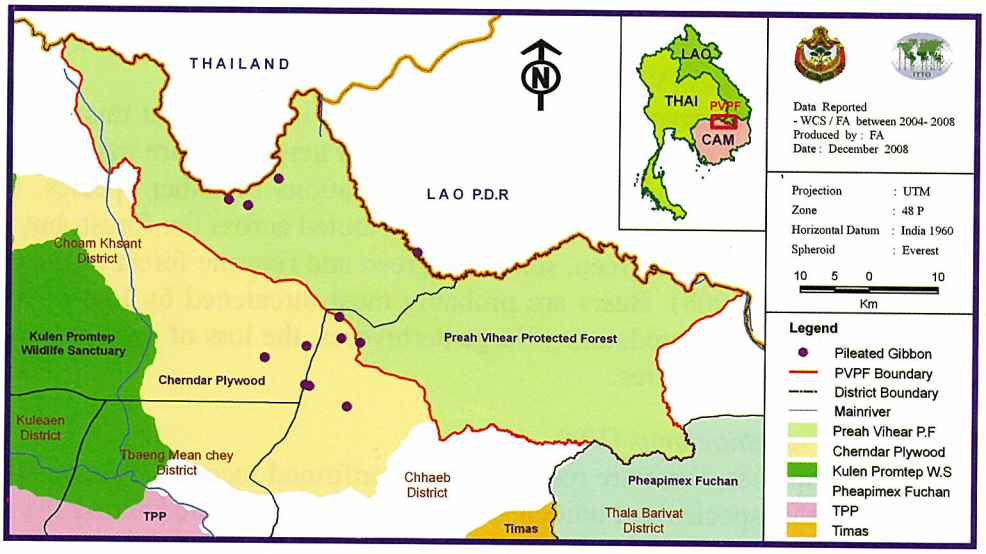
Long-tailed Macaque *Macaca fascicularis* (LC)
Widely distributed across PVPF, although it prefers dense forest (WCS 2008). Although this species is not considered globally threatened, because of the very high levels of live capture of this species for captive-breeding for the pharmaceutical industry, it is now thought to be highly threatened outside protected forests in Cambodia. It is possible that without reductions in live capture of this species, sites like PVPF will be the only locations which continue to hold populations of this species.

Hylobatidae

Pileated Gibbon *Hylobates pileatus* (EN)

Widely distributed across PVPF wherever there is evergreen and mixed deciduous-evergreen forest (WCS 2008). The species is confined to forest areas in south-east Thailand and Cambodia to the Mekong River (Brockelman 1975; Brockelman & Gittins 1984; Marshall & Sugardjito 1987). Its range is therefore relatively small and its distribution within that range is declining rapidly as forest is cleared. If this trend continues, then it is likely that, as in Thailand, it will only be found in protected forests within Cambodia. The high quality of management and the intact nature of the forests of PVPF make this site of special importance for this species. Additionally, as PVPF is adjacent to Yot Dom Wildlife Sanctuary and Phu Jong Na Yoi National Park in Thailand where Rungnapa & Brockelman found small populations of gibbons, there is connectivity with other protected areas which increases the overall importance of PVPF for pileated gibbons. A review of the population of pileated gibbon for Cambodia by Traeholt *et al.* (2005) should be disregarded as it is based on extrapolation.

Map 1.5.1: Pileated Gibbon of PVPF



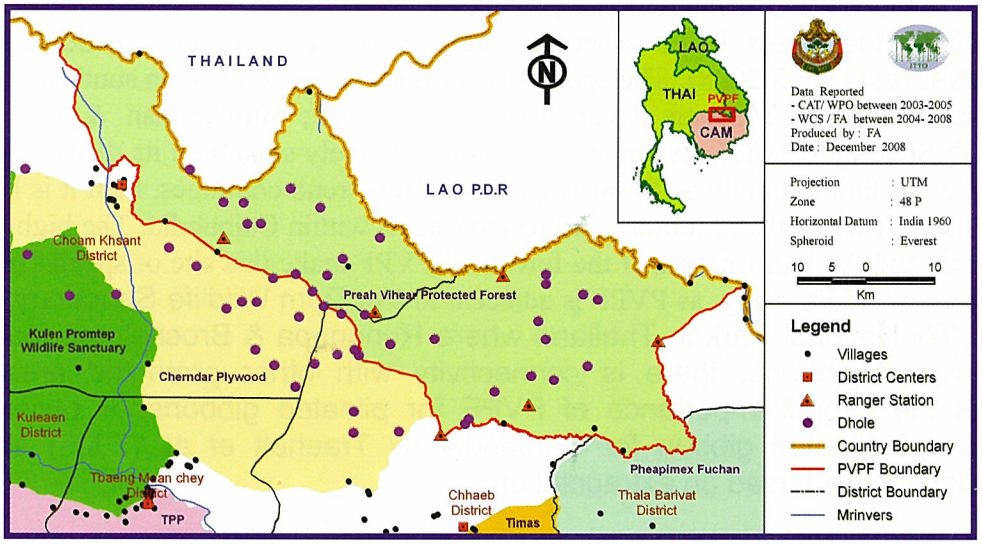
CARNIVORA

Canidae

Dhole *Cuon alpinus* (EN)

The dhole is probably the most frequently recorded of all the large carnivores in PVPF with records across much of the site (WCS 2008). Dhole have disappeared from large areas of their range in northern Asia and there are estimated to be only 2,500 adults remaining globally (Durbin et al. 2008). Tropical dry and moist deciduous forest is thought to be optimal habitat and deer are its main prey base. Thus PVPF is of great significance for this species as there is a large area of high quality habitat and increasing numbers of typical prey species.

Map 1.5.2: Dhole of PVPF



Ursidae

Sun Bear *Helarctos malayanus* (VU)

There are relatively few confirmed sightings of this species in PVPF, but this may be due to the difficulties of identifying the two species of bear found here; there are many more records of unidentified bear species than of confirmed identifications of either species. Most bear records of this species and unidentified species are distributed across the forest, but with most observations coming from the evergreen, semi-evergreen and riverine forest of the Core Zone and Buffer Zone 2 (WCS 2008). Bears are probably most threatened by loss of habitat and some hunting. As bears are not predators of large herbivores, the loss of prey base is probably not a significant threat to this species.

Asian Black Bear *Ursus thibetanus* (VU)

As for the preceding species, there are relatively few confirmed records of Asian Black Bear. Most bear records of this species and unidentified species are distributed across the forest, but with most observations coming from the evergreen, semi-evergreen and riverine forest of the Core Zone and Buffer Zone 2 (WCS 2008).

Mustelidae

Ferret-badger sp. *Melogale* sp. (DD/LC)

The two Ferret-badger species are very difficult to distinguish except by examining the dentition. Thus, although it is believed that the Large-toothed Ferret-badger *Melogale personata* (DD) has been recorded in PVPF from camera traps, the presence of Small-toothed Ferret-badger *Melogale moschata* cannot be ruled out (WCS 2008).

Hog Badger *Arctonyx collaris* (NT)

There have been few observations, mostly from evergreen forest in the Core Zone and Buffer Zone 2 (WCS 2008). The paucity of observations may be due to the nocturnal habits of Hog Badgers. This species, like many smaller species may be threatened mostly by habitat loss as well as by trapping using snares.

Smooth Otter *Lutrogale perspicallata* (VU)

Known from a few sight observations, thus exact identification remains to be confirmed (WCS 2008). Threats to this species include loss of prey base by intensive fishing, capture in fishing nets and illegal hunting.

Viverridae

Large Indian Civet *Viverra zibetha* (NT)
Widely distributed throughout PVPF, in both dry dipterocarp forest and more moist forest (WCS 2008).

Large-spotted Civet *Viverra megaspila* (VU)
Found mostly in dry dipterocarp forest as well as some more moist forest (WCS 2008). More frequently recorded than the Large Indian Civet which suggests it may be more common than that species. However, if it prefers more open forest, then the relative frequency of observations may be related to its greater visibility in this more open habitat.

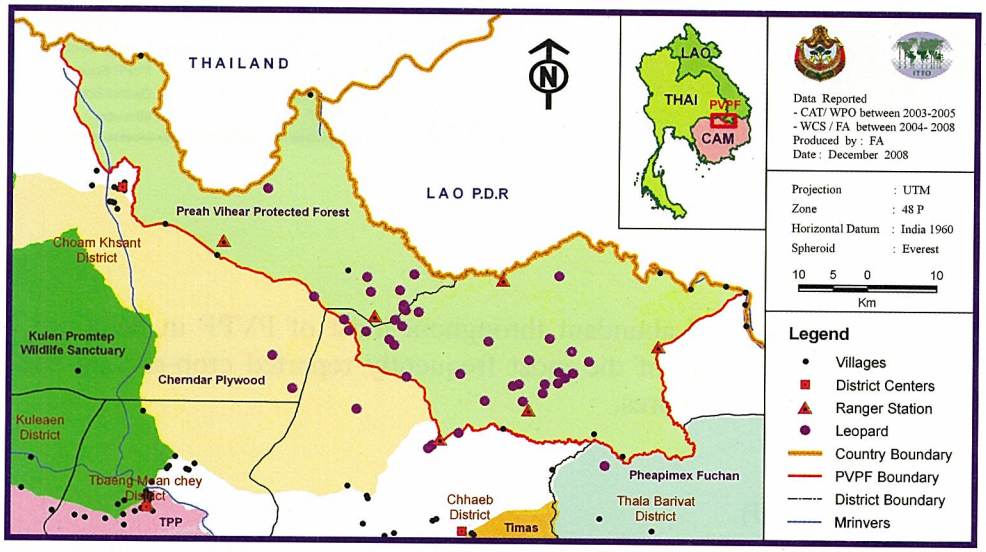
Felidae

There are no records of Clouded Leopard *Neofelis nebulosa* (VU) from PVPF which is somewhat remarkable. Additionally, there are very few records of Marbled Cat *Pardofelis marmorata* (VU) and Asiatic Golden Cat *Pardofelis temminckii* (NT). Details of other key felid species are detailed below.

Tiger *Panthera tigris* (EN)
There have been no confirmed observations of this species for over five years in PVPF (WCS 2008). Camera-trapping and measurement of large cat footprints are being used to assess the veracity of recent reports of tigers in PVPF.

Leopard *Panthera pardus* (NT)
Widely distributed across PVPF with many records from the south-east (WCS 2008) dry dipterocarp forest and also the evergreen forest of the Core Zone and Buffer Zone 2. Although this species is widespread from Africa to East Asia, it is disappearing with loss of habitat, hunting and loss of prey base. Large areas of intact habitat with large numbers of prey animals such as PVPF are of key importance for the long term survival of this species in south-east Asia.

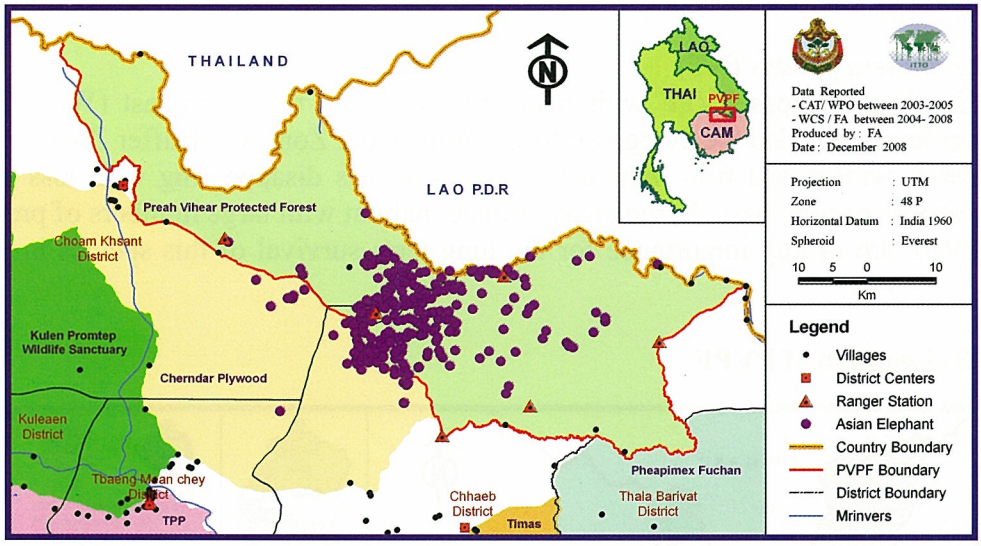
Map 1.5.3: Leopard of PVPF



Fishing Cat *Prionailurus viverrinus* (EN)
This species is recorded from sites across PVPF in a number of different habitats. It is the most frequently recorded of the small cats alongside the Jungle Cat *Felis chaus* (LC). Given its endangered status, its relative abundance at this site indicates that PVPF may be of considerable importance for the global conservation of this species.

PROBOSCIDEA
Elephantidae
Asian Elephant *Elephas maximus* (EN)
There are numerous records of this species from all seasons indicating that it is resident in PVPF although no data is yet available on the elephant population size here. Given that habitats in areas adjoining PVPF are similar to those within the forest's boundaries, it is likely that Asian Elephants may also cross the international border to Lao PDR and also travel into the Cherndar Plyw]ood concession. It is possible that its range may have changed somewhat in recent years, perhaps through the influence of changing hunting or disturbance patterns. However, given that surveys and patrolling effort have not been identical in all years and as we do not have meteorological data which we can use to assess the effects of rainfall on elephant movements, it is not possible to say if these range changes are real or not. Although previously the PVPF elephant population may have been connected to that in Kulen Promtep Wildlife Sanctuary (KPWS) through Cherndar concession, there is no evidence to suggest that elephants still move into KPWS. A recent range-wide review of elephant abundance and distribution indicated that there is no data on the elephant population in Lao PDR adjacent to PVPF. Thus we do not know if the PVPF is part of a wider regional population which would increase its global significance.

Map 1.5.4: Asian Elephant of PVPF



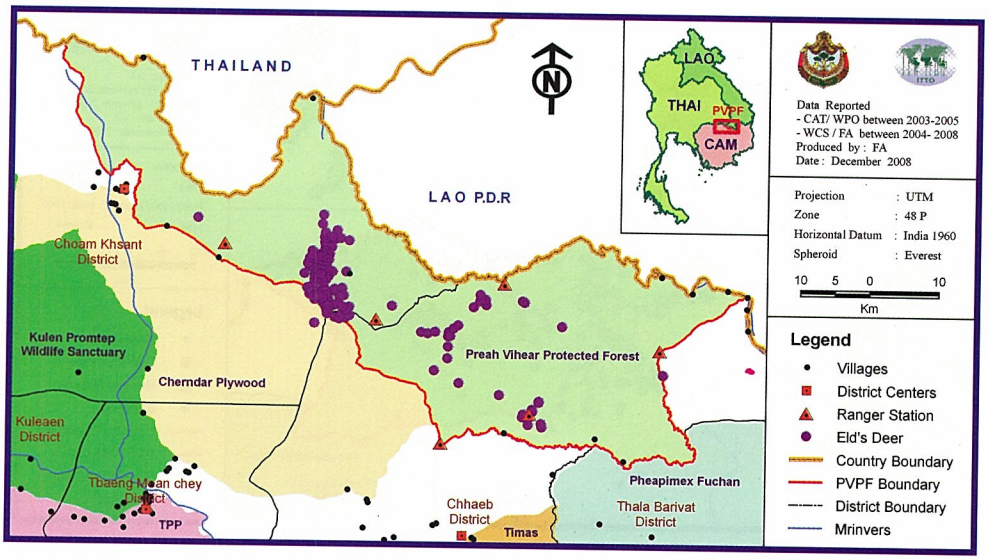
ARTIODACTYLA
Suidae
Eurasian Wild Pig (LC)
This species is widespread and abundant throughout most of PVPF in the Core Zone and Buffer Zones 1 and 2. It is one of the most frequently reported crop-raiding species. It is important as prey for large carnivores.

Cervidae
Sambar *Rusa unicolor* (VU)
Widespread and frequently recorded in most habitats. As this species is in itself vulnerable as well as being an important prey species for large carnivores, the abundance of Sambar is an indicator of conservation success for the current PVPF management approach.

Eld's Deer *Rucervus eldii* (EN)
Eld's Deer are found most frequently recorded in dry dipterocarp forest, particularly in three main areas: in the forests south of Roboinh village, between the O Koki and Dangphlat village

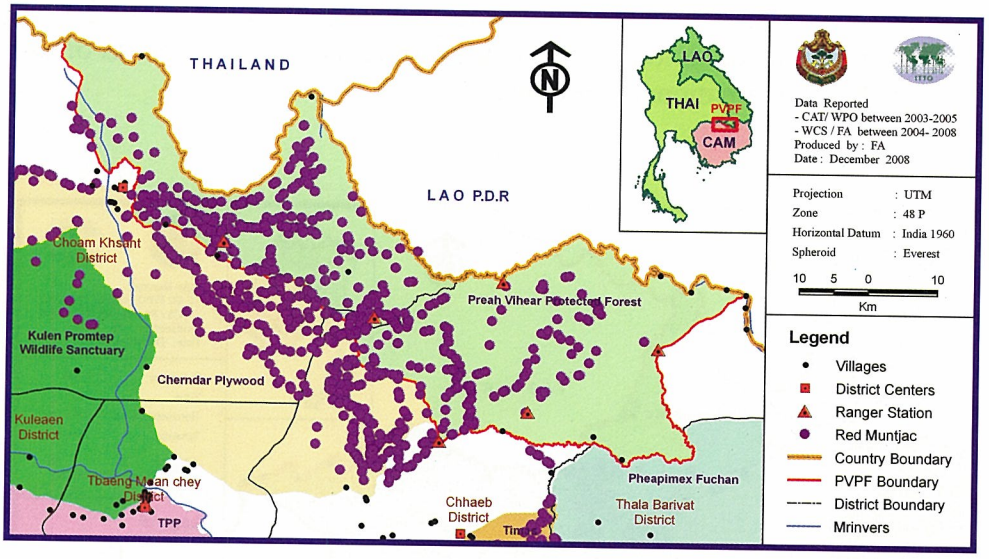
and in the south-east of PVPF. PVPF is possibly one of the most important sites for this species in the world as dry dipterocarp forest, on which this species relies, has disappeared from so much of its original range in south-east Asia. Additionally, as an important prey species for large carnivores, its abundance has wider implications.

Map 1.5.5: Eld's Deer of PVPF



Red Muntjac *Muntiacus muntjak* (LC)
This species is widespread and abundant throughout most of PVPF. It is important as prey for large carnivores.

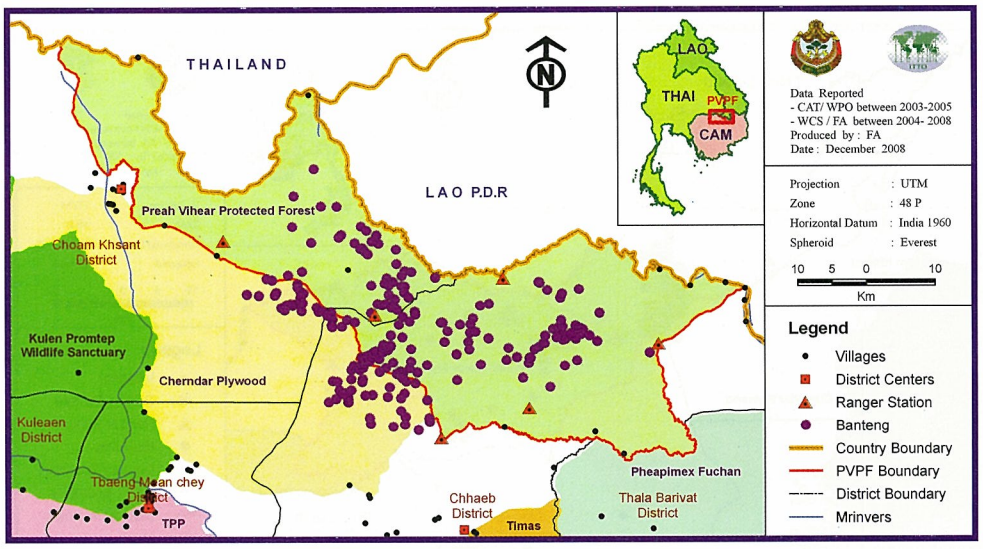
Map 1.5.6: Red Muntjac of PVPF



Bovidae
Banteng *Bos javanicus* (EN)
This species is widespread across the PVPF and Cherndar Plywood concession. It is observed relatively frequently from camera traps, prints and direct observation. In general, it is thought that this species prefers more open forest than gaur and this may be the case in PVPF. Although we do not yet have adequate abundance data from surveys of PVPF, this site is almost certainly of international importance for this species. This species has disappeared from most of the rest of its range in south-east Asia and it is only in the northern and eastern plains of Cambodia that this species is relatively widespread. Elsewhere fragmented

populations are found in small areas of their former distribution. Law enforcement activities to control hunting and illegal clearance of habitat are the most important safeguards for this species in PVPF.

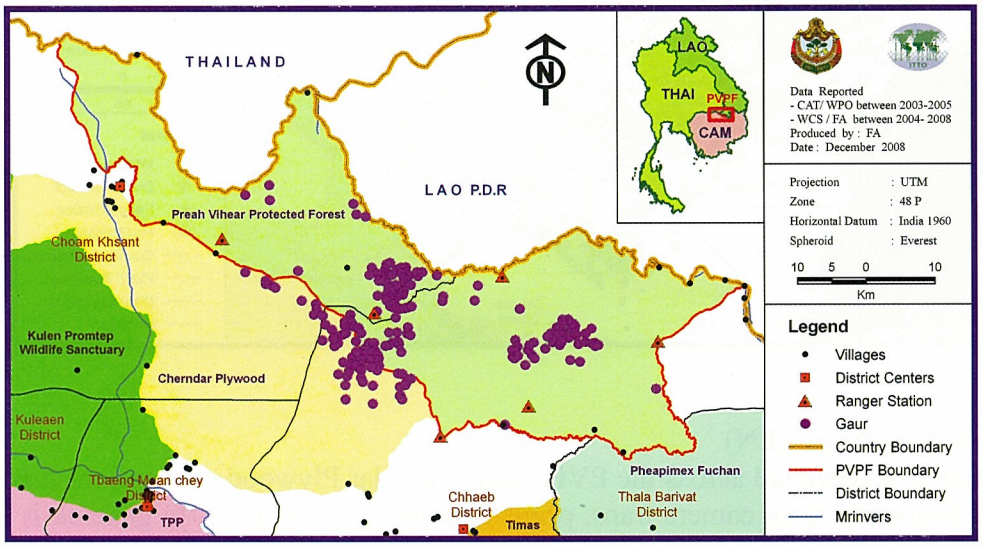
Map 1.5.7: Banteng of PVPF



Gaur *Bos gaurus* (VU)

Gaurs are most common in the central part of PVPF and in Cherndar concession. This may be because they favour evergreen, semi-evergreen and riverine forest which is more abundant in this area. This species is recorded relatively frequently during annual large mammal surveys in PVPF, although as for Banteng, the data do not yet allow estimates of the population size. Although this species has a wider global distribution, regionally in south-east Asia it may even be more threatened than Banteng and has disappeared from much of its former range. The population in PVPF linked to other sites in the northern and eastern plains of Cambodia is therefore likely to be of international importance.

Map 1.5.8: Gaur of PVPF



Northern Serow *Capricornis milneedwardsii* (NT)

There are a small number of records of this species from a Phnom to the east of PVPF. This species is generally restricted to rocky mountains and steep cliffs throughout its range.

Appendix 1.6: List of Birds of Preah Vihear Protected Forest

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
	Francolins, Partridges and Pheasants (Phasianidae)					
1	ទទា	Chinese Francolin	*Francolinus pintadeanus*			Common
2	មាន់ព្រៃ	Red Junglefowl	*Gallus gallus*			Common
3	មាន់ទោពណ៌ប្រាក់	Silver Pheasant	*Lophura nycthemera*			Common
4	ស្តេចកូលីត	Siamese Fireback	*Lophura diardi*	NT		
5	ក្រៀក	Green Peafowl	*Pavo muticus*	VU	II	Rare
	Whistling-ducks (Dendrocygnidae)					
6	ប្រវឹក	Lesser Whistling-duck	*Dendrocygna javanica*			Common
	Ducks and Pygmy-geese (Anatidae)					
7	ទាព្រៃសោបស	White-winged Duck	*Cairina scutulata*	EN	I	Endangered
	Buttonquails (Turnicidae)					
8	ក្រួចអ៊ឹតជើងលឿង	Yellow-legged Buttonquail	*Turnix tanki*			Common
9	ក្រួចអ៊ឹត	Barred Buttonquail	*Turnix suscitator*			Common
	Piculets and Woodpeckers (Picidae)					
10	ត្រសេះតូចខ្មៅស	Grey-capped Woodpecker	*Dendrocopos canicapillus*			Common
11	ត្រសេះមធ្យមខ្មៅស	Fulvous-breasted Woodpecker	*Dendrocopos macei*			Common
12	ត្រសេះតូចក្បាលលឿង	Yellow-crowned Woodpecker	*Dendrocopus mahrattensis*			Common
13	ត្រសេះពោះត្នោត	Rufous-bellied Woodpecker	*Dendrocopos hyperythrus*			Common
14	ត្រសេះត្នោតចំពុះខ្មៅ	Rufous Woodpecker	*Celeus brachyurus*			Common
15	ត្រសេះធំពោះស	White-bellied Woodpecker	*Dryocopus javensis*			Common
16	ត្រសេះតូចកំប៉ោយលឿង	Lesser Yellownape	*Picus chlorolophus*			
17	ត្រសេះធំកំប៉ោយលឿង	Greater Yellownape	*Picus flavinucha*			Common
18	ត្រសេះតូចក្បាលក្រហម	Laced Woodpecker	*Picus vittatus*			Common
19	ត្រសេះបៃតងច្រមុះពណ្តាក់	Streak-throated Woodpecker	*Picus xanthopygaeus*			Common
20	ត្រសេះបៃតងក្បាលខ្មៅ	Black-headed Woodpecker	*Picus erythropygius*			Common
21	ត្រសេះបៃតងក្បាលប្រផេះ	Grey-headed Woodpecker	*Picus canus*			Common
22	ត្រសេះតូចខ្នងភ្លើង	Common Flameback	*Dinopium javanense*			Common
23	ត្រសេះធំខ្នងភ្លើង	Greater Flameback	*Chrysocolaptes lucidus*			Common
24	ត្រសេះពពោលបំពង់ក-ស	Heart-spotted Woodpecker	*Hemicircus canente*			Common
25	ត្រសេះដីរ	Great Slaty Woodpecker	*Mulleripicus pulverulentus*			Common
	Asian Barbets (Megalaimidae)					
26	ប៉ោលតោកក្បាលព្រំលែត	Lineated Barbet	*Megalaima lineata*			Common
27	ប៉ោលតោកត្រចៀកបៃតង	Green-eared Barbet	*Megalaima faiostricta*			Common
28	ប៉ោលតោកថ្ពាសខ្មៅ	Blue-eared Barbet	*Megalaima australis*			Common

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29	ប៉ោលតោកអំបុក	Coppersmith Barbet	*Megalaima haemacephala*			Common
Hornbills (Bucerotidae)						
30	កេងកងតូច	Oriental Pied Hornbill	*Anthracoceros albirostris*		II	Common
31	កេងកងធំ	Great Hornbill	*Buceros bicornis*	NT	I	Rare
Hoopoes (Upupidae)						
32	ហ៊ូតូ	Common Hoopoe	*Upupa epops*			Common
Trogons (Trogonidae)						
33	ចាបច្បើបពោះលឿង	Orange-breasted Trogon	*Harpactes oreskios*			Common
Rollers (Coraciidae)						
34	ទ្បើរខ្បើរ	Indian Roller	*Coracias benghalensis*			Common
35	ទ្បើរព្រៃ	Dollarbird	*Eurystomus orientalis*			Common
Smaller Kingfishers (Alcedinidae)						
36	ចចាតក្រឹម	Common Kingfisher	*Alcedo atthis*			Common
Larger Kingfishers (Halcyonidae)						
37	កដបព្រៃ	Banded Kingfisher	*Lacedo pulchella*			Common
38	ងាវកក	Stork-billed Kingfisher	*Halcyon capensis*			Common
39	កដបទ្រូងស	White-throated Kingfisher	*Halcyon smyrnensis*			Common
40	កដបក្បាលខ្មៅ	Black-capped Kingfisher	*Halcyon pileata*			Common
Pied Kingfishers (Cerylidae)						
41	កដបខ្មៅស	Pied Kingfisher	*Ceryle rudis*			Common
Bee-eaters (Meropidae)						
42	ត្រដេវព្រៃ	Blue-bearded Bee-eater	*Nyctyornis athertoni*			Common
43	ត្រដេវតូច	Green Bee-eater	*Merops orientalis*			Common
44	ត្រដេវក្បាលបៃតង	Blue-tailed Bee-eater	*Merops philippinus*			Common
45	ត្រដេវក្បាលត្នោតខ្ចី	Chestnut-headed Bee-eater	*Merops leschenaulti*			Common
Cuckoos (Cuculidae)						
46	តាវៅកំប៉ោយ	Chestnut-winged Cuckoo	*Clamator coromandus*			Common
47	តាវៅធំ	Large Hawk Cuckoo	*Hierococcyx sparverioides*			Common
48	តាវៅក្បាលប្រផេះស្រាល	Indian Cuckoo	*Cuculus micropterus*			Common
49	តាវៅពោះអង្កន់លឿង	Oriental Cuckoo	*Cuculus saturatus*			Common
50	តាវៅខ្នងអង្កន់ត្នោត	Banded Bay Cuckoo	*Cacomantis sonneratii*			Common
51	តាវៅភូមិ	Plaintive Cuckoo	*Cacomantis merulinus*			Common
52	តាវៅបៃតង	Asian Emerald Cuckoo	*Chrysococcyx maculatus*			Common
53	តាវៅស្វាយ	Violet Cuckoo	*Chrysococcyx xanthorhynchus*			Common
54	តាវៅខ្មៅ	Drongo Cuckoo	*Surniculus lugubris*			Common

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55	តាវ៉ៅ	Asian Koel	*Eudynamys scolopacea*			Common
56	តុកកាតូ	Green-billed Malkoha	*Phaenicophaeus tristis*			Common
Coucals (Centropodidae)						
57	ល្មូតធំ	Greater Coucal	*Centropus sinensis*			Common
58	ល្មូតស្បៃរ	Lesser Coucal	*Centropus bengalensis*			Common
Parrots and Parakeets (Psittacidae)						
59	សេកក្រិច	Vernal Hanging Parrot	*Loriculus vernalis*		II	Common
60	សេកសោម	Alexandrine Parakeet	*Psittacula eupatria*		II	Rare
61	សេកកន្ទុយខ្យែវល្បើង	Grey-headed Parakeet	*Psittacula finschii*		II	Common
62	សេកអាត់	Blossom-headed Parakeet	*Psittacula roseata*		II	Common
63	សេកសក	Red-breasted Parakeet	*Psittacula alexandri*		II	Common
Swifts (Apodidae)						
64	ត្រចៀកកាំធំខ្នងត្នោត	Brown-backed Needletail	*Hirundapus giganteus*			Common
65	ត្រចៀកកាំដើមត្នោត	Asian Palm Swift	*Cypsiurus balasiensis*			Common
66	ត្រចៀកកាំកន្ទុយឆែក	Fork-tailed Swift	*Apus pacificus*			Common
Treeswifts (Hemiprocnidae)						
67	ត្រចៀកកាំព្រៃ	Crested Treeswift	*Hemiprocne coronata*			Common
Barn and Bay Owls (Tytonidae)						
68	ខ្លែងស្រោក	Barn Owl	*Tyto alba*		II	Common
69	ឌីឡក្របី	Oriental Bay Owl	*Phodilus badius*		II	Common
Typical Owls (Strigidae)						
70	ឌីឡឡឹក	Collared Scops Owl	*Otus bakkamoena*		II	Common
71	ទីទុយធំព្រៃ	Spot-bellied Eagle Owl	*Bubo nipalensis*		II	Rare
72	ទីទុយត្រីថ្ងាសត្នោត	Brown Fish Owl	*Ketupa zeylonensis*			
73	ម្យៀមធំវ៉ូ	Spotted Wood Owl	*Strix seloputo*		II	Common
74	ម្យៀមធំតូក	Brown Wood Owl	*Strix leptogrammica*		II	Common
75	ម្យៀមតូចព្រៃ	Asian Barred Owlet	*Glaucidium cuculoides*		II	Common
76	ម្យៀមតូចភូមិ	Spotted Owlet	*Athene brama*		II	Common
77	ម្យៀមខ្លែង	Brown Hawk Owl	*Ninox scutulata*		II	Common
Frogmouths (Batrachostomidae)						
78	ចាបមាត់កង្កែប	Javan Frogmouth	*Batrachostomus javensis*			Common
Eared Nightjars (Eurostopodidae)						
79	ពណ្ណាក់ធំ	Great Eared Nightjar	*Eurostopodus macrotis*			Common
Typical Nightjars (Caprimulgidae)						
80	ពណ្ណាក់ចង់	Large-tailed Nightjar	*Caprimulgus macrurus*			Common

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81	ពណ្ណាក់តូច	Indian Nightjar	*Caprimulgus asiaticus*			Common
82	ពណ្ណាក់ជ្រុំច	Savanna Nightjar	*Caprimulgus affinis*			Common
Pigeons and Doves (Columbidae)						
83	ពពូលក្បាលព្រំលែត	Pale-capped Pigeon	*Columba punicea*	VU		Rare
84	លលកបាយធំ	Oriental Turtle Dove	*Streptopelia orientalis*			Common
85	លលកបាយ	Spotted Dove	*Streptopelia chinensis*			Common
86	លលកទ្រាំង	Red Collared Dove	*Streptopelia tranquebarica*			Common
87	លលកស្នាបបៃតង	Emerald Dove	*Chalcophaps indica*			Common
88	លលកតូច	Peaceful Dove	*Geopelia striata*			Common
89	ពពូលក្បាលបៃតង	Orange-breasted Green Pigeon	*Treron bicincta*			Common
90	ពពូលចំពុះធំល្មើង	Thick-billed Green Pigeon	*Treron curvirostra*			
91	ពពូលជើងល្មើង	Yellow-footed Green Pigeon	*Treron phoenicoptera*			Common
92	ព្រាបព្រៃ	Green Imperial Pigeon	*Ducula aenea*			Common
Cranes (Gruidae)						
93	ក្រៀល	Sarus Crane	*Grus antigone*	VU	II	Rare
Rails, Crakes and Coots (Rallidae)						
94	មាន់ទឹក	White-breasted Waterhen	*Amaurornis phoenicurus*			
Snipe, Sandpipers and Dowitchers (Scolopacidae)						
95	ចឡាជើងល្មៃត	Common Greenshank	*Tringa nebularia*			Common
96	ទីតលីតស្នាបក្រោមត្នោតចាស់	Green Sandpiper	*Tringa ochropus*			Common
97	ទីតលីតជើងខ្លីល្មើង	Temminck's Stint	*Calidris temminckii*			Common
98	ទីតលីតជើងវែងល្មើង	Long-toed Stint	*Calidris subminuta*			Common
Jacanas (Jacanidae)						
99	ព្រហើតខ្មៅ	Bronze-winged Jacana	*Metopidius indicus*			Common
Thick-knees (Burhinidae)						
100	ជង្គង់ក្រាស់ត្រសក់	Eurasian Thick-knee	*Burhinus oedicnemus*			Rare
Stilts, Plovers and Lapwings (Charadriidae)						
101	សត្វក្បាលធំរីណ្តូងខ្មៅ	Little Ringed Plover	*Charadrius dubius*			Common
102	ត្រដេវរិចក្បាលប្រផេះ	Grey-headed Lapwing	*Vanellus cinereus*			Common
103	ត្រដេវរិចទូល	Red-wattled Lapwing	*Vanellus indicus*			Common
Hawks, Eagles and Vultures (Accipitridae: Accipirinae)						
104	ស្លាំងខ្មៅសស្នាបពងក	Black Baza	*Aviceda leuphotes*		II	Common
105	រអាតឃ្មុំ	Oriental Honey-buzzard	*Pernis ptilorhyncus*			
106	ស្លាំងលលក	Black-shouldered Kite	*Elanus caeruleus*		II	Common
107	ខ្លែងខ្មៅ	Black Kite	*Milvus migrans*		II	Rare

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108	ខ្លែងឆាបល្មើងក្រមៅ	Brahminy Kite	*Haliastur indus*		II	Common
109	អកត្រីក្បាលប្រផេះ	Grey-headed Fish Eagle	*Ichthyophaga ichthyaetus*	NT	II	Common
110	ត្មាតផេះ	White-rumped Vulture	*Gyps bengalensis*	CR	II	Rare
111	ត្មាតក្ដោត	Slender-billed Vulture	*Gyps tenuirostris*	CR	II	Rare
112	ត្មាតក្លើង	Red-headed Vulture	*Sarcogyps calvus*	CR	II	Rare
113	អកពស់ព្រៃ	Crested Serpent Eagle	*Spilornis cheela*		II	Common
114	ស្វាំងស្លាបឆែកកំប៉ោយខ្ចី	Crested Goshawk	*Accipiter trivirgatus*			
115	ស្វាំងស្លាបឆែក	Shikra	*Accipiter badius*		II	Common
116	ស្វាំងស្លាបឆែកព្រៃ	Besra	*Accipiter virgatus*		II	Common
117	រអាតក្ដោត	Rufous-winged Buzzard	*Butastur liventer*		II	Common
118	រអាតវាល	Common Buzzard	*Buteo buteo*		II	Common
119	អកខ្មៅដីសើម	Greater Spotted Eagle	*Aquila clanga*	VU	II	Rare
120	ស្វាំងពោះក្ដោត	Rufous-bellied Eagle	*Hieraaetus kienerii*		II	Common
121	អកព្រៃច្រើនពណ៌	Changeable Hawk Eagle	*Spizaetus cirrhatus*		II	Common
	Falcons (Falconidae)					
122	ស្វាំងស្លាបស្រួចចុងខ្នងស	White-rumped Falcon	*Polihierax insignis*	NT	II	Common
123	ស្វាំងតូចស្លាបស្រួច	Collared Falconet	*Microhierax caerulescens*		II	Common
124	ស្វាំងទទាក់ម្សៅ	Common Kestrel	*Falco tinnunculus*		II	Common
125	ស្វាំងធំស្លាបស្រួច	Peregrine Falcon	*Falco peregrinus*		I	Common
	Darters (Anhingidae)					
126	ស្នោញ	Oriental Darter	*Anhinga melanogaster*	NT	II	Common
	Herons, Egrets and Bitterns (Ardeidae)					
127	កុកគ្រោងតូច	Little Egret	*Egretta garzetta*			Common
128	ក្រសាប្រផេះ	Grey Heron	*Ardea cinerea*			Common
129	កុកគ្រោងមធ្យម	Intermediate Egret	*Mesophoyx intermedia*		III	Common
130	កុកគោ	Cattle Egret	*Bubulcus ibis*		III	Common
131	កុកក្រកក្បាលត្នោតចាស់	Chinese Pond Heron	*Ardeola bacchus*			Common
132	ក្រសាស្វាយ	Little Heron	*Butorides striatus*			Common
133	កុកមូសទុំ	Cinnamon Bittern	*Ixobrychus cinnamomeus*			Common
	Ibises and Spoonbills (Threskiornithidae)					
134	ត្រយ៉ងចង្កឹកស	White-shouldered Ibis	*Pseudibis davisoni*	CR		Endangered
135	ត្រយ៉ងយក្ស	Giant Ibis	*Pseudibis gigantea*	CR		Endangered
	Storks (Ciconiidae)					
136	ចង្រៀលខ្យង	Asian Openbill	*Anastomus oscitans*			Common
137	សត្វកស	Woolly-necked Stork	*Ciconia episcopus*			Common

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138	អង្គត់ខ្មៅ	Black-necked Stork	*Ephippiorhynchus asiaticus*	NT		Endangered
139	ត្រដក់តូច	Lesser Adjutant	*Leptoptilos javanicus*	VU		Rare
140	ត្រដក់ធំ	Greater Adjutant	*Leptoptilos dubius*	EN		Endangered
Pittas (Pittidae)						
141	ប៉ាក់ខ្សៀវពោះបង្គង់	Bar-bellied Pitta	*Pitta elliotii*			Common
Fairy Bluebirds and Leafbirds (Irenidae)						
142	ចេកខ្ចីស្លាបខ្សៀវ	Blue-winged Leafbird	*Chloropsis cochinchinensis*			Common
143	ចេកខ្ចីថ្ងាសភ្លើង	Golden-fronted Leafbird	*Chloropsis aurifrons*			Common
Shrikes (Laniidae)						
144	ចាបដូនតាខ្នងអង្កន់	Tiger Shrike	*Lanius tigrinus*			Common
145	ចាបដូនតាខ្នងត្នោត	Brown Shrike	*Lanius cristatus*			Common
146	ចាបដូនតាខ្នងត្នោតពោះស	Burmese Shrike	*Lanius collurioides*			Common
Jays, Magpies and Crows (Corvidae: Corvinae: Corvini)						
147	ឆ្នងឆ្នតខ្សៀវ	Red-billed Blue Magpie	*Urocissa erythrorhyncha*			Common
148	ឆ្នងឆ្នតល្មើង	Rufous Treepie	*Dendrocitta vagabunda*			Common
149	ទ្រមាក់ខ្លា	Racket-tailed Treepie	*Crypsirina temia*			Common
150	ក្អែក	Large-billed Crow	*Corvus macrorhynchos*			Common
Woodswallows (Corvidae: Corvinae: Artamini)						
151	ត្រចៀកកាំក្បាលធំ	Ashy Woodswallow	*Artamus fuscus*			Common
Orioles, Cuckooshrikes, Minivets (Corvidae: Corvinae: Oriolini)						
152	ចេកទុំ	Black-naped Oriole	*Oriolus chinensis*			Common
153	ចេកទុំក្បាលខ្មៅ	Black-hooded Oriole	*Oriolus xanthornus*			Common
154	អល់អែកធំ	Large Cuckooshrike	*Coracina macei*		II	Common
155	អល់អែកសក្រោមកន្ទុយ	Indochinese Cuckooshrike	*Coracina polioptera*			Common
156	អល់អែកស្លាបស្តុចខ្មៅ	Black-winged Cuckooshrike	*Coracina melaschistos*			Common
157	ចេកទេសផ្ការឈូក	Swinhoe's Minivet	*Pericrocotus cantonensis*			Common
158	ចេកទេសខ្មៅ-ស	Ashy Minivet	*Pericrocotus divaricatus*			Common
159	ចេកទេសតូច	Small Minivet	*Pericrocotus cinnamomeus*			Common
160	ចេកទេសធំ	Scarlet Minivet	*Pericrocotus flammeus*			Common
161	អល់អែកស្លាបខ្មៅឆ្នូតស	Bar-winged Flycatcher-shrike	*Hemipus picatus*			Common
Fantails (Corvidae: Dicrurinae: Rhipidurini)						
162	កញ្ជ្រោងស្លាចញើមស	White-browed Fantail	*Rhipidura aureola*			Common
Drongos (Corvidae: Dicrurinae: Dicrurini)						
163	អន្លេបខ្មៅ	Black Drongo	*Dicrurus macrocercus*			Common
164	អន្លេបប្រផេះ	Ashy Drongo	*Dicrurus leucophaeus*			Common

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165	អន្ទេបខ្មៅរលើប	Bronzed Drongo	*Dicrurus aeneus*			Common
166	អន្ទេបកំប៉ោយខ្សែ	Spangled Drongo	*Dicrurus hottentottus*			Common
167	អន្ទេបចងកន្ទ្រែ	Greater Racket-tailed Drongo	*Dicrurus paradiseus*			Common
Monarchs (Corvidae: Dicrurinae: Monarchini)						
168	ពពិចបន្ទុលក្បាលខ្មៅ	Black-naped Monarch	*Hypothymis azurea*			
169	សត្វស៊ីរុយកន្ទុយវែង	Asian Paradise-flycatcher	*Terpsiphone paradisi*			
Ioras (Corvidae: Aegithininae)						
170	ចេកចៅស្លាបខ្មៅ- ស	Common Iora	*Aegithina tiphia*			
171	ចេកចៅស្លាបខ្មៅ	Great Iora	*Aegithina lafresnayei*			
Woodshrikes (Corvidae: Malaconotinae)						
172	អល់អែកមធ្យម	Large Woodshrike	*Tephrodornis gularis*			
173	អល់អែកតូច	Common Woodshrike	*Tephrodornis pondicerianus*			
Thrushes and Shortwings (Muscicapidae: Turdinae)						
174	ពពិចថ្ម ក-ស	White-throated Rock Thrush	*Monticola gularis*			
175	ពពិចថ្មខ្លួនស្រកា	Scaly Thrush	*Zoothera dauma*			
176	ពពិចខ្មៅស្លាបប្រផេះ	Eurasian Blackbird	*Turdus merula*			
Flycatchers (Muscicapidae: Muscicapinae: Muscicapini)						
177	ចាបស៊ីរុយខ្នងត្នោត	Asian Brown Flycatcher	*Muscicapa dauurica*			
178	ចាបស៊ីរុយច្រើនពណ៌	Mugimaki Flycatcher	*Ficedula mugimaki*			
179	ចាបស៊ីរុយកក្រហម	Red-throated Flycatcher	*Ficedula parva*			
180	ចាបស៊ីរុយខ្លួនខ្សែវពោះ-ស	Blue-and-white Flycatcher	*Cyanoptila cyanomelana*			
181	ចាបស៊ីរុយ ក-ខ្សែវ	Blue-throated Flycatcher	*Cyornis rubeculoides*			
182	ចាបស៊ីរុយវ៉ាលទំនាប	Tickell's Blue Flycatcher	*Cyornis tickelliae*			
183	ចាបស៊ីរុយក្បាលប្រផេះ	Grey-headed Canary Flycatcher	*Culicicapa ceylonensis*			
Robins, Chats (Muscicapidae: Muscicapinae: Saxicolini)						
184	ចាបវ៉ាលស្រែ ក-ក្រហម	Siberian Rubythroat	*Luscinia calliope*			
185	ល្វាចេកច្រមុះលឿង	Siberian Blue Robin	*Luscinia cyane*			
186	ល្វាចេក	Oriental Magpie Robin	*Copsychus saularis*			
187	ល្វាចេកព្រៃ	White-rumped Shama	*Copsychus malabaricus*			
188	ពពិចថ្មច្រមុះត្នោត	Common Stonechat	*Saxicola torquata*			
189	ពពិចថ្មខ្មៅចុងខ្នង-ស	Pied Bushchat	*Saxicola caprata*			
Starlings and Mynas (Sturnidae)						
190	កញ្ជ្រៀចកន្ទុយត្នោត	Chestnut-tailed Starling	*Sturnus malabaricus*			
191	កញ្ជ្រៀចស្លា-ស	White-shouldered Starling	*Sturnus sinensis*			
192	ត្រលីងត្រលងត្រចៀក-ស	Asian Pied Starling	*Sturnus contra*			

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
193	ត្រលីងត្រលោង	Black-collared Starling	*Sturnus nigricollis*			
194	កញ្ជ្រោងច	Vinous-breasted Starling	*Sturnus burmannicus*			
195	រីក ឬសារិកាកែវគោ	Common Myna	*Acridotheres tristis*			
196	សារិកាកែវវង	Hill Myna	*Gracula religiosa*			
Nuthatches (Sittidae)						
197	ត្រសេះតូចពោះត្នោតទុំ	Chestnut-bellied Nuthatch	*Sitta castanea*			
198	ត្រសេះតូចចំពុះក្រហម	Velvet-fronted Nuthatch	*Sitta frontalis*			
Tits (Paridae)						
199	ពពិចក្បាលមូល	Great Tit	*Parus major*			
Swallows and Martins (Hirundinidae)						
200	ត្រចៀកកាំ	Barn Swallow	*Hirundo rustica*			
201	ត្រចៀកកាំចុងខ្នងក្រហម	Red-rumped Swallow	*Hirundo daurica*			
202	ត្រចៀកកាំចុងខ្នង-ស	Asian House Martin	*Delichon dasypus*			
Bulbuls (Pycnonotidae)						
203	ពពិចក្បាលខ្មៅកំប៉ោយ	Black-crested Bulbul	*Pycnonotus melanicterus*			
204	ពពិចក្បាលខ្មៅចុងខ្នង ស	Sooty-headed Bulbul	*Pycnonotus aurigaster*			
205	ពពិចពុកមាត់លឿង	Stripe-throated Bulbul	*Pycnonotus finlaysoni*			
206	ចាបក្រច	Yellow-vented Bulbul	*Pycnonotus goiavier*			
207	ពពិចត្រចៀកឆ្នូត	Streak-eared Bulbul	*Pycnonotus blanfordi*			
208	ពពិចបំពង់កសម្រួងលឿងចាស់	Puff-throated Bulbul	*Alophoixus pallidus*			
209	ពពិចបែតងភ្នែកច្រេះ	Grey-eyed Bulbul	*Iole propinqua*			
210	ពពិចខ្មៅ	Black Bulbul	*Hypsipetes leucocephalus*			
Cisticolas and Prinias (Cisticolidae)						
211	ចាបដង្កូវធំ	Brown Prinia	*Prinia polychroa*			
212	ចាបដង្កូវស្លាបច្រេះ	Rufescent Prinia	*Prinia rufescens*			
213	ចាបដង្កូវម្រួងប្រផេះ	Grey-breasted Prinia	*Prinia hodgsonii*			
214	ចាបដង្កូវលឿង	Yellow-bellied Prinia	*Prinia flaviventris*			
215	ចាបដង្កូវចិញ្ចើមស	Plain Prinia	*Prinia inornata*			
Warblers and Tailorbirds (Sylviidae: Acrocephalinae)						
216	ចាបដូនតាឆ្នូតចុងខ្នង	Lanceolated Warbler	*Locustella lanceolata*			
217	ចាបដូនតាចិញ្ចើមខ្មៅ- ស	Black-browed Reed Warbler	*Acrocephalus bistrigiceps*			
218	ចាបដូនតាវាលស្រែ	Manchurian Reed Warbler	*Acrocephalus tangorum*	VU		
219	ចាបដូនតា	Oriental Reed Warbler	*Acrocephalus orientalis*			
220	ចាបដូនតាចំពុះធំ	Thick-billed Warbler	*Acrocephalus aedon*			
221	ចាបតេត	Common Tailorbird	*Orthotomus sutorius*			

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
222	ចាបតេតព្រៃ	Dark-necked Tailorbird	*Orthotomus atrogularis*			
223	ចាបដូនតាតំរបក្រោមកន្ទុយក្រាស់	Radde's Warbler	*Phylloscopus schwarzi*			
224	ចាបដូនតាចិញ្ចើមលឿង	Yellow-browed Warbler	*Phylloscopus inornatus*			
225	ចាបដូនតាខ្លួតស្លាបពីរ	Two-barred Warbler	*Phylloscopus plumbeitarsus*			
226	ចាបដូនតាក្បាលប្រផេះ	Pale-legged Leaf Warbler	*Phylloscopus tenellipes*			
	Laughingthrushes (Sylviidae: Garrulacinae)					
227	ចកវៃកកំបៅយ ស	White-crested Laughingthrush	*Garrulax leucolophus*			
228	ចកវៃកវ៉ីណូថ្លែងខ្មៅ	Lesser Necklaced Laughingthrush	*Garrulax monileger*			
	Babblers (Sylviidae: Sylviinae: Timaliini)					
229	ចាចដូនតាចំពុះធំ	Abbott's Babbler	*Malacocincla abbotti*			
230	ចាបដូនតាបំពង់កប៉ោង	Puff-throated Babbler	*Pellorneum ruficeps*			
231	ចាបដូនតាបន្ទូលក្បាលស្រកា	Scaly-crowned Babbler	*Malacopteron cinereum*			
232	ចាបដូនតាទូរសព្ទ័	Striped Tit Babbler	*Macronous gularis*			
233	ចាបដូនតាបន្ទូលក្បាលត្នោតទុំ	Chestnut-capped Babbler	*Timalia pileata*			
234	ចាបដូនតាក្បាលខ្មៅ	White-browed Shrike Babbler	*Pteruthius flaviscapis*		II	
235	ចាបដូនតាកំប៉ោយគូថលឿង	White-bellied Yuhina	*Yuhina zantholeuca*			
	Larks (Alaudidae)					
236	ក្រួចអិន	Indochinese Bushlark	*Mirafra marionae*			
	Flowerpeckers (Nectariniidae: Nectariniinae: Dicaeini)					
237	ចាបកន្ធង់ចំពុះធំ	Thick-billed Flowerpecker	*Dicaeum agile*			
238	ចាបកន្ធង់គូថលឿង	Yellow-vented Flowerpecker	*Dicaeum chrysorrheum*			
239	ចាបកន្ធង់ភក់	Plain Flowerpecker	*Dicaeum concolor*			
240	ចាបកន្ធង់ខ្នងក្រហម	Scarlet-backed Flowerpecker	*Dicaeum cruentatum*			
	Sunbirds (Nectariniidae: Nectariniinae: Nectariniini)					
241	ចាបកន្ធង់បំពង់កត្នោតចាស់	Brown-throated Sunbird	*Anthreptes malacensis*			
242	ចាបកន្ធង់	Olive-backed Sunbird	*Nectarinia jugularis*			
243	ចាបកន្ធង់ខ្សៀវ	Purple Sunbird	*Nectarinia asiatica*			
244	ចាបកន្ធង់ក្រហម	Crimson Sunbird	*Aethopyga siparaja*			
	Sparrows (Passeridae: Passerinae)					
245	ចាបស្រុក	Plain-backed Sparrow	*Passer flaveolus*			
246	ចាបផ្ទះ	Eurasian Tree Sparrow	*Passer montanus*			
	Wagtails and Pipits (Passeridae: Motacillinae)					
247	ខ្ចប់ដីខ្នងប្រផេះ	Grey Wagtail	*Motacilla cinerea*			
248	ក្រួចអិនជើងវែង	Richard's Pipit	*Anthus richardi*			
249	ក្រួចអិនវាលស្រែ	Paddyfield Pipit	*Anthus rufulus*			

No	Khmer Name	English name	Scientific name	IUCN	CITES	Cambodia Classification
250	ក្រួចអិនទ្រែងឆ្នូតខ្មៅ	Olive-backed Pipit	*Anthus hodgsoni*			
Weavers (Passeridae: Ploceinae)						
251	ចាបពូកទ្រែងឆ្នូត	Streaked Weaver	*Ploceus manyar*			
252	ចាបពូកទ្រែងត្នោត	Baya Weaver	*Ploceus philippinus*			
253	ចាបពូកទ្រែងលឿង	Asian Golden Weaver	*Ploceus hypoxanthus*	NT		
Munias (Passeridae: Estrildinae)						
254	ចាបចង្រៃង់ចុងខ្នងស	White-rumped Munia	*Lonchura striata*			
255	ចាបចង្រៃង់	Scaly-breasted Munia	*Lonchura punctulata*			

Key Bird Species in PVPF

GALLIFORMES

Phasianidae

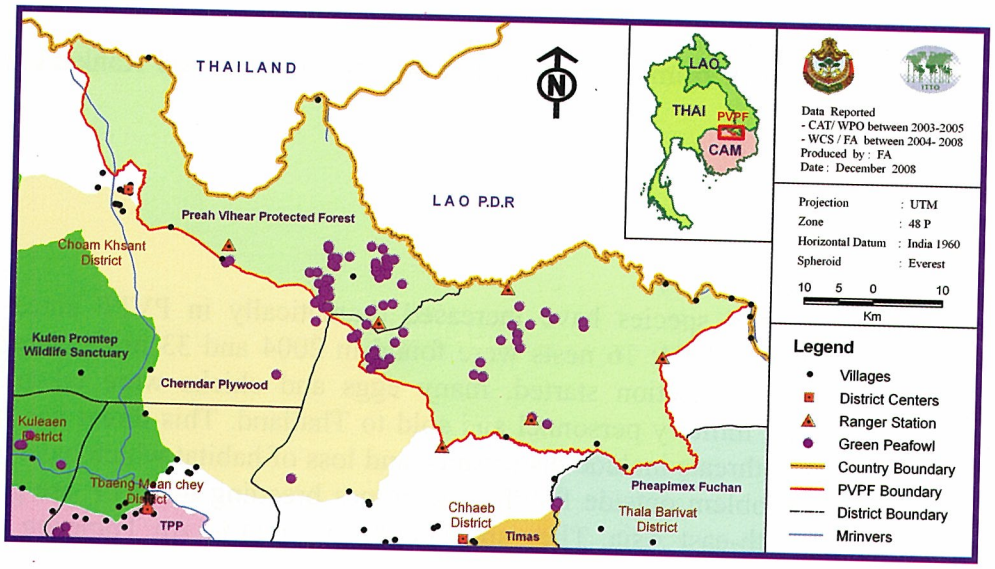
Red Jungle Fowl *Gallus gallus* (LC)

Red Jungle Fowl is still reasonably common in PVPF even though the size of this bird makes it quite attractive for substantial hunting by local people.

Green Peafowl *Pavo muticus* (VU)

Green Peafowl are known from south and west of Kahkeuk station and along the catchment of the O'Kapok. As it is thought to prefer undisturbed dry dipterocarp forest near streams and wetlands, these areas of PVPF may be the most suitable for this species. Elsewhere within its range it is declining rapidly and the only large populations remaining globally are believed to be in northern and eastern Cambodia and west-central Vietnam. Hence, the well protected forests of PVPF are likely to be of international importance for this species. Habitat degradation and hunting are likely to be the biggest threats to this species in the region and fragmentation of habitat may increase is vulnerability to both hunting and disturbance. Its threat status is being reviewed currently and it is likely to be upgraded to Endangered.

Map 1.6.1: Green Peafowl of PVPF



ANSERIFORMES

Anatidae

White-winged Duck *Cairina scutulata* (EN)

This large duck is found at a small number of sites in riverine forest near Roboinh village, Kahkeuk station (the O Koki and O Kapok and in Buffer Zone 2 in Cherndar concession). It is found only where there is dense forest with permanent water pools or rivers and low levels of disturbance. This species is a popular target species for birding tourists. Its global population is now highly fragmented and only in Cambodia and Myanmar do important populations remain. Thus, PVPF is of international importance for this species.

Map 1.6.2: White-winged Duck of PVPF

BUCEROTIFORMES

Bucerotidae

Great Hornbill *Buceros bicornis* (NT)

This iconic species is known from a few records from the forest around Kahkeuk station of PVPF.

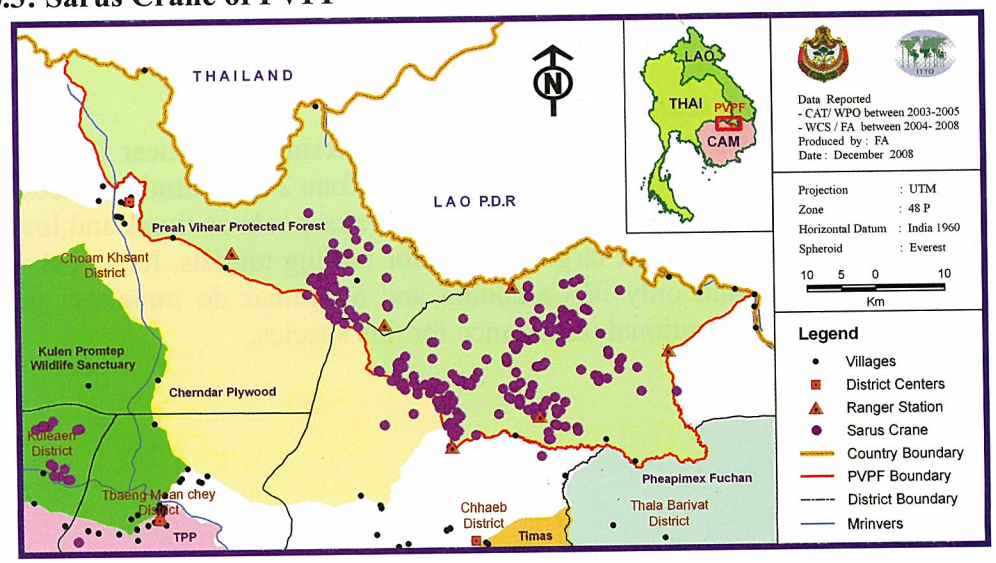
GRUIFORMES

Gruidae

Sarus Crane *Grus antigone* (VU)

Numbers of this threatened species have increased dramatically in PVPF since the nest protection project started in 2004: 16 nests were found in 2004 and 33 nests were found in 2008. Before direct nest protection started, many eggs and chicks were taken by local community members and military personnel and sold to Thailand. This threat has now been largely eliminated. Other threats include disturbance and loss of habitat which have now been reduced, but remain a problem outside PVPF. The cranes breeding in PVPF are part of the largest population in south-east Asia. They are thought to travel to An Trapeang Thmor in Banteay Mencheay in the non-breeding dry season.

Map 1.6.3: Sarus Crane of PVPF



FALCONIFORMES

Accipitridae

White-rumped Vulture *Gyps bengalensis* (CR)
This species breeds in small numbers here (in 2007-2008 breeding season, four nests were found of which two were successful) and over 40 were found at the annual Cambodian vulture census in June 2008. It is also regularly recorded at monthly vulture restaurants when over 60 may be recorded. Vultures in PVPF and elsewhere breed in loose colonies in trees, often selecting sites close to reliable food sources. This species is threatened globally by the use of the veterinary drug diclofenac which is extremely toxic to vultures as well as by limited food availability, habitat loss, nest predation and loss, and locally, incidental poisoning targeting other species. PVPF is probably the most important site for this species in south-east Asia. As this vulture is rapidly declining in the main parts of its range in south Asia due to the effects of diclofenac, the south-east Asian sub-population of this species will be the only remaining which is not affected by this drug. PVPF is therefore critical for its survival as a species.

Slender-billed Vulture *Gyps tenuirostris* (CR)
This species is recorded regularly in PVPF at vulture restaurants and at the June 2008 census, 11 were recorded, a large proportion of the minimum known population size in Cambodia. Threats are similar to those for the preceding species, however, the population size of this species is even smaller and thus it may be even more threatened. As part of the network of sites supporting vultures, PVPF plays a vital role in Slender-billed Vulture conservation.

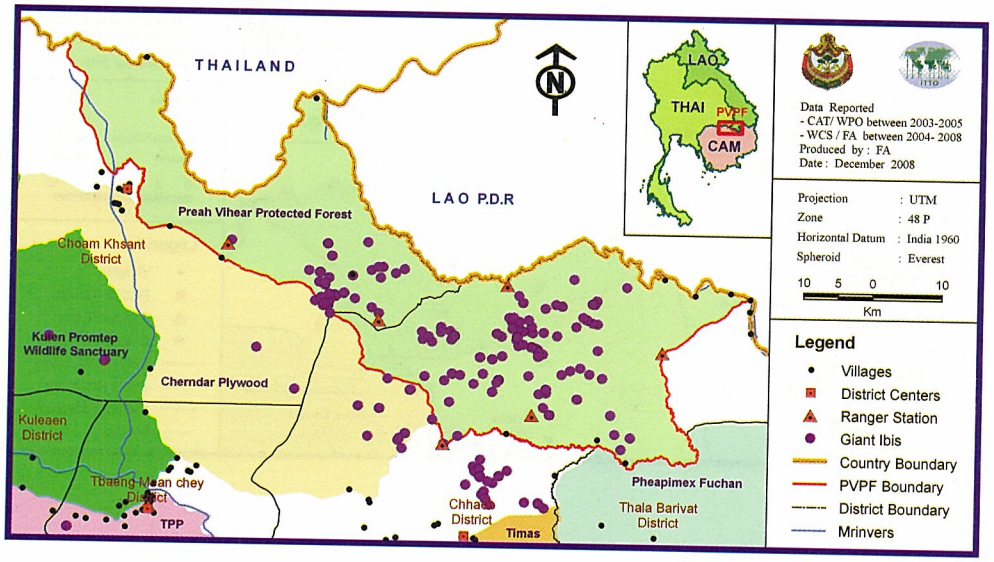
Red-headed Vulture *Sarcogyps calvus* (CR)
Red-headed Vultures are found in the highest numbers in PVPF and 19 were found in the 2008 census. It also breeds at this site. This species is not as social as other vultures and may feed more often away from larger carcasses such as those used at vulture restaurants. It may therefore be under-recorded using this technique. However, it suffers the same threats as for the *Gyps* species and PVPF is vital for its survival globally.

CICONIIFORMES

Threskiornithidae

Giant Ibis *Pseudibis gigantea* (CR)
PVPF is the most important site globally for this Critically Endangered species. Up to 36 nests have been found here in recent years, so it is likely that the total population here exceeds 100 birds if there are as many non-breeding individuals as there are adults; the global population was most recently estimated at approximately 200 individuals. As ibises are not vulnerable to nest predation by humans, the bird nest protection scheme is not used for protecting this species, although it can be used for monitoring the population size. Critically Endangered White-shouldered Ibis are not observed frequently in PVPF, although it is possible that they may be found here regularly in some areas.

Map 1.6.4: Giant Ibis of PVPF



Ciconiidae

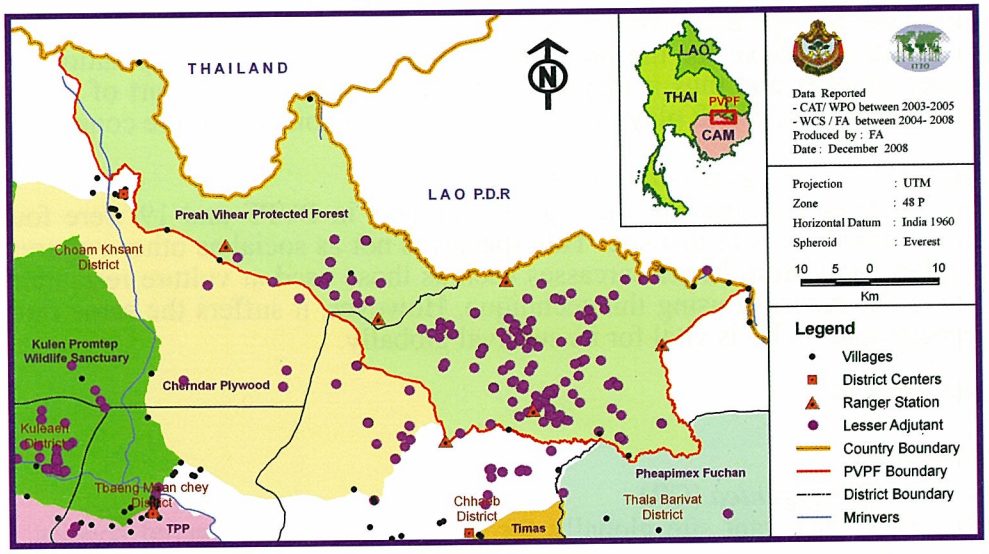
Black-necked Stork *Ephippiorhynchus asiaticus* (NT)

This species breeds in small numbers in PVPF, but is not very abundant. It prefers larger grasslands or veals with some flooding.

Lesser Adjutant *Leptoptilos javanicus* (VU)

This species breeds in large numbers in colonies across PVPF. The largest count was in 2007 when 115 nests were found. It is commonly found at trapeangs and other wetlands and can be seen easily in PVPF. It is found in wetlands in both open forest and evergreen forest. It is part of a very large Northern Plains population which may surpass the population of Tonle Sap Biosphere Reserve in size. Additionally, the population in PVPF seems to be increasing which indicates the effectiveness of the bird nest protection project. The PVPF population can be considered as internationally important as the global population is believed to be declining.

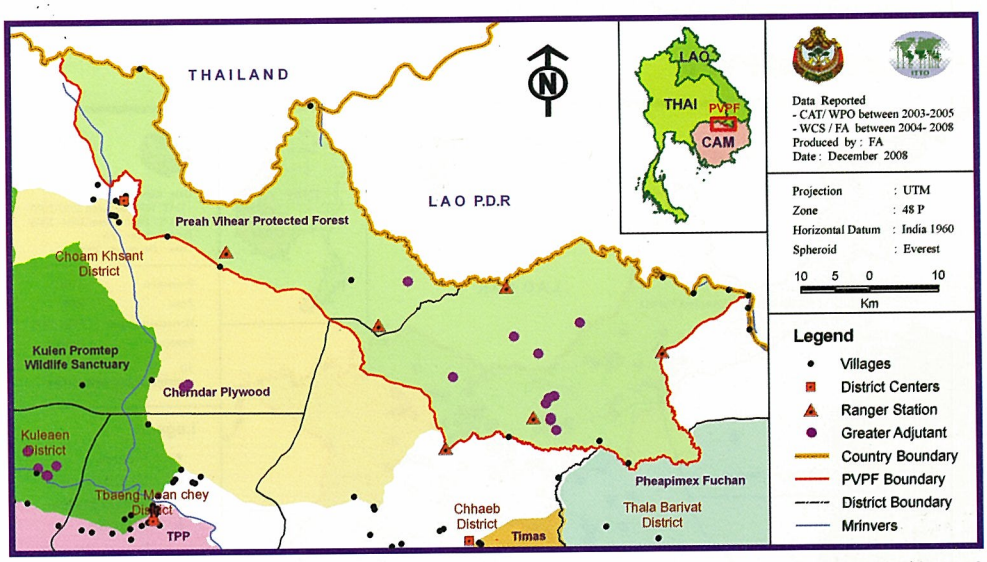
Map 1.6.5: Lesser Adjutant of PVPF



Greater Adjutant *Lepoptilos dubius* (EN)

This species is found rarely in PVPF, mostly in the south-east of the site in both the Core Zone and Buffer Zone 1. It does not breed here and is not thought to be resident.

Map 1.6.6: Greater Adjutant of PVPF



Appendix 1.7: List of Reptiles of Preah Vihear Protected Forest

No.	ឈ្មោះជាភាសាខ្មែរ	English Name (Robson)	Scientific Name	IUCN	CITES
1	ក្រពើភ្នំ	Siamese Crocodile	*Crocodylus siamensis*	CR	I
2	អណ្តើកក្បាលធំ	Big-headed Turtle	*Platystemon megacephalum*	EN	
3	អណ្តើកបិទមុខឥណ្ឌូចិន	Indochinese Box Turtle	*Cuora galbinifrons*	CR	II
4	អណ្តើកព្រិច	Elongated Tortoise	*Indotestudo elongata*	EN	II
5	អណ្តើកបិទមុខស្នូកខ្មៅ	Asian Box Turtle	*Cuora amboinensis*	VU	II
6	អណ្តើកសកល	Malayan Snail-eating Turtle	*Malayemys subtrijuga*	VU	
7	អណ្តើកក្អែកខ្មៅ	Black Marsh Turtle	*Siebenrockiella crassicollis*	VU	
8	អណ្តើកក្របីក្បាលលឿង	Yellow-headed Temple Turtle	*Hieremys annandalii*	EN	
9	កន្ធាយអាស៊ី	Asian Softshell Turtle	*Amyda cartilaginea*	VU	
10	កន្ធាយក្បាលកន្ទែប	Asian Giant Softshell Turtle	*Pelochelys cantorii*	EN	
11	ពស់ផ្កាន់តូច	Burmese Python	*Python molurus bivittatus*	N-t	II
12	អន្សង	Water Monitor	*Varanus salvator*		II
13	ត្រកួត	Bengal Monitor	*Varanus bengalensis*		I
14	ពស់ផ្កាន់ធំ	Reticulated Python	*Python reticulatus*		II
15	ពស់ព្រៃកណ្តុរ	Common Rat Snake	*Ptyas mucosus*		II
16	ពស់វែកនាម	King Cobra	*Ophiophagus hannah*		II
17	ពស់វែកក្របី	Monocled Cobra	*Naja kaouthia*		II
18	ពស់វែកដំបូក	Indochinese Spitting Cobra	*Naja siamensis*		II
19	ពស់ក្រាយខ្លួនជ្រុងវែង	Banded Krait	*Bungarus fasciatus*		
20	ពស់ពព្លាក់ខ្លួនជ្រុងខ្លី	Malayan Krait	*Bungarus candidus*		
21	ពស់ព្រៃ	Indochinese Ratsnake	*Pytas korros*		
22	ពស់ព្រៃកន្ទុយក្រហម	Red-tailed Green Ratsnake	*Gonyosoma oxycephalum*		
23	ពស់ចាន់លួម	Bocourt's Water Snake	*Enhydris bocourti*		
24	ពស់កាចាន់	Tay Ninh Water Snake	*Enhydris innominata*		
25	ពស់ដែក	File Snake	*Acrochordus granulatus*		
26	ពស់ដែកអង្រួស	Elephant-trunk Snake	*Acrochordus javanicus*		
27	ពស់ប្រែងតូច	Common Blind Snake	*Ramphotyphlops braminus*		
28	ពស់ប្រែងធំ	Diards's Blind Snake	*Typhlops diardi*		
29	ពស់ដីខ្លួនឆ្នូតក្រហម	Red-tailed Pipe Snake	*Cylindrophis ruffus*		

No.	ឈ្មោះជាភាសាខ្មែរ	English Name (Robson)	Scientific Name	IUCN	CITES
30	ពស់ដីខ្លួនរលោងភ្លឺ	Sunbeam Snake	*Xenopeltis unicolor*		
31	ពស់ក្រាយឫស្សី	Bamboo Pit-viper	*Trimeresurus stejnegeri*		
32	ពស់ស្រកាចាស់	Russell's Pit-viper	*Daboia russelli*		
33	ពស់ត្រែភ្នែកភ្លឺមុត	Modest Keelback	*Amphiesma modesta*		
34	ពស់ខ្សែគោ	Striped Keelback	*Amphiesma stolata*		
35	ពស់ឈើ	Tentacled Snake	*Erpeton tentaculatum*		
36	ពស់ត្រែក្បាលវិល្លួស	Speckel-bellied keelback	*Rhabdophis chrysargus*		
37	ពស់ត្រែខ្លួនក្រហម-បៃតង	Green keelback	*Rhabdophis nigrocinctus*		
38	ពស់ត្រែកក្រហម	Red-necked keelback	*Rhabdophis subminiatus*		
39	ពស់ខ្សែគោឆ្នូតបួន	Indo-Chinese Sand Snake	*Psammophis condanarus*		
40	ពព្លាក់ត្នោតក្បាលអុច	Barron's Kukri Snake	*Oligodon barroni*		
41	ពព្លាក់ត្នោតអុចប្រផេះ	Banded Kukri Snake	*Oligodon fasciolatus*		
42	ពព្លាក់ក្បាលខ្មៅ	Cambodian Kukri Snake	*Oligodon mouhoti*		
43	ពព្លាក់ព្រៃ	Inornate Kukri Snake	*Oligodon inomatus*		
44	ពស់អង្កាច់មាស	Striped Kukri Snake	*Oligodon taeniatus*		
45	ពស់តឹកកែ	Common Wolf Snake	*Lycodon capucinus*		
46	ពស់ខ្សែគោល្បឿង-បៃតង	Golden Tree Snake	*Chrysopelea ornata*		
47	ពស់ខ្សែគោក្បាលឆ្នូតស	Mountain Bronzeback	*Dendrelaphis subocularis*		
48	ពស់បានុមានបៃតង	Green Cat Snake	*Boiga cyanea*		
49	ពស់ភ្លីថ្នកែវ	Marbled Cat Snake	*Boiga multomaculata*		
50	ពស់ខ្សែងអុច ស ខ្មៅ	White-spotted Slug Snake	*Pareas margaritophorus*		
51	ពស់ស្លាប់កង្កែប	Chequered Keelback	*Xenochrophis piscator*		
52	ពស់ត្រីស្រែកាធំ	Dog-faced Water Snake	*Cerberus rynchops*		
53	តុកកែ	Tockay	*Gekko gecko*		
54	បង្គួយត្រែត្រចៀកតូច	Scale-bellied Tree lizard	*Acanthosaura lepidogaster*		
55	បង្គួយមានពុកមាត់	Moustached Lizard	*calotes mystaceus*		
56	ផ្លែនកន្ទុយក្រហម	Common Butterfly Lizard	*Leiolepis belliana*		
57	ផ្លែនឆ្នូតខ្លងកន្ទុយវែង	Long-tailed Sun Skink	*Mabuya longicaudata*		
58	កន្ត្រែង	Water Dragon	*Physignathus cocincinus*		

Key Reptiles Species

Siamese Crocodile *Crocodylus Siamensis* (CITES App. I, IUCN-CR)

The most impressive reptile living in the PVPF is the Siamese crocodile. Siamese crocodiles are globally endangered and were assumed to be extinct from the planet (Ross, 1998; Bembrick & Cannon, 1999) until surviving and breeding populations were identified in the Central and Southern Cardamoms in 2000 (IUCN/SSC, CSG, Jenny D. & Dany C. 2000). Once used to be abundant and widespread in rivers and marshes of freshwater system of mainland and island Southeast Asia. Though, this relatively small and harmless crocodile had been hunted to near-extinction. Siamese Crocodiles have historically been collected for farming, and hatchlings were collected for trophies. However, these threats have been mitigated by the protection and conservation measures implemented by Forestry Administration in collaboration with development partners. The main threat to Siamese Crocodiles in the PVPF is now accidental by-catch in fishing nets. During the 1980's, 1990's and early 2000's most of the wild Siamese Crocodiles were hunted during that period and few remain in it natural habitat. The hunted crocodiles were sold to neighbouring country (live caught crocodiles) and to domestic crocodile traders. The crocodile is most likely to persist, was very handful within and around PVPF.

Elongated tortoise *Indotestudo elongata* (IUCN-VU, CITES App. II)

This species is widespread throughout dry deciduous/open forests in mainland tropical Asia of Cambodia, Vietnam, Laos, Thailand, Northern Peninsular Malaysia, and from China to India. Elongated tortoises feature heavily in the international pet trade and in the Far East trade for medicine, ornaments and food (Daltry & Momberg, 2000). A few carapaces/shells of this species were found at abundance hunting camp in the surveyed areas as well as in abandon NTFP collectors' camps site in the forest, though some were spotted in the village settlement near by the PVPF in Chunh.

Bengal monitor *Varanus bengalensis* (CITES App. I)

Bengal monitor or clouded monitor lizards are widespread, but heavily hunted throughout Asia. International trade in Bengal monitor skins is estimated about 1 million skins per year. These spotted lizards are likely presented in the area through difference habitats at lower and medium elevations ranging from dense evergreen logged forest, open forest, bamboo forest and farmlands (Chheang at al. 2002). This species has been commonly harvested by the local villager from forested areas, especially within the PVPF, for subsistence and for sale.

Water monitor *Varanus salvator* (CITES App II)

This is the world's second largest lizard, reaching a maximum length in excess 2.5 m (Daltry & Momberg, 2000). This species is highly adaptable and still widespread across tropical Asia, millions are killed annually for their meats and skins and populations have plummeted in many areas (Bennett, 1998). Water monitor is the most heavily exploited monitor and international trade in water monitor skins in Southeast Asia is estimated 1-1.5 million skins (Sen, 1999). Water monitors are frequently encountered near rivers in the PVPF and several were seen trapped by fishing nets and snared for bush-meat. This species have been commonly harvested by the local villager from forest area, especially within the PVPF, for subsistence and for sale.

Reticulated python *Python reticulatus* (CITES App. II, IUCN-LR/nt) and Burmese python *Python molurus bivittatus*(CITES App. II, IUCN-LR/nt)

With weight more than 100 kg and its girth about 60 centimeter, the Reticulated python is known to be the world's longest snake, reportedly reaching lengths of about 10 m (Cox, 1991),. This species of python distributed throughout most of Southeast Asia. This python is well known to local people who hunt it for meat and its skin. The reticulated python is a major

target of both the international pet trade and skin trade, and populations have been depleted locally in many countries (Daltry & Momberg, 2000). As Groombridge & Luxmoore (1991) reported many of the python skins exported from Thailand are said to originate from Cambodia, for prices of US$ 13-17/m. Local villagers and field guides confirmed that the survey area is home for both Reticulated python *Python reticulatus* and Burmese python *Python molurus bivittatus*, but the field team did not encounter significant evidence of both species during this survey, but only part of the skins of both species keeping in houses of local villager in Choam Khsan, and Chhep districts.. These species been harvested by the local villager from forest area, especially within the PVPF, for subsistence and for sale.

Appendix 2.1 : Population Data of 2 Districts of Preah Vihea Province

A. Districts in Rural

No.	Kind of Statistics	District/Khan Considered as a Rural		Total
		Chhep	Choam Ksant	
1	Total number of families	1247	1795	3042
2	Total number of females	3240	3867	7107
3	Total number of males	3245	3837	7082
4	Number of girls 0-5 years old (under 6's)	1087	567	1654
5	Number of boys 0-5 years old (under 6's)	1197	740	1937
6	Number of girls 6 to 14 years old	1370	933	2303
7	Number of boys 6 to 14 years old	1509	920	2429
8	Number of girls 6 to 14 who go to school	1247	730	1977
9	Number of boys 6 to 14 who go to school	1375	783	2158
10	Number of women 15 to17 years old	356	309	665
11	Number of men 15 to17 years old	419	263	682
12	Number of women 18 to 60 years old	2461	1926	4387
13	Number of men 18 to 60 years old	2226	1757	3983
14	Number of women over 61 years of age	267	132	399
15	Number of men over 61 years of age	217	157	374
16	Number of Illiterate women over 15 years old	1262	664	1926
17	Number of Illiterate men over 15 years old	911	450	1361
18	Number of houses with thatched roof	936	724	1660
19	Number of houses with tiled roof	1	6	7
20	Number of houses with zinc roof	894	838	1732
21	Number of houses with concrete roof	1	2	3
22	Number of latrines	50	51	101
23	Number of families with piped water, private pump well or private ring well, usable year round, at their house, less then 150m.	798	447	1245
24	Number of families with a communal tap, pump well or ring well, usable year round, within 150m of their house.	308	278	586
25	Most common source of water for other families: pond, river, rain water, other.	2136	1795	3931
26	Number of families with cattle and buffalo in village	898	931	1829
27	Number of families with pigs in the village	904	935	1839
28	Average farm gate price of paddy in Riel for this month, December	718	710	1428
29	Number of motorcycles	205	367	572
30	Number of tractors/koyons/cars	119	593	712
31	Number of horse carts and ox carts	323	77	400
32	Number of bicycles	400	676	1076
33	Number of row boats	39	0	39
34	Number of boats with motor	143	0	143
35	Number of TVs	71	203	274
36	Number of families who used a traditional birth attendant in the past year	221	37	258
37	Number of families who used a trained midwife in the past year	6	123	129
38	Number of traditional birth attendants in the village	41	23	64
39	Number of government trained midwives in the village	6	4	10
40	Number of family who have some irrigated rice land	0	0	0
41	Number of family using chemical fertilizer in the past year	31	5	36
42	Number of family using pesticide in the past year	1	5	6
43	Number of murder, robbery, theft cases in the past year	33	4	37
44	Number of land conflict case in the past year	21	16	37
45	Number of female headed household/families, where the head is a mother with one or more children with under 5 yrs old	218	56	274
46	Number of families having problems with violence in home	78	32	110
47	Location of the nearest market villager frequently go to buy goods	145	74	219
48	Distance in Km to nearest year-round road (4 wheel motor vehicles)	6.5	8	15
49	Time taken to get from village to this nearest market by motor or motorboat	534	34	568

No.	Kind of Statistics	District/Khan Considered as a Rural		Total
		Chhep	Choam Ksant	
50	Number of primary school classrooms in the commune	51	30	81
51	Number of secondary school classrooms in the commune	16	10	26
52	Number of primary school teachers in the commune	50	36	86
53	Number of secondary school teachers in the commune	9	13	22
54	Area wet season rain fed rice land in Ha	1465	1913	3378
55	Area wet season supplemental irrigated rice land in Ha	1414	1913	3327
56	Rice production in wet season, MT	1.9	2.00	4
57	Area of full-irrigated dry season rice land in Ha	0	0	0
58	Area of recession dry season rice land in Ha	0	0	0
59	Rice production in dry season, MT	0	0	0

Appendix 3.1: Conceptualized Management Zones

UNECO, the United Nations Educational, Scientific, and Cultural Organization, has established a number of Biosphere Reserves in different parts of the world in an attempt to consolidate human activities, research, and protection of the natural environment. The focal point of a Biosphere Reserve is a core area in which a selected ecosystem's biological communities are strictly protected. The core zone is surrounded by a buffer zone in which traditional human activities such as the collection of non-timber forest products are allowed. The buffer zone then extends into a transitional zone in which some forms of sustainable development such as small scale-farming and selective logging, as well as some forms of research, are allowed (Primack 1995).

Miller and Hamilton (1999) modified the zoning configuration of a Biosphere Reserve in order to maintain biological diversity across an entire landscape while still meeting the requirements of local people. Their bioregional approach proposes four broad zones in a human-induced landscape: a core area, a buffer or transitional zone, a corridor, and a human-dominant matrix. The purpose of the corridor is to connect critical ecosystems to encourage and facilitate animal migration and dispersal patterns.

The premise of the proposed zoning configuration of the PVPF was developed by integrating the Biosphere Reserve concept with elements of a landscape ecology theory (Turner et al. 2001) in order to recognize that the PVPF are not contiguous.

1. Zoning Criteria and Methods

The guiding principles for determining the ecological management zones of the PVPF landscape are to maintain wildlife habitats, protect ecosystems, and provide opportunities for sustainable uses of resources. In incorporating those principles into the management plan, the zoning arrangement for the PVPF is linked to the following spatial ecological quality factors:

- Critical Habitat;
- Environmental Services;
- Naturalness; and
- Remoteness.

1.1. Critical Habitat: Critical habitat is reflected in the level of wildlife concentration in an area. Concentrations, or hot spots, of wildlife are subdivided into three classes. These include critical (high to relatively high concentration), moderately critical (moderate to relatively low concentration), and not critical (low concentration).

1.2. Environmental Services: The most recognized environmental service provided by the PVPF is its watershed. This system supplies water to low land communities as well as to the Tonle Sap flood plain. Several small reservoirs have also been constructed in this watershed to store water for irrigation. The integrity, or quality, of a watershed is commonly represented by its erosion sensitivity index. This is developed using two physical factors, elevation and slope.

1.3. Naturalness: Naturalness reflects the degree to which a site is free from disturbances caused by modern technology and human interference, or remains in a natural state. Within the PVPF, several areas that have been converted to farmlands and settlements, or allocated to development uses, no longer exhibit significant degrees of naturalness.

1.4. Remoteness: Remoteness is a measure of the distance of a site from established settlements. In the PVPF, it is determined by distance from human settlements, main roads, and boundaries.

2. Characteristics of Ecological Management Zones:

2.1. A **Core Area** is a natural zone with a high degree of ecological integrity that is remote from human disturbances and settlements. It is primarily managed for the conservation and maintenance of biological diversity and the provision of a wide range of ecosystem services. The area must be of sufficient size to support a viable population of target species (Orsdof 1987). The management team proposes that core areas in the PVPF are developed with reference to the following criteria:

- Relatively high to high species richness, or critical wildlife habitat ;
- A high erosion sensitivity index ;
- Inclusion of a physical portion of each protected area that is at least 3 km from human settlements and park peripheries, at least 1 km from all main roads, and at least 1 km from large agricultural activities (25 ha) ; and
- A minimum area of 100 ha of undisturbed vegetation.

The primary purpose of a **Buffer Zone** that surrounds a core zone is to manage unfavourable impacts that extend into the core area and its surrounding landscape. Buffer zones in the PVPF should be developed on the basis of the following factors:

- Moderate wildlife concentration;
- Moderate erosion sensitivity;
- Inclusion of some remaining forest and agricultural areas inside the protected area boundaries; and
- Lack of overlap with other zones.

For practical implementation on the ground, the buffer zone may be subdivided into two subzones, a primary buffer zone and a secondary buffer zone.

2.2. A **Primary Buffer Zone** is a natural area situated around the core area. The entire primary buffer zone is located inside the protected area boundaries. The management of this zone is directed to research, training, education, and ecotourism activities. These non-consumptive uses support conservation within the core area. Limited use of plants and wood from fallen trees, and seasonal grazing of domestic animals, are allowed in certain places and under certain conditions. In the PVPF there are some activities that may not be consistent with strict protection, but it must be recognized that these activities have been conducted in this complex for a long period of time.

2.3. A **Secondary Buffer Zone**, or transition zone, encircles the primary buffer zone. It is located outside of the protected area. Within this zone, sustainable use of resources by local communities is permitted. The primary objective of this buffer zone is to ensure that local residents have access to resources without having to enter the core area. Activities in this zone might include agro-forestry, collection of mushrooms, bamboo shoots, and resins, use of plants and wood from fallen trees, and seasonal grazing of domestic animals.

2.4. A **Corridor** is a linear assemblage of mainly continuous vegetation that connects critical ecosystems to encourage and facilitate animal migration and the dispersal of plant and animal species in fragmented landscapes. The land in a conservation corridor usually overlaps parts of the buffer zones and the matrix. Potential areas for inclusion in this zone include the following:

- Remnants of significant ecological value to improve connectivity between protected areas or fragmented landscapes; and
- Lands that are extensive enough to reduce edge effects and do not overlap with other zones.

The designation of a conservation corridor is not as exact as that of the inner two zones. Its delineation is based on consultations with the Wildlife Ecology Specialist, as well as with field experts.

2.5. A **Matrix** contains extensive cover and connectivity in a landscape where human settlements and intensive development activities are conducted. Agricultural areas and human settlements form the matrix in the PVPF landscape.

3. Spatial analysis

The spatial analysis of GIS ArcView 3.2 is employed to perform all spatial analysis functions. The analysis involves three steps, the preparation of spatial criteria and map overlays, map queries and reclassification, and generalization.

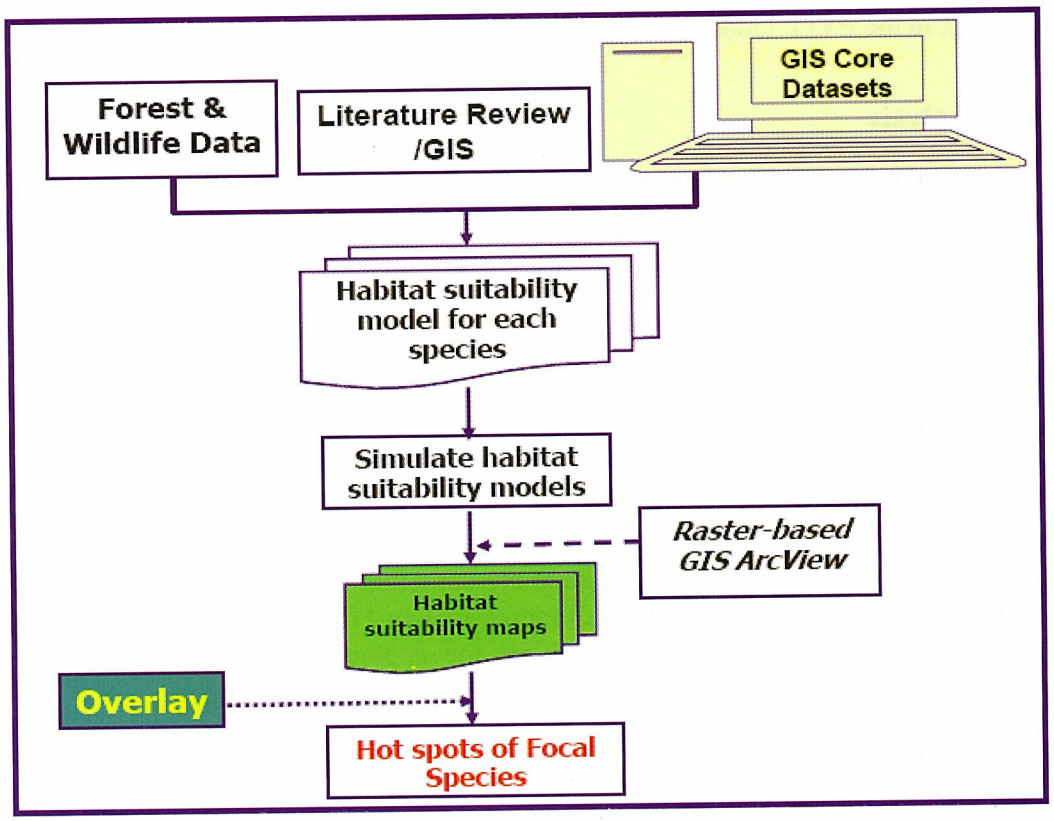
Biophysical factors, including land-use or land-cover type, village location, and main roads, are converted from vector format to raster format, and grid values assigned to land-cover attributes. Slope, elevation, and wildlife concentration are initially in grid format. The FIND DISTANCE command generates distances to human settlements, roads, and large agriculture grids. The MAP QUERY function selects and reclassifies grids that contain values according to designated characteristics of each ecological zone. It is used to query grid locations that represent critical habitat, sensitivity to erosion, or the physical condition of each zone.
The results of each preliminary ecological zone are superimposed and reclassified as priorities. Values of zones that are smaller than 100 ha (approximately 110 pixels) are replaced by those of their nearest neighbours. This process simplifies the ecological zonation map for practical implementation.

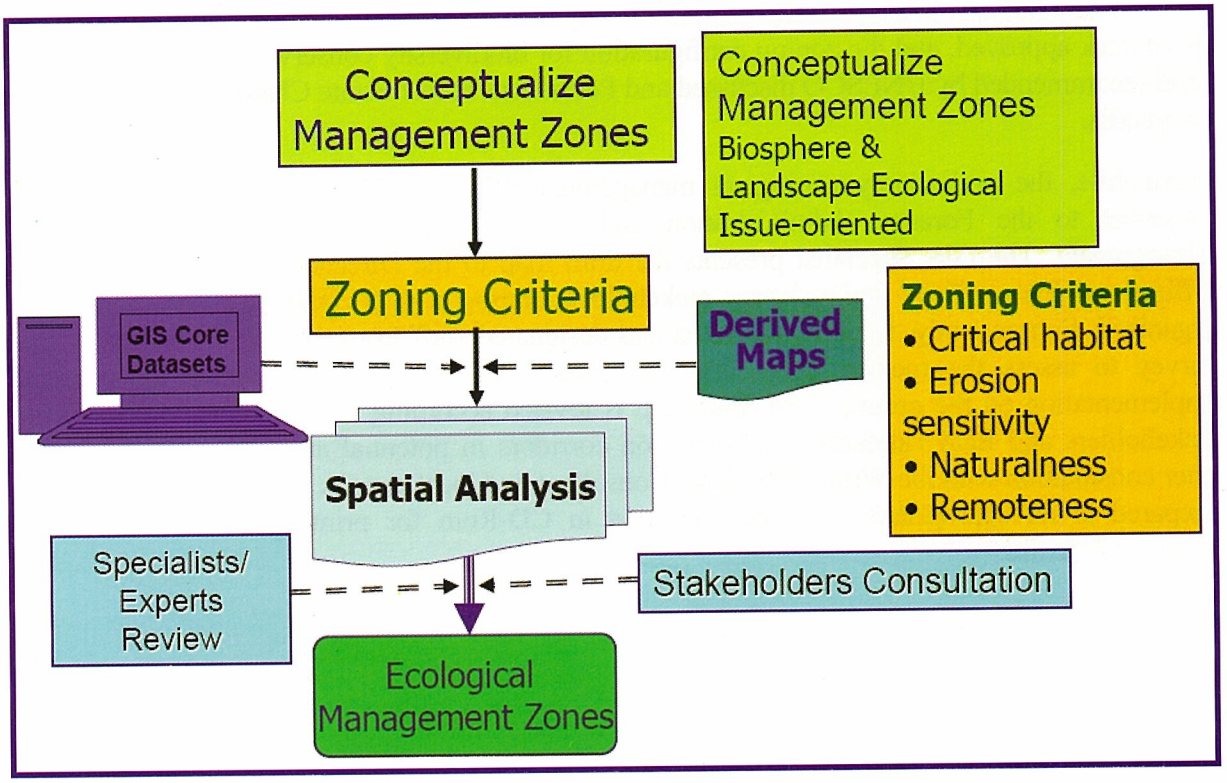
4. Consultation and Ground Validation

Consultation occurs as part of a two-step process. The first step is public consultation on the zoning plan for the PVPF during a district and provincial consultation workshop to be organized. At this workshop, the zoning concept is presented by the GIS Specialist to participants, the zoning framework approved, and the zoning configuration for biodiversity conservation at the landscape level recommended by UNESCO discussed and Permanent Forest Estate Classification (PFEC) in Cambodia.

Meanwhile, the preliminary ecological management PFEC of PVPF zone map is sent for comment to the Forestry Administration and all technical staff involved in the PVPF Management. The GIS Specialist presents the draft map to the Director of Wildlife Protection Office and FA's official and relevant stakeholders during a GIS Training Workshop to be organized. Subsequently, the GIS specialist and designated staff from the PVPF conduct a field survey to assess the merits of the draft map, especially the proposed zones for practical implementation on the ground. The draft map is revised according to comments received from stakeholders and field validation. Conservation corridors in potential areas are then delineated after consultation with the Wildlife Ecology Consultant and local experts. The final zoning map is prepared at an appropriate scale and recorded in CD-Rom for printing and distribution to concerned parties.

Diagram 3.1.1: Zoning Concept





5. Mapping of Agriculture and Residential land in PVPF

Prepared by FA-WCS team
January 2009

These steps are to help the facilitator plan for activities in the village. The steps are not intended to provide a rigid process that the facilitator is required to follow exactly. The facilitator may change sequence of some activities as he/she sees fit depending on the situation in the village.

Step	Sub Step	Details
Step 1. Mapping in Office	a. Using aerial photos and satellite images paddy areas or agricultural areas (that are identifiable) are demarcated and mapped.	
	b. Aerial Photos and Topographic maps are prepared A^0 size and wrapped in plastic sheets.	• Put the maps in big plastic sheets then flatten the sheets over the map and clip edges with stapler. Ensure there are no wrinkles or folds in the plastic sheet or map.
	c. Discuss with Protect Forest and Khan officials on cooperation and membership in Mapping team.	• Clarify working relationship or identify members from Khan or Protected Forest who will work with Mapping team.
	d. Mapping team looks at the maps and familiarizes themselves with the maps.	• Mapping teams are formed and team leaders identified. • Training to Mapping team on approach and working with community. • Discussion on laws and conservation issues regarding the particular village.
	e. Collect existing information of the target village	• Existing reports • Seila program data
Step 2. Introduction to village	a. Introduce project to district and Commune Councils and request them to arrange and introductory meeting for team in the target village.	• Present district & Commune Council with map showing protected forest. • Discuss importance of zoning within protected forest • Present relevant legal instruments highlighting relevant articles emphasize the role of CC in all these procedures. • Explain project plans and objectives • Discuss importance of protecting wildlife and important conservation areas in their commune. • Discuss plan for meeting with community and fix time and date with Commune Council.
	b. Present the project and its activities to the target community and obtain agreement for cooperation.	• Commune Council introduces team to village • Present maps showing boundary of protected forest and location of village and if relevant areas community use for agriculture and residential land based on aerial photos. • Present and explain relevant legal instruments and how this would impact on village land use. • Explain the aims and objectives of Mapping exercise and help community understand why this is important for them • Explain conservation and conservation needs in the area (Cardamom Video) • Present the procedure of how mapping will be done and then request for

		cooperation from community. • Ask community members if they are interested in mapping activities and if they are, help community write a thumb-printed request to Commune Council to form a user community. • Discuss schedule for next visit and explain how committee members will be selected
	c. Discussion with Neighboring villages	• Ask Commune Council to arrange meeting with neighboring villages • Present conservation map and discuss importance of conservation activities in their neighborhood. • Present overview of activities that will be implemented in target village. • Discuss activities and relevance to existing laws. • Obtain agreement for cooperation.
Step 3. Selection of Committee	a. Selection of Forest Demarcation committee	• Review main points of last village discussion. • Discuss roles and responsibilities of Committee. • Discuss selection procedure for committee members (voting or selection by community) • Select Committee members
	b. Provide training to Committee Members	• The concept of Zoning or Land Use Planning • GPS, map and compass • Present maps to Committee members and help them locate themselves on the map. • Discuss their roles and responsibilities and help committee review and change as necessary. Help them understand that the maps, discussions, decisions need to be presented to village for their agreement and approval. • Study Tour/Exchange visit • Discuss relevant legal instruments/procedures and help committee's understand this in detail so that they can discuss with the community. • Discuss conservation issues and important wildlife and wildlife habitat areas with committee.
	c. Commune Endorsement	• Discuss structure for committee and finalize agreement from village. • Discuss roles and responsibilities of each post in structure, selection process and terms of office of committee. Develop rules and regulations for committee. • Committee members and village/commune chief identifies persons in selected committee members to fill different posts in the structure. • The names of committee members and

		their posts are endorsed through a Commune Deika. • The rules and regulations regarding selection of Committee, Roles and Responsibilities and Structure are also endorsed by Commune Council, village representatives and community.
	d. Present the **Mapping of Community Protected Forest Steps** to committee members and make work plan with them to discuss what will happen when.	• Discuss mapping steps with committee and help them understand each step of mapping process. • Present the current land use maps to the Committee and help them understand the maps. • Discuss residential boundary and agriculture boundary. • Discuss important wildlife habitats with committee. • Make workplan with committee based on mapping steps. In other words develop a timeframe for implementing the mapping steps with the committee. • Explain the need to verify maps and correct if necessary. • Make plan for next visit.
4. Mapping	a. Conduct Livelihood study	• With committee take a census of the village. • Identify ownership/use of agricultural and residential plots. • Using livelihood framework understand livelihood strategies and its dependence on resources around community i.e. collect information on production, population, village history, sources of income and NTFP use. Important to link rice production to agriculture areas. • Understand production and resource issues faced by community. • Understand existing management systems for resources in community. • Understand decision making hierarchy in community. • PRA Tools that can be used i. Social and natural resources map, Analyst the past and present use of land and natural resources ii. Institution analysis iii. Conflict map iv. Transect walk v. Seasonal calendar
	d. Identify boundary of village residential land	• Present A^0 size aerial photos and identify present village residential land boundary. • Take GPS points of current village boundary and draw on map (on plastic sheet). • Discuss reserve Village Residential Area with committee • Present maps showing areas important for wildlife and wildlife habitats.

		• Discuss and modify if necessary boundaries of reserve residential area and if necessary present village residential area boundary. • Take GPS points of new modified boundary and put on the map. • Ask Committee to present this map to community and explain the boundaries and if necessary take the community around the boundaries. • Obtain agreement from village on boundary. • Discuss management structure and rules and regulations for managing existing village residential land and reserve village residential land. • Committee presents the structure and rules and regulations to community and obtains agreement from community.
	e. Map Agriculture land	• Identify user area boundaries of the village • Map current agriculture land based on existing crops and ownership agreements within village user area. • Present existing data on agriculture land on a A^0 size map to committee(Satellite or aerial photo or ground survey) • Discuss Land Law, and other relevant laws with committee emphasizing expansion of agriculture land without agreement from relevant authorities is illegal. • Discuss future expansion for agriculture land with committee and take GPS point. • Identify areas with potential to convert to paddy within village user area. • Identify areas reserved for cash crop • Identify swidden areas* • Present maps showing important wildlife areas and habitats • Discuss boundary for agriculture land. (boundary beyond which paddy cultivation/cash cropping is not allowed even land is available) • Present to villagers for modification and/or agreement. • Present Maps to Khan and Protected Forest Authorities discuss and make modifications if necessary. • Present modifications to village and finalize agreements. • Present to villagers for modification and/or agreement.
	f. Map of natural resources use	• Identify Resin tapping areas • Identify areas where other NTFP or timber products are collect from (timber products: eg. Poles for fences around paddies, wood and other material for houses, farming

		equipment and handicrafts, NTFP for food or sale, wood for ox-carts, etc. • Discuss areas and identify zone around these user areas and discuss broad rules and regulations and criteria of this zone. • Discuss important fishing areas • Present boundary and results of discussion to Khan and Protected Forest Authorities • Present results of discussion to community and obtain agreement on decisions.
	g. Map of village user area boundary	• Based on maps and discussions above discuss village user area boundaries with community and committee. • Discuss with committee, village and commune chief and villagers on the village boundary • Committee go to discuss this boundary with neighboring villages
	h. Endorsement of Map	• Finalize maps with different boundaries and obtain agreement from villagers, other relevant stakeholders. • 8 key stakeholders: – Community – Commune, District, Province – FA Division and Cantonment – Head of DWB – Provincial DLMUPC Sign on the finalized maps. • Single sheet with named zones
	i. Develop Broad regulations to manage each zone. *Sometimes authorities may ask for rules and regulations before the boundary has been made.*	• Review structure to manage the areas. • Review procedures for installing these structures. • Review roles & responsibilities of structure • Discuss rules, regulations for allocation of land and criteria of beneficiaries who will receive residential land, paddy land and land for cash crop cultivation. • Discuss rules, regulations for allocation swidden plots in demarcated swidden areas. • Divide NTFP Collection areas based on use and discuss rules and regulations to manage use of each NTFP or zone. • Present to community for modification and/or agreement.
	j. Agreement of Zone Regulations.	• Community, Village Chief, Commune, District PF Director, possibly also Khan if necessary sign on these rules and regulations. • 5-20 page set of written regulations, zone-by-zone including UTMs of zone corners
5. Demarcating boundaries	a. Painting of boundaries	• Paint different boundaries after agreement or • Put cement posts to demarcate boundaries on ground or

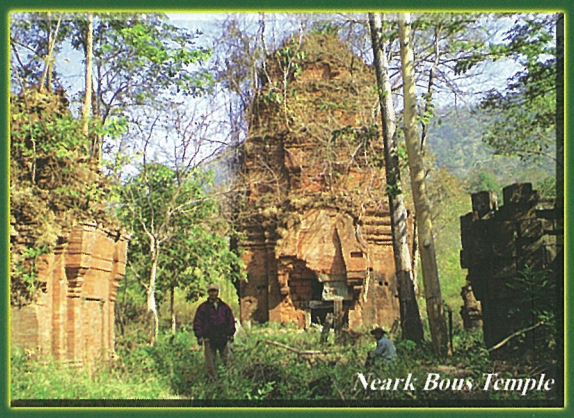
		• Plant live fences on boundaries
5. Detailed Management Plans	a. Develop Detailed Management plans for each Zone	• If community Forestry will have to follow Community Forestry Guidelines. • If Land Registration will have to follow proper procedures allowed in the Land Law • Management plans developed in accordance to legal requirements.

*Swidden areas: Swidden areas are defined as areas where upland (chomkar) rice is grown.

Based on this definition we can classify swidden agriculture into two categories:

a) Many indigenous communities grow rice only or mostly in swidden plots . Paddy farming is not the main source of rice and but maybe practiced by some members in the community. This system has a specific traditional management regime and such land is eligible for communal land registration. The community maintains an ownership right to the land while individuals have usurfruct rights. The rights depend on community. These communities have specifically designated swidden areas which they use for agriculture. In these communities the team will have to identify these areas and include them in the map as agriculture areas for swidden agriculture. Ownership patterns follow traditional systems.

b) Most Khmer and other ethnic minority/indigenous communities conduct swidden agriculture as part of their food production. Paddy rice is the main source of rice however, families that do not have draft animals, labor or land to conduct paddy conduct swidden agriculture as a temporary practice till they are able to grow paddy rice. The community may have specifically designated areas, however ownership of these swidden areas is complex, some villages provide usufruct rights as long as rice is being grown on plot while in others it is a precursor for claiming ownership to grow other crops. In these communities it is important to identify specific areas as 'land reserved for swidden agriculture' where community members with no draft animals, labor or paddy land can grow upland rice on a temporary basis. The ownership in these areas is temporary for growing rice only and ownership rights end once individual members stop growing rice in these areas.



Neark Bous Temple

Preah Vihear Protected Forest
contains many sites with cultural significance,
such as ancient temples and sacred forests.

Giant Ibis

Preah Vihear Protected Forest is a global stronghold of
endangered species of Giant Ibis Pseudibis gigantea-
national bird symbol of Cambodia

The Preah Vihear Protected Forest of Cambodia is a part of the Indo-Burma Biodiversity Hotspot, one of the 25 Global Hotspots on our planet and part of the Indochinese Dry Forest. This Management Plan describes the overall objectives, zoning classifications and main program activities for conserving the resources and maintaining the biodiversity of the Preah Vihear Protected Forest and intended to provide a road map of interrelated strategies and management activities designed to ensure the sustainable development of the natural resources in the area. *Conserve the forest and biological resources and promote sustainable management initiatives in Phreah Vihear Protected Forest in order to maximize contributions to the socio-economic development and healthy ecosystem of the region.*

Forestry Administration (FA)

#40, Preah Norodom Blvd. Phnom Penh, Cambodia

Tel: (855-23) 214-651; Fax: (855-23) 212-201
Email: wpo@online.com.kh; Website: http://www.forestry.gov.kh/