SITE NAME: **Dong Phayayen - Khao Yai Forest Complex**

DATE OF INSCRIPTION: 15th July 2005

STATE PARTY: THAILAND

CRITERIA: N (iv)

DECISION OF THE WORLD HERITAGE COMMITTEE:
Excerpt from the Decisions of the 29th Session of the World Heritage Committee

Criterion (iv): The Dong Phayayen-Khao Yai Forest Complex (DPKY-FC) contains more than 800 fauna species, including 112 species of mammals, 392 species of birds and 200 reptiles and amphibians. It is internationally important for the conservation of globally threatened and endangered mammal, bird and reptile species that are recognised as being of outstanding universal value. This includes 1 critically endangered, 4 endangered and 19 vulnerable species. The area contains the last substantial area of globally important tropical forest ecosystems of the Thailandian Monsoon Forest biogeographic province in northeast Thailand, which in turn can provide a viable area for long-term survival of endangered, globally important species, including tiger, elephant, leopard cat and banteng. The unique overlap of the range of two species of gibbon, including the vulnerable Pileated Gibbon, further adds to the global value of the complex. In addition to the resident species the complex plays an important role for the conservation of migratory species, including the endangered Spot-billed Pelican and critically endangered Greater Adjutant.

BRIEF DESCRIPTIONS

The Dong Phayayen-Khao Yai Forest Complex spans 230km between Ta Phraya National Park on the Cambodian border in the east, and Khao Yai National Park in the west. It is a rugged mountainous area ranging between 100m to 1,351m high with about 7,500 of its 615,500 hectares above 1,000m. The north side is drained by several tributaries of the Mun River, itself a tributary of the Mekong River. The southern side is drained by numerous scenic waterfalls and gorges and four main fast streams that flow into the Prachinburi River. The site is home to more than 800 species of fauna, including 112 mammal species (among them two species of gibbon), 392 species of birds and 200 reptiles and amphibians. It is internationally important for the conservation of globally threatened and endangered mammal, bird and reptile species, among them 19 that are vulnerable, four that are endangered, and one that is critically endangered. The area contains substantial and important tropical forest ecosystems, which can provide a viable habitat for the long-term survival of these species.

1.b State, Province or Region: Provinces of Saraburi, Nakhon Nayok, Nakhon Rachisima, Prachinburi, Srakaew and Burirum

1.d Exact location: N14 19 48.0 E102 03 00.0

Submission for Nomination of the

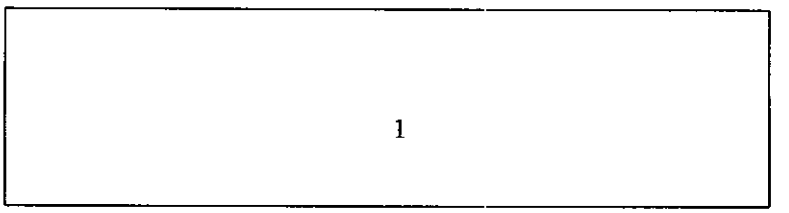
Dong Phayayen – Khao Yai Forest Complex

By

The Royal Thai Government

To be included in
The World Heritage List

Cover page photographic credits



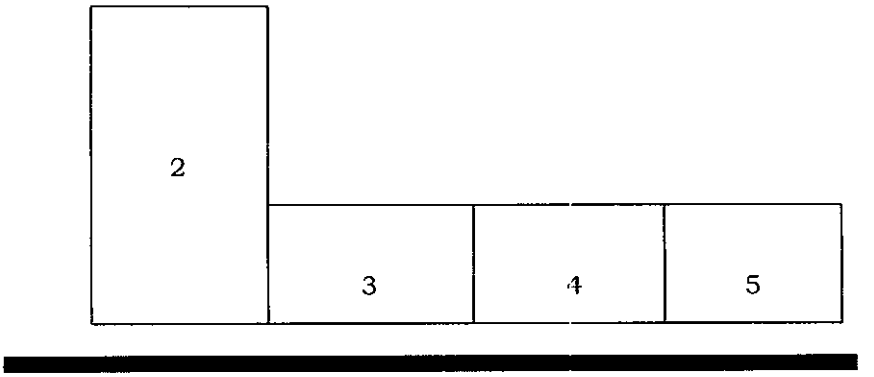


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Table of contents

	Page
Cover page photo credits	i
Table of Contents	ii
List of Maps and Figures	v
List of Tables and Box	vi
List of Photographs	viii
Authorization	ix
Acknowledgements	x
Abbreviations	xi
1. Identification of the Property	**1**
2. Justification for Inscription	**5**
a. Statement of significance	5
b. Comparative analysis	13
c. Integrity	15
d. Criteria under which the inscription is proposed	18
3. Description	**22**
a. Description of the property	22
b. History and development	41
c. Form and date of most recent records of property	45
d. Present state of conservation	45
e. Policies and programmes related to the presentation and promotion of the property	47

	Page
4. Management	**48**
a. Ownership	48
b. Legal status	48
c. Protective measures and means of implementation	49
d. Agency/agencies with management authority	52
e. Level at which management is exercised and name and address of responsible person for contact purposes	52
f. Agreed plans related to the property	56
g. Sources and levels of finance	58
h. Sources of expertise and training in conservation and management techniques	58
i. Visitor facilities and statistics	58
j. Property management plan and statement of objectives	61
k. Staffing levels	62
5. Factors Affecting the Property	**64**
a. Development pressures	64
b. Environmental pressures	65
c. Natural disasters and preparedness	65
d. Visitor/tourism pressures	65
e. Number of inhabitants within property, buffer zone	66
6. Monitoring	**67**
7. Documentation	**69**
a. Photograph	69
b. Copies of DPKY-FC integrated management plan	69
c. Bibliography	69
d. Address where inventory records and archives are held	73

Page

8. Signature on Behalf of the State Party **74**

Appendix 1: List of Mammals in the DPKY-FC Appendix 1 - 1

Appendix 2: List of endemic angiosperm species identified in the Dong Phayayen – Khao Yai Forest Complex Appendix 2 - 1

Appendix 3: Comprehensive list of Bird species in the Dong Phayayen – Khao Yai Forest Complex by protected area unit Appendix 3 - 1

Appendix 4: Maps of Distribution and Relative Abundance of species in the Dong Phayayen - Khao Yai Forest Complex Appendix 4 - 1

List of Maps and Figures

		Page
Map 1:	Location of Thailand within the Southeast Asia Region	2
Map 2:	Location of Dong Phayayen – Khao Yai Forest Complex, Thailand	3
Map 3:	Dong Phayayen – Khao Yai Forest Complex with road network in the region	4
Map 4:	Topographical features, boundaries and sub-stations of Khao Yai National Park	23
Map 5:	Topographical features, boundaries and sub-stations of Thap Lan National Park	26
Map 6:	Topographical features, boundaries and sub-stations of Pang Sida National Park	28
Map 7:	Topographical features, boundaries and sub-stations of Ta Phraya National Park	30
Map 8:	Topographical features, boundaries and sub-stations of Dong Yai Wildlife Sanctuary	32
Map 9:	Main habitat types of the Dong Phayayen – Khao Yai Forest Complex	34
Map 10:	Survey points used to assess bird distribution in the DPKY-FC	42
Figure 1:	Organizational structure of the Department of National Parks, Wildlife, and Plant Conservation	53

List of Tables and Box

		Page
Table 1:	Global and/or national mammal species of high conservation priority found within the DPKY-FC	7
Table 2:	List of globally and/or nationally threatened or near threatened bird species by protected area unit	9
Table 3:	Significant target mammal species for conservation of Evergreen Forests	35
Table 4:	Globally and/or nationally threatened or near threatened bird species of Evergreen Forests	36
Table 5:	Globally and/or nationally threatened or near threatened mammal species of Dipterocarp /Deciduous Forests	37
Table 6:	Globally and/or nationally threatened or near threatened bird species of Dipterocarp /Deciduous Forests	38
Table 7:	Globally and/or nationally threatened or near threatened bird species of Riverine Ecosystems	39
Table 8:	Thailand's protected area system	44
Table 9:	Summary state of conservation assessment for the Dong Phayayen – Khao Yai Forest Complex	46
Table 10:	Legal status of the sites to be included in the World Heritage Site nomination	48
Table 11:	Unit designation, substations, and general comments	50
Table 12:	Names and addresses of responsible persons for the management of the protected area units of the DPKY-FC	54
Table 13:	Name and addresses of key DNP persons responsible for various aspects of DPKY-FC management	55
Table 14:	Annual government budgets of protected area units within the DPKY-FC	59
Table 15:	Visitor facilities and services of the DPKY-FC	60

Page

Table 16: Visitor statistics 61

Table 17: Status of the operational management plans of protected area units within the DPKY-FC 62

Table 18: Staffing levels and categories for units within the DPKY-FC 63

Table 19: Proposed conservation monitoring matrix for the DPKY-FC 67

Box 1: Some habitat parameters and a general description of the units that make up the Dong Phayayen -- Khao Yai Forest Complex 22

List of Photographs

		Page
Photograph 1:	An abrupt escarpment that runs, virtually unbroken, from Khao Yai National Park in the east through the other protected area units that make up the Dong Phayayen – Khao Yai Forest Complex all the way to the western end of the Dongrak Range in Cambodia. The escarpment represents an active and ongoing global geological process.	5
Photograph 2:	The complex is ecologically significant as it contains a very wide range of habitats ranging from moist evergreen formations to the drier Dipterocarp / Deciduous forests that make-up the eastern part of the complex. As well as distinctive biodiversity, the complex is large and topographically varied.	14
Photograph 3:	A road bisecting the complex along the north/south axis is one of several threats to the integrity of the complex.	16
Photograph 4:	Options have been developed to help ensure that the connectivity of Khao Yai and Thap Lan NPS is maintained. When these are implemented they will significantly add to the integrity of the complex.	17
Photograph 5:	The distinctive rare species, *Thismia mirabilis*, found in the Dry Evergreen Forest of Dong Phayayen – Khao Yai Forest Complex.	21
Photograph 6:	Khao Yai National Park is the only unit in the complex where tourism levels present specific areas for concern. This is the case particularly close to waterfalls, rivers and some other attractions.	66

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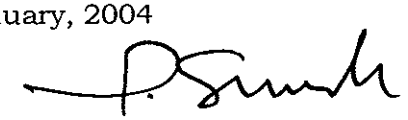
Signature: 

Name: Dr. Plodprasop Suraswadi

Title: Permanent Secretary, Ministry of Natural Resources and Environment

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Abbreviations

CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Flora & Fauna
CR	Globally Threatened - Critically Endangered
DD	Data Deficient
DF	Dipterocarp Forest
DNP	Department of National Parks, Wildlife and Plant Conservation
DPKY-FC	Dong Phayayen – Khao Yai Forest Complex
DYWS	Dong Yai Wildlife Sanctuary
EIA	Environmental Impact Assessment
EN	Endangered
GSN	Global Survival Network
ICEM	International Centre for Environmental Management
IUCN	World Conservation Union
KYNP	Khao Yai National Park
LR	Lower Risk
MNRE	Ministry of Natural Resources and Environment
NGO	Non-Governmental Organization
NP	National Park
NT	Globally Near-threatened
NTFP	Non-Timber Forest Products
OUV	Outstanding Universal Value
PA	Protected Area
PSNP	Pang Sida National Park
RFD	Royal Forest Department
RTG	Royal Thai Government
TDRI	Thailand Development Research Institute
TLNP	Thap Lan National Park
TPNP	Ta Phraya National Park
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-WHC	United Nations Educational, Scientific & Cultural Organization - World Heritage Centre
V	Vulnerable
VU	Globally Threatened - Vulnerable
WCS	Wildlife Conservation Society Thailand Programme
WH	World Heritage

WHC	Convention Concerning the Protection of the World's Cultural and Natural Heritage (The World Heritage Convention)
WS	Wildlife Sanctuary
WWF	World Wide Fund for Nature

1. Identification of the Property

a. Country: Thailand

b. Provinces: Includes parts of Saraburi, Nakhon Nayok, Nakhon Rachisima, Prachinburi, Srakaew and Burirum

c. Name of Property: Dong Phayayen - Khao Yai Forest Complex

d. Exact location: Between latitudes 14° 00′ and 14° 33′ N and longitude 101° 05′ and 103° 14′ E

e. Maps:

(i) Map 1: Thailand within the S/E Asia Region

(ii) Map 2: Location of the Dong Phayayen - Khao Yai Forest Complex within Thailand

(iii) Map 3: Dong Phayayen - Khao Yai Forest Complex with road network in the region

(iv) Maps 4-8 show the main topographical features, roads, and boundaries of:

Map 4: Khao Yai National Park

Map 5: Thap Lan National Park

Map 6: Pang Sida National Park

Map 7: Ta Phraya National Park

Map 8: Dong Yai Wildlife Sanctuary

(v) Map 9: Main forest types of the Dong Phayayen - Khao Yai Forest Complex

(vi) Maps 10- 16 show the distribution and relative Abundance of species in the Dong Phayayen - Khao Yai Forest Complex

Map 10: Bird Survey Points

Map 11: Carnivores

Map 12: Felines

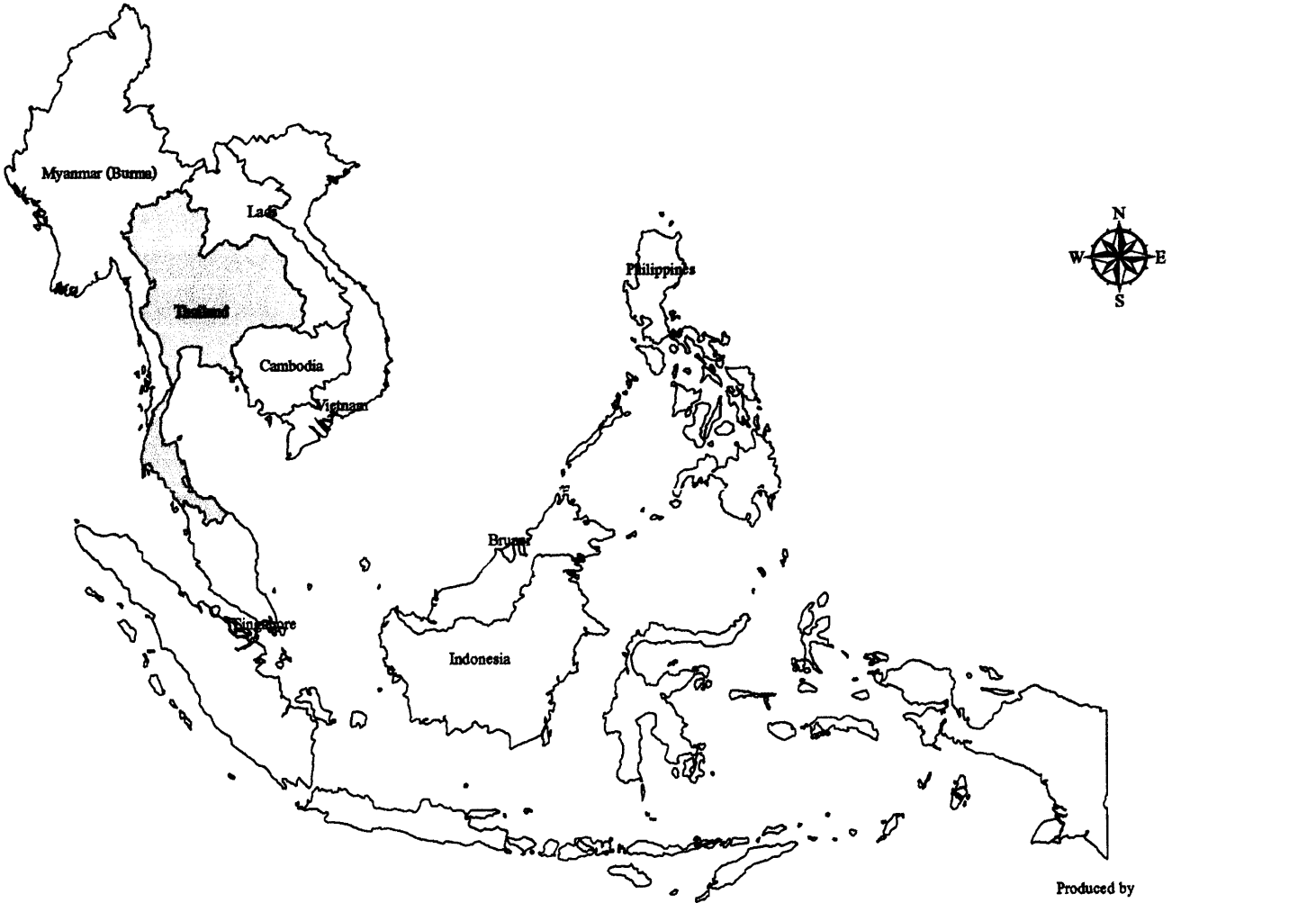
Map 13: Bear & Dhole

Map 14: Primates

Map 15-16: Ungulates

f. The area of the property proposed for inscription is 615,500 ha., or 6,155 sq. km.

Map 1 : Location of Thailand within the Southeast Asia Region



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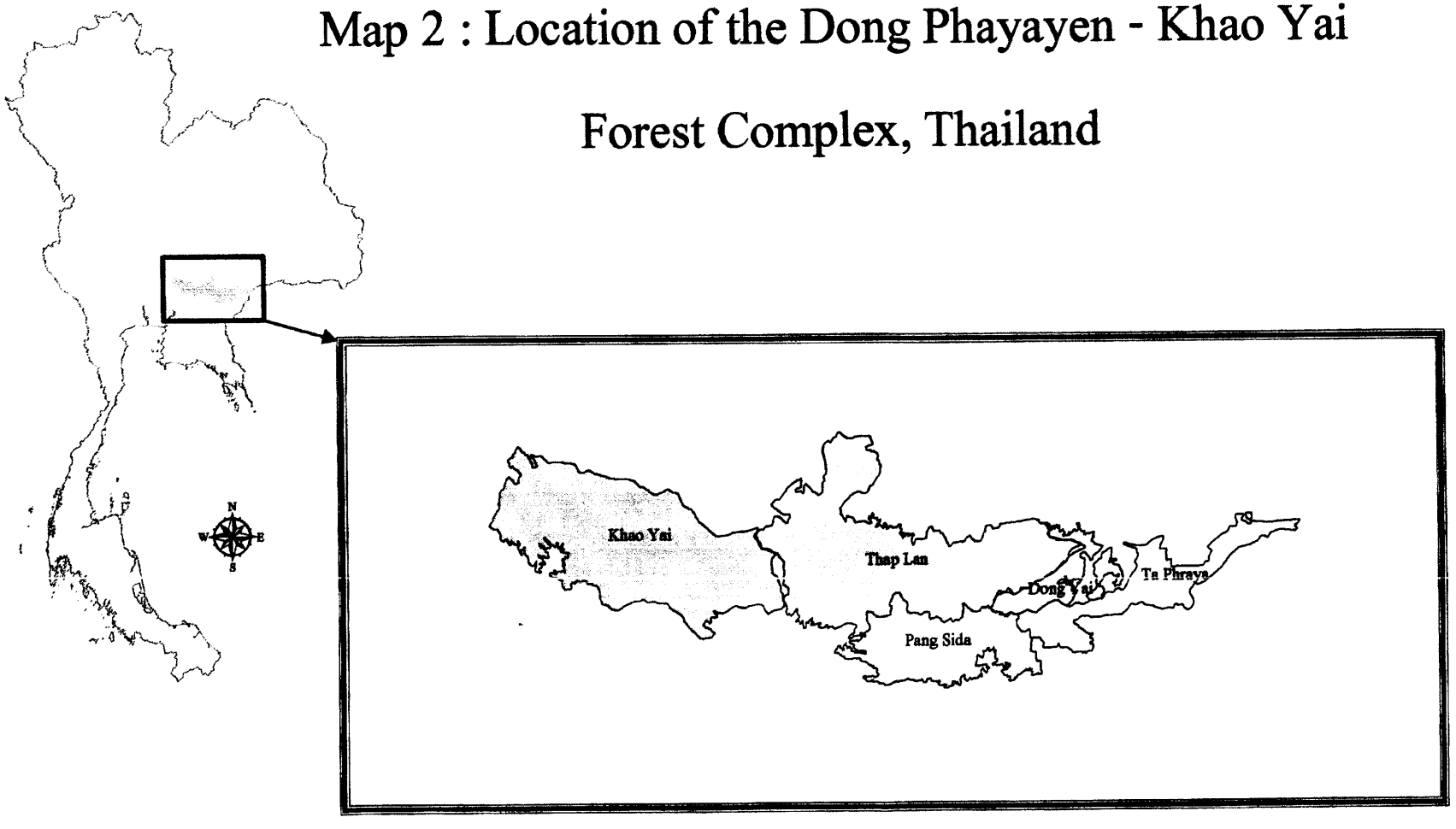
Map 2 : Location of the Dong Phayayen - Khao Yai Forest Complex, Thailand



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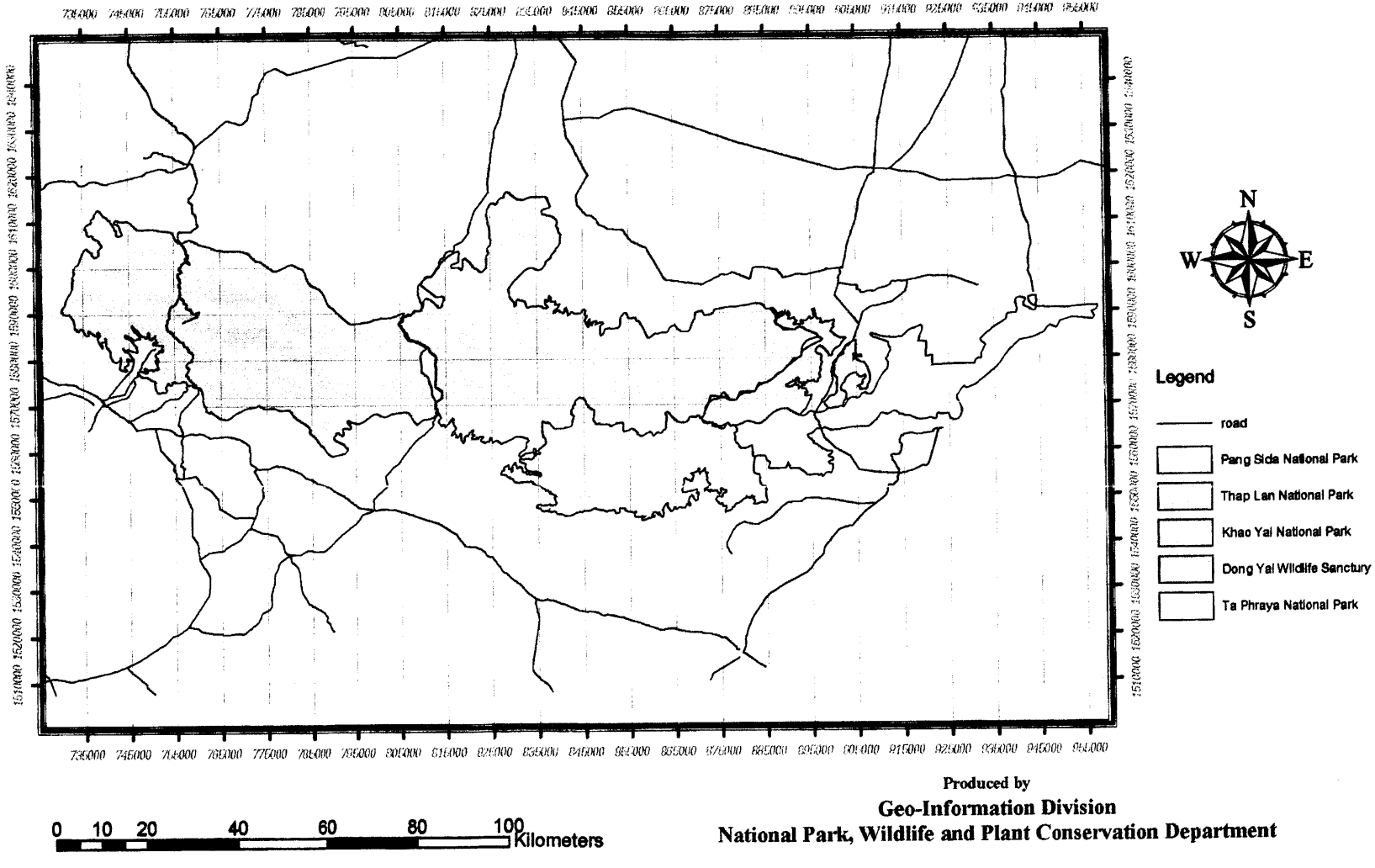
Map 3 : Dong Phayayen-Khao Yai Forest Complex with road network in the region



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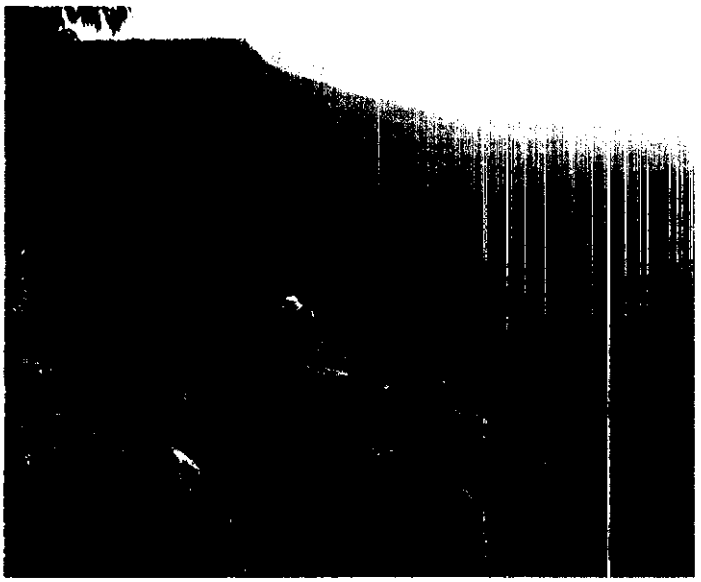
2. Justification for Inscription

a. Statement of significance

Continental drift, the theory that ascribes movements of the earth's crustal plates and other geological processes including folding, faulting, and uplift of the earth's crust to form mountain ranges, has resulted in tectonically affected belts including large linear features such as Thailand's Korat Plateau. Some 60 million years ago, as the Indian subcontinent moved north into Asia, topography changed as geological pressures increased, tilting the southern rim of the Korat Plateau higher, and creating a fault zone.

This process has resulted in the formation of an abrupt escarpment that runs, virtually unbroken, from Khao Yai National Park in the east through the other protected area units that make up the Dong Phayayen – Khao Yai Forest Complex (DPKY-FC)[1] [also refer to Section 3a] all the way to the western end of the Dongrak Range in Cambodia, a distance of more than 200 kms. This distinctive escarpment, rising in places to some 500m, represents an active and ongoing global geological process. The DPKY-FC is, as a result, made-up of several geographically-related attributes that embrace a range of natural processes including climate, plant and animal distribution - as well as a rich history of human existence.



Photograph 1: *An abrupt escarpment that runs, virtually unbroken, from Khao Yai National Park in the east through the other protected area units that make up the Dong Phayayen – Khao Yai Forest Complex all the way to the western end of the Dongrak Range in Cambodia. The escarpment represents an active and ongoing global geological process. (Photo © Bruce Jefferies)*

The western extremity of the DPKY-FC receives the most rainfall, up to 3,000mm per year in some areas. The hydrological significance of the DPKY-FC, consequently, influences the livelihoods of countless rural communities as well as the overall economic base of much of Thailand's northeastern region. As well, the DPKY-FC provides significant water catchment functions and protects environmental functions such as soil erosion, groundwater depletion, modification of water levels, changes in natural flow patterns, nutrient loading and sedimentation.

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1 Khao Yai, Thap Lan, Pang Sida & Ta Phraya National Parks and Dong Yai Wildlife Sanctuary.

Five major watersheds originate from within the complex with one, the Mae Nam Mun providing an important life support function - water - to some of the driest areas of Thailand. This river is also a tributary of the Mekong and, therefore, it makes a significant contribution to this important transboundary river system. Although most precipitation is a result of the monsoon season (May to October), this forest type remains moist and humid even during the long dry season, as cooler air condenses within the forest canopy, creating a moist vapour, particularly early in the morning.

In the central and eastern parts of the DPKY-FC, the altitude of the escarpment gradually declines and the distance from the effects of the rain-bearing monsoons increase. Precipitation amounts decline steadily to under 1,000mm at the eastern end of the complex. Forest type and cover also change and become increasingly a Dipterocarp / Deciduous forest with a generally more open forest canopy.

The entire escarpment provides a distinctive landscape feature. Western areas, in particular Khao Yai NP with varying topography and higher precipitation, contain numerous spectacular waterfalls. These waterfalls form the main attraction for visitors, in addition to many other rivers and streams found with the complex. Education, interpretation, recreation, and simply taking time out from increasingly busy urban-based life styles to observe scenery and natural processes are also important visitor experiences. For example, Khao Yai NP, probably, provides some of the best opportunities in Thailand to observe several important and spectacular species, such as hornbills, tigers, deer (sambar, mouse and barking), gibbons, and elephants. These conservation education, interpretive and recreational opportunities are all the more significant when the location of the park, which is only 2 hours drive from Bangkok's resident population of 8 million, is taken into account. The central and eastern units of the complex (Pang Sida NP for example) are noteworthy as they provide some of the very few opportunities in Thailand to observe two species of wild cattle, gaur (*Bos gaurus*) and banteng (*B. javanicus*) and possibly crocodiles (*Crocodylus siamensis*) in the wild.

The most salient contribution that the DPKY-FC can add to present and future global conservation endeavors is the preservation of a wide assemblage of species that are increasingly under pressure elsewhere in the tropics. The DPKY-FC is thought to contain some of the largest remaining protected populations of many species in the ecoregion[2]. Of particular note are populations of Asian elephant (*Elephas maximus*) and tiger (*Panthera tigris*). The complex is also known to contain populations of Malayan sun bear (*Helarctos malayanus*), Asiatic black bear (*Ursus thibetanus*), dhole (*Cuon alpinus*), clouded leopard (*Neofelis nebulosa*), leopard (*Panthera pardus*), gaur (*Bos gaurus*), and Banteng (*Bos javanicus*).

During 2002 and 2003, the Department of National Parks, Wildlife and Plant Conservation and the Wildlife Conservation Society undertook survey work. In the draft report on the surveys conducted over the DPKY-FC, a number of species that fall into either (i) Threatened status in Thailand, (ii) IUCN Globally Threatened Categories, or (iii) are included in CITES Appendices I, II or III, are identified. (Lynam *et al.* 2003). These are listed in Table 1.

---

2 Thailand is situated in the Indochinese ecoregion and encompasses six (6) of the Biogeographic Regions identified by MacKinnon: Northern Highlands, Korat Plateau, Central Plain, South-East Uplands, Tenasserim Hills and the South Peninsula. The Dong Phayayen - Khao Yai Forest Complex is located on the Korat Plateau (MacKinnon and MacKinnon 1992).

Table 1: Global and/or national mammal species of high conservation priority found within the DPKY-FC

Scientific Name	Common Name	Thai Status	IUCN	CITES
Macaca nemestrina	Pig-tailed Macaque		VU	
Macaca arctoides	Stump-tailed Macaque	VU	VU	
Macaca fascicularis	Crab-eating Macaque		LR/NT	
Presbytis cristata	Silvered Langur		LR/NT	
Hylobates lar	White-handed Gibbon	VU	LR/NT	App I
Hylobates pileatus	Pileated Gibbon	EN	VU	App I
Manis javanica	Malayan Pangolin		LR/NT	App II
Ratufa bicolor	Black Giant Squirrel			App II
Belomys pearsoni	Hairy-footed Flying Squirrel	VU		
Maxomys whiteheadi	Whitehead's rat	VU		
Hystrix brachyura	Malayan Porcupine		VU	
Atherurus macrourus	Brush-tailed Porcupine		EN	
Cuon alpinus	Asian Wild Dog	VU	VU	App II
Ursus thibetanus	Asiatic Black Bear	VU	VU	App I
Helarctos malayanus	Malayan Sunbear	VU	DD	App I
Lutrogale perspicillata	Smooth-coated Otter	VU		
Viverra megaspila	Large-spotted Civet	VU	V	
Paradoxurus hermaphroditu	Common Palm Civet		VU	
Arctictis binturong	Binturong		VU	
Pardofelis marmorata	Marbled Cat	EN	DD	App I
Prionailurus bengalensis	Leopard Cat		EN	App II
Felis chaus	Jungle Cat	CR		

Table 1 (continued)

Scientific Name	Common Name	Thai Status	IUCN	CITES
Catopuma temmincki	Asian Golden Cat	EN	LR/VU	App I
Neofelis nebulosa	Clouded Leopard	VU	VU	App I
Panthera pardus	Leopard	VU	LR	App I
Panthera tigris	Tiger	VU	EN	App I
Elephas maximus	Elephant	EN	EN	App I
Sus scrofa	Common Wild Pig		VU	
Bos javanicus	Banteng	CR	VU	
Bos gaurus	Gaur	VU	VU	App I
Naemorhedus sumatraensis	Serow		VU	App I

As the above Table points out, of the 112 mammal species that are known to inhabit the DPKY-FC, 36 (+-) are known (or highly likely) to be global or national conservation priorities. One unit (Khao Yai NP) is also the only known area where the white-handed (*Hylobates lar*) and pileated (*Hylobates pileatus*) gibbons overlap in range and produce crossbred offspring. This is of considerable scientific interest.

Substantial populations of primates such as pig-tailed macaques (*Macaca nemestrina*), long-tailed macaques (*M.fascicularis*), slow loris (*Nycticebus coucang*) and silvered langurs (*Presbytis cristata*) are known to also inhabit the complex.

The re-discovery of a relict population of crocodiles in Pang Sida NP in 1992 and reported sightings during the formulation phase for this nomination (Prawat Vohandee, Superintendent Khao Yai NP, *pers. comm.)* provides an indication of species that may be re-discovered when further biodiversity inventories are undertaken. Sightings of animal signs, such as scat, tracks and footprints of several species including wild water buffalo (*Bubalus bubalus*) in the lowland forests of Pang Sida await definitive confirmation.

As the DPKY-FC extends east along the Dongrak Range, this landform demarcates the international frontier for some 40 km with the Banteay Chmor Protected Landscape in Cambodia, the area where kouprey (*Bos sauveli*) was first discovered sharing a common boundary. There are insinuations that this species remains in the far eastern part of the complex, but this is a remote possibility. If populations of the kouprey are re-discovered (e.g. see Olivier and Woodford, 1994), the significant amount of suitable habitat within both the DPKY-FC and adjacent areas in Cambodia would provide opportunities for an international transboundary PA as well as ideal conditions for a re-introduction project of this species.

A full list of mammals including those categorized: (i) Threatened in Thailand, (ii) IUCN Globally Threatened, and (iii) CITES Appendices I, II or III, forms Appendix 1 [Lynam *et al.* 2003].

Inventories of bird populations are ongoing, but it is known with some certainty that there are significant populations of hornbills distributed throughout the complex. The 2002/03 survey (referred to above) conducted a reasonably comprehensive avifauna survey over the DPKY-FC. Survey data has revealed that a number of species fall into various categories of globally and/or nationally threatened or near-threatened. The Table below provides a list of globally or nationally threatened or near-threatened bird species that are known to be found within the DPKY-FC.

Table 2: List of globally and/or nationally threatened or near threatened bird species by protected area unit

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
121	Siamese Fireback *Lophura diardi*	R	X	X	X	X	
127	Green Peafowl *Pavo muticus*			1	LR	LR	
423	Rufous-bellied Woodpecker *Dendrocopos hyperythrus*	R		X			
416	White-bellied Woodpecker *Dryocopus javensis*	R	Mc	X			
404	Streak-throated Woodpecker *Picus xanthopygaeus*	R		X	U		
406	Black-headed Woodpecker *Picus erythropygius*	R	U	X			
415	Great Slaty Woodpecker *Mulleripicus pulverulentus*	R	X	X	X		
374	Oriental Pied Hornbill *Anthracoceros albirostris*	R	X	X	X	X	
376	Great Hornbill *Buceros bicornis*	R	X	1	X	3	
367	Brown Hornbill *Anorrhinus tickelli*	R	X	LR			

Table 2: (continued)

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
371	Wreathed Hornbill *Aceros undulates*	R	X	X	X		
304	Coral-billed Ground Cuckoo *Carpococcyx renauldi*	R	X		X	3	
274	Alexandrine Parakeet *Psittacula eupatria*	R					
276	Blossom-headed Parakeet *Psittacula roseata*	R	X	X	X		
318	Spot-bellied Eagle Owl *Bubo nipalensis*	R	X		X		
329	Javan Frogmouth *Batrachostomus javensis*	R	X				
265	Pale-capped Pigeon *Columba punicea*	N	X				
255	Orange-breasted Pigeon *Treron bicincta*	R	X		4		
251	Pompadour Pigeon *Treron pompadora*	R	X		X	3	
257	Yellow-footed Pigeon *Treron phoenicoptera*	R	U				
249	White-bellied Pigeon *Treron sieboldii*	R	X				
259	Green Imperial Pigeon *Ducula aenea*	R	X	X	X	X	
159	Masked Finfoot *Heliopais personata*	Vagrant	X				
160	Pheasant-tailed *Jacana Hydrophasianus chirurgus*	Vagrant		1			

Table 2: (continued)

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
163	Grey-headed Lapwing *Vanellus cinereus*	Vagrant	X				
72	Jerdon's Baza *Aviceda jerdoni*	B	X	2	X		
70	Black Kite *Milvus migrans*	N	X				
71	Brahminy Kite *Haliastur indus*	Vagrant			X	3	
87	Grey-headed Fish Eagle *Ichthyophaga ichthyaetus*	R	X				
83	Rufous-winged Buzzard *Butastur liventer*	R	Mc	X	X	X	
98	Black Eagle *Ictinaetus malayensis*	R	X	X	X		
91	Mountain Hawk Eagle *Spizaetus nipalensis*	R	X	X		X	
109	White-rumped Falcon *Polihierax insignis*	R		X			
6	Oriental Darter *Anhinga melanogaster*	N	X				
28	Malayan Night Heron *Gorsachius melanolophus*	R	X		X		
30	Schrenck's Bittern *Ixobrychus eurhythmus*	Vagrant	X				
42	Spot-billed Pelican *Pelecanus philippensis*	Vagrant	X	X		LR	
34	Asian Openbill *Anastomus oscitans*	Vagrant	X			X	
36	Black Stork *Ciconia nigra*	Vagrant	X				

Table 2: (continued)

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
37	Woolly-necked Stork *Ciconia episcopus*	R				U3	
40	Lesser Adjutant *Leptoptilos javanicus*	Vagrant	X				
39	Greater Adjutant *Leptoptilos dubius*	Vagrant	X				
429	Black-and-red Broadbill *Cymbirhynchus macrorhynchos*	R					
558	Silver Oriole *Oriolus mellianus*	N	X				
496	Brown-rumped Minivet *Pericrocotus cantonensis*	N	X	X	X		
806	White-browed Fantail *Rhipidura aureola*	R		X			
812	Japanese Paradise-flycatcher *Terpsiphone atrocaudata*	Vagrant					
779	Green-backed Flycatcher *Ficedula elisae*	P	X				
835	Golden-crested Myna *Ampeliceps coronatus*	R	X	X	X	X	
836	Hill Myna *Gracula religiosa*	R	X	X	X	X	
603	Limestone Wren Babbler *Napothera crispifrons*	R	X				
877	Baya Weaver *Ploceus philippinus*	R		2	X		
899	Yellow-breasted Bunting *Emberiza aureola*	Vagrant	X				

Note:

1) *No confirmed data on bird population or abundance is available for Dong Yai Wildlife Sanctuary at the present time.*
2) *L&R species number is allotted in Lekagul and Round 1991.*
3) *X presence is confirmed by substantiated records.*
4) *All species on this list are either globally or nationally threatened or near-threatened*

A very significant part of the rationale for considering the DPKY-FC for World Heritage status is the overall size (615,500 ha.) and diversity of the complex. There is considerable doubt amongst conservation biologists regarding the minimum size areas necessary for effective conservation. For example, an area of at least 55 km² has been suggested as a general target for conservation management at any one site, if biodiversity conservation objectives, including principles related to distinctiveness, integrity, naturalness, dependency, and diversity are to be achieved. However, there is no doubt that the size of this complex meets the requirements of even the most demanding and wide-ranging species in the ecoregion.

b. Comparative analysis

The DPKY-FC is one of the largest and most comprehensive representations of Thailand's biodiversity richness, particularly its variety of tropical forest eco-systems including:

(i) Evergreen Forest

- Moist Evergreen Forest
- Dry Evergreen Forest
- Hill / Lower Montane Forest
- Corypha Palm Community (*Corypha lecomtei*)
- Escarpments
- Figs
- Orchids
- Tree Ferns

(ii) Dipterocarp / Deciduous Forest

- Mixed Deciduous Forest
- Dry Dipterocarp / Deciduous Forest
- Savanna /Grassland

(iii) Karst

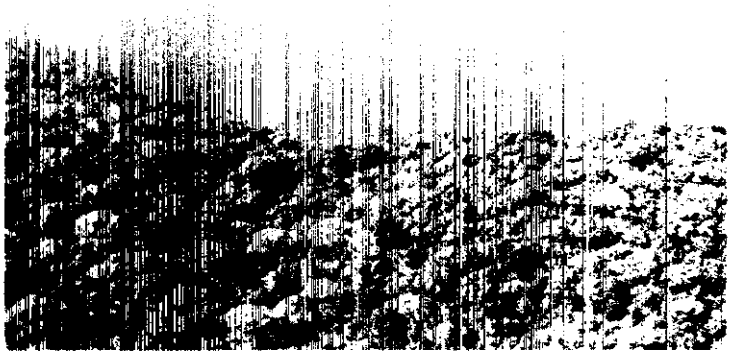
(iv) Riverine Forest

These forest types and associated species of birds and animals are a consequence of the evolutionary history of the complex including the formation and uplift of the earth's crust. This formed a fault zone along the geologically linear feature that has been used to define the biogeographic region that is identified as the Korat Plateau. The habitats within this part of the ecoregion contain floral and faunal assemblages that are as complete as are currently known to exist anywhere in the Indochina bio-region.

In addition, the DPKY-FC is noteworthy and ecologically significant in comparison to other sites in the region for the following reasons:

- ❖ It contains a very wide range of habitats ranging from the moist evergreen forest of Khao Yai NP through to the drier and mixed Dipterocarp / Deciduous forests that make-up the eastern part of the complex;
- ❖ The complex is large (the total size of the area is 615,500 ha. [3]) and topographically varied.
- ❖ The complex is under increasingly effective management with conservation management plans in place for the majority of units;
- ❖ A general strategic management plan for the complex has been drafted. This is in contrast to some other areas in Indochina where conservation is not high on the agenda of some countries, protected areas are a relatively low priority, and PA management capacity and expertise is insufficient to cope with increasingly complex management demands;
- ❖ In comparison to Thailand's only other natural World Heritage Site, (Huay Kha Khaeng - Thung Yai located on Thailand's western border with Myanmar), the DPKY-FC contributes important additional ecosystems, species and habitats, in particular areas of lowland evergreen forests.

It is, therefore, reasonable to assume that a comprehensive approach to the management and protection of the complex has the potential to make a significant conservation contribution to both the biogeographical realm as well as global conservation objectives.



Photograph 2: *The complex is ecologically significant as it contains a very wide range of habitats ranging from moist evergreen forests to the drier Dipterocarp / Deciduous forests that make-up the eastern part of the complex. As well as distinctive biodiversity, the complex is large and topographically varied. (Photo © Bruce Jefferies)*

3 For comparative purposes two icon World Heritage sites in the United States cover less area than this, i.e. Yosemite National Park at 308,000 ha. and Grand Canyon National Park 490,000 ha. respectively.

c. Integrity

The overall integrity of the DPKY-FC is represented, in the first instance, by the legal basis for the five units that make-up the complex.

According to Thai law (National Parks Act 1961) a national park is defined as *"any land or natural feature which is of interest to be maintained with a view to preserving it for the benefit of public education and pleasure, with the provision that such land is not owned or legally possessed by any person other than a public body".*

Prohibited activities are defined in Chapter 3 of the Act and provide for comprehensive habitat and wildlife protection, but with provision for recreation and tourism (Faculty of Forestry 1987). Protected areas in Thailand, according to generally accepted criteria, have a number of basic functions, including:

- preservation of biodiversity and ecosystems
- protection of life support systems
- research
- education
- recreation and tourism

The park management professionals responsible for maintaining the integrity of the PA network are, as are their counterparts in most places in the world, facing a formidable number of resource management and socio-economic based issues and challenges. These include:

- encroachment
- hunting
- illegal logging
- harvesting of Non-Timber Forest Products (NTFP)
- organized and opportunistic wildlife poaching
- alteration of natural fire regimes
- habitat degradation and / or disturbance, and
- fragmentation

The DNP, with positive and active support from a number of other agencies including the national and international NGO community, police and ranger units, customs officials, and in some cases the army, are using a variety of strategies and have undertaken a number of interventions to address these problems. These strategies include relocation of intrusive elements, initiation of local development projects to help address poverty issues (which in some instances are linked to illegal activities), educational programmes both within the units that makeup the complex as well as surrounding communities, employment of local villagers (and in some instances past poachers) as park guards, de-gazetting of areas with limited conservation value for use by local villagers (this applies particularly in Thap Lan National Park), and human capacity development and training.

There is evidence that these strategies are progressively easing pressures and are helping to conserve natural resources but it is also realized that this process will take considerable time. It is anticipated, within the highest levels of government in Thailand, that the general integrity of the complex will progressively improve, and that World Heritage status will provide additional and creditable support to existing and ongoing national and regional conservation efforts.

Other threats to the integrity of the complex include the presence of roads that currently bisect the complex at various points along a north / south axis. Of particular concern is Highway 304, which links Khorat and Kabin Buri. This busy arterial road severs a number of natural migration routes that, prior to road construction, provided connectivity between eastern and western units of the complex, in particular the corridors that link Khao Yai and Thap Lan National Parks. These links are vital, as they allow wildlife to move from other parts of the complex during seasonal migrations or, in the case of carnivores, in pursuit of prey.

Photograph 3: *A road bisecting the complex along the north/south axis is one of several threats to the integrity of the complex. (Photo © Surachet Chettamart).*

The progressive reduction of natural habitats into small isolated patches has a severe and detrimental impact on biodiversity. It is also of significance that the primary reason units within the DPKY-FC were designated as a national park was to maintain biodiversity conservation objectives.

Wildlife corridors can be planned and developed to form a linear habitat to connect two or more significant habitat areas. A number of studies have shown that wildlife corridors contribute to a reduction of the detrimental impacts of habitat fragmentation. Two significant units within the DPKY-FC (Thap Lan and Khao Yai National Parks) are vitally important for the conservation of several globally and nationally significant and threatened species of large mammals, such as gaur and banteng.

Using the results from surveys undertaken in Thap Lan and Khao Yai National Parks (Mahan *et al.* 2003), it is suggested that the establishment of effective wildlife corridors between these two units of the DPKY-FC would add considerably to the potential for this area to become not only one of the largest tracts of natural habitat in Thailand, but to also add considerably to the complex's overall integrity. At least two wildlife corridors could be constructed along Highway 304: (i) Between 27-29 km, which would facilitate the movement of a variety of mammals such as tigers, Asiatic black bears and Asian elephants. Several exclusion fences would be necessary to funnel animals into these corridors as well

as to reduce road mortalities. (ii) Between 42-48 km, a series of culverts could be constructed in the other potential corridor area. This would complement the underpass/ overpass options noted above, and facilitate the movement of smaller mammal species.

The Royal Thai Government is currently studying a range of options that have been designed to help ensure that the connectivity of two of the important units that make-up the complex is maintained and, where possible, enhanced.

As well as infrastructure, it will be necessary to address human impacts and disturbance in and around the proposed corridors. Activities such as illegal hunting and logging, annual burning of the grassland area and the proximity of Highway 304 are likely responsible for the low number of mammal species currently found within the proposed corridor. These influences will need to be managed effectively to ensure that a variety of animal species use the wildlife corridors.

Photograph 4: *Options have been developed to help ensure that the connectivity of Khao Yai and Thap Lan NPS is maintained. When these are implemented they will significantly add to the integrity of the complex. (Photo © Bruce Jefferies)*

d. Criteria under which the inscription is proposed

Criterion I: Be an outstanding example representing major stages of the Earth's history, including the record of life

During the period now recognized in geological time definitions as the *Himalayan orogeny* some 60 million years ago, the Indian subcontinent moved north into Asia. Topography was heavily modified and changed as geological pressures increased tilting the southern rim of the Korat Plateau higher and creating a fault zone. This uplift was followed by progressive mountain building activity caused by the ongoing movement of these two sub-continental plates, which produced the heat that melted the Earth's crust and produced magma, creating a volcanic belt (MacKinnon and MacKinnon 1992). A subsequent up-thrust occurred 20 million years ago, and during this period mountain building activity was accompanied by considerable faulting and volcanic activity that progressively shaped the present form of Indochina. A final period of mountain building activity occurred between the Pliocene and the Pleistocene about 3 million years ago, with further faulting and the creation of rift valleys and horizontal offsetting of various segments of the land surface.

These dynamic and ongoing geological processes have resulted in the formation of an abrupt escarpment that runs, virtually unbroken, from Khao Yai National Park in the west through the other protected area units that make up the DPKY-FC, all the way to the eastern end of the Dongrak Range in Cambodia, a distance of more than 200 kms. This distinctive escarpment, rising in places to some 500m, represents an active and ongoing global geological process. The DPKY-FC is, as a result, made-up of several correlated geological and geographically related attributes that embrace a range of natural processes including plate tectonics, climate, plant and animal distribution, in addition to a rich history of human existence.

Criterion II: Be an outstanding example representing significant on-going ecological and biological processes in the evolution and development of terrestrial ecosystems and communities of plants and animals[4]

Two related factors are considered to be of importance here. First is the hydrological significance of the complex. Khao Yai, at the western end of the protected area complex receives the most rainfall, probably as much as 3,000 mm per year in some areas. It has a significant headwater function, with five major watersheds, one of which, the Mae Nam Mun provides water and life to the driest part of Thailand, the Northeast, before becoming a tributary of the Mekong and contributing to that important river. There is an intricate feedback loop between the altitude of Khao Yai, the presence of moist, evergreen forest and the precipitation. Although most rain is brought by the monsoons in May through October, even in the dry season the forests remain humid as the cooler air condenses on the leaves of the forest.

To the east of Khao Yai, through to Thap Lan, Pang Sida and ultimately Ta Phraya, these processes change. The altitude of the scarp gently declines from

4 Criterions 3 and 4 are taken from Chettamart *et al.* 1997.

west to east. The distance from the rain-bearing monsoons increases. Precipitation amounts decline steadily to under 1,000 mm. The forests become increasingly deciduous, and canopies more open.

Inclusion of this complex in World Heritage would help protect and emphasize the important changes in the relationships between topography, climate and vegetation. As global climatic change becomes more pronounced, protection of virtually uninterrupted complexes that contain such gradients will become increasingly important for conservation. No other protected area complex within this biogeographical zone contains such a well-marked, longitudinal gradient.

The second factor that needs to be mentioned within this context is the size and diversity of the ecological unit being proposed. Processes such as the relationships described above require large areas to remain intact. Many of the species contained within the area (e.g., hornbills, tigers, and elephants) require large areas of habitat that are fast disappearing elsewhere. Protection of this complex of parks provides sufficient habitat to help conserve biodiversity into the future.

Criterion III: Be an outstanding example representing a significant aesthetic experience

The entire escarpment provides a distinctive and highly aesthetic landscape feature. Khao Yai, due to its topography and higher precipitation has numerous spectacular waterfalls, as can be seen in the accompanying photographic documentation. The waterfalls form the main attraction for many of Khao Yai's 700,000 visitors per year (DNP 2003). Nature observation is also an important aesthetic experience. Khao Yai provides perhaps the best opportunities in Thailand to see many large, spectacular species, such as hornbills, tigers, sambar deer, gibbons, and elephants. Park management has also sought to enhance these opportunities through diverse management strategies, including the provision of viewing towers in selected areas. Testimony to the outstanding aesthetic attraction of the area is the numerous expensive resort hotels that now ring the park.

The other units also have outstanding aesthetic attractions. Pang Sida, for example, is noted for its rugged topography and one of the very few, and the best, remaining opportunities in Thailand to see Siamese crocodiles (*Crocodylus siamensis)* in the wild. In Pang Sida, Thap Lan, and Ta Phraya, opportunities to view two of the four species of wild cattle, gaur and banteng are also possible.

Criterion IV: Contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science and conservation.

Perhaps the most outstanding contribution of the protected area complex nominated is in its current and future contribution to the conservation of an assemblage of tropical forest species that are coming under increasing pressure elsewhere. The complex contains some of the largest remaining protected populations of many species in the biogeographical realm. Of particular note are the large populations of Asian elephants (*Elephas maximus*) and tigers (*Panthera tigris*). The site is also known to contain populations of Malayan sun bears (*Helarctos malayanus*), Asiatic black bears (*Ursus thibetanus)*, dholes (*Cuon alpinus)*, clouded leopards (*Neofelis nebulosa*), leopards (*Panthera pardusl)*, gaur,

and banteng, although relatively little is known about their populations. Both gaur and banteng are on the international list of threatened animal species, and both sub-species found in the area are of the rarest sub-species. Preliminary estimates suggest some 150 gaur and 10 banteng in Khao Yai and Pang Sida (Srikosamatara and Suteethorn 1995). Khao Yai is also the only site where the white-handed (*Hylobates lar*) and pileated (*Hylobates pileatus)* gibbons overlap in range and produce cross-bred offspring, and is hence of considerable scientific interest. Substantial populations of other primates such as pig-tailed macaques (*Macaca nemestrina*), long-tail macaques (*M. fascicularis*), slow loris (*Nycticebus coucang)* and silvered langurs (*Presbytis cristata)* also remain.

The discovery of the relict population of crocodiles in Pang Sida in 1992 when they were thought to be extinct is not only important in its own right, but also provides some indication of the species that may be re-discovered when biological inventories of the complex are completed. There have been reported sightings of the footprints of several species, such as the wild water buffalo (*Bubalus bubalus)* in the lowland forests of Pang Sida that await confirmation.

The nominated site also extends west from the Dong Rak Range in Cambodia, the site where the kouprey (*Bos sauveli*) was first discovered. Although it has been suggested that the kouprey may already remain within the complex, this is considered a somewhat remote possibility. However, if populations of the kouprey are re-discovered (e.g. see Olivier and Woodford 1994), the large amount of habitat provided by the nominated site could provide ideal conditions for a re-introduction project. The park complex is directly adjacent to the Banteay Chmor protected landscape in Cambodia. Designation of the Khao Yai complex as World Heritage will help encourage neighbouring countries to extend full protection measures to adjacent sites.

Full inventories of bird populations have also yet to be undertaken. Significant populations of hornbills still remain, and, in Khao Yai alone, there are some 34 threatened bird species. The complex also contains 23 species of threatened or endangered mammal species. Given the size of the complex, even the most wide-ranging and space-demanding species should be well enough protected to ensure that populations will continue to flourish into the future.

Other characteristics of the complex that are of noteworthy attention include the following:

- The DPKY-FC contains samples of all key habitats that characterize the six biogeographic regions making up this part of the Biogeographic Realm, and includes all major rainforest habitat types of north-eastern Thailand.
- At least 2,500 plant species out of 15,000 plant species in Thailand have been identified in various habitats within DPKY-FC with as many as 16 species identified as endemics (Appendix 2).
- Habitat variation also harbors a high diversity of fauna (> 805 species) with an estimated 112 mammals identified, including threatened mammal species of outstanding universal value from both a scientific and conservation perspective.
- Important habitats for key bird species are also contained within the complex with some 392 bird species identified, including 3 Thailand endemic species and 6 threatened species under the IUCN Red List of Threatened Species.

- Some preliminary surveys on herpetofauna reveal that the complex harbors at least 205 species of reptiles and amphibians, with 9 species identified as endemics. Limited information is available on fresh water life including fish and insect fauna and it appears that little research has been conducted in the complex.

Summary

Inclusion of the DPKY-FC on the World Heritage list would recognize:

- ❖ the importance of a large, in the main, contiguous protected area that is comprised of five units: 4 areas designated as National Parks and one Wildlife Sanctuary.
- ❖ that no other protected area complex within the biogeographical zone contains a comparable longitudinal escarpment that represents global geological process.
- ❖ and emphasize the contention that as global climate change becomes more pronounced, efforts to protect the inter-relationship between topography, climate and vegetation is an increasingly important imperative.
- ❖ that the protection of protected area complexes as Natural World Heritage Sites is increasingly important and would make a significant contribution to the quality and consistency of integrated site management and protection endeavors.
- ❖ that designation of the Dong Phayayen - Khao Yai Forest Complex as World Heritage will also help encourage neighboring countries to extend full protective measures to adjacent sites.

Photograph 5: *The distinctive rare species Thismia mirabilis found in the Dry evergreen forest of Dong Phayayen – Khao Yai Forest Complex (Photo © Songsri Unjit).*

3. Description

a. Description of the property

(i) Dong Phayayen - Khao Yai Forest Complex

The Dong Phayayen - Khao Yai Forest Complex encompasses a large, mainly contiguous area comprising five legal protected area units: four areas designated as National Parks under the National Parks Act 1961 (B.E. 2504) and one Wildlife Sanctuary designated under the Wild Animals Reservation Protection Act 1960 (B.E. 2503).

Some habitat parameters and a general description of the units that make-up the Dong Phayayen - Khao Yai Forest Complex are outlined in Box 1.

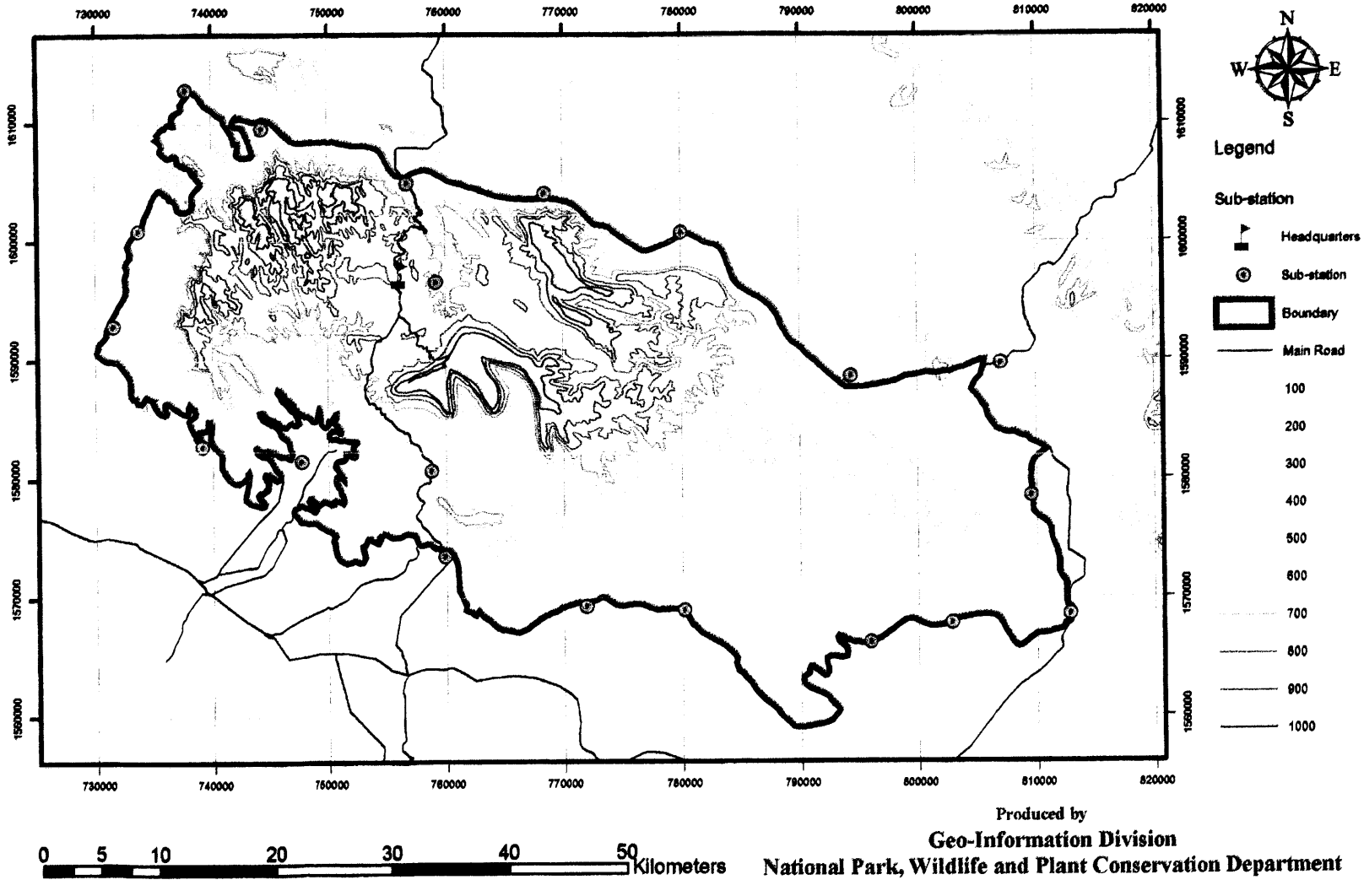
Box 1: Some habitat parameters and a general description of the units that make-up the Dong Phayayen - Khao Yai Forest Complex

Unit Name and Date Established	Elev. Range (m)	Habitats	Area (ha.)
Khao Yai National Park Est. 1962	100-1351	Hill evergreen	3,500
		Evergreen (>600m)	80,400
		Evergreen (<600 m)	101,300
		Mixed Dipterocarp / Deciduous	18,600
		Scrub/deforested/ grassland	13,000
Total area			**216,800**

The topography of this unit, which can be regarded as the "biological nucleus" of the proposed DPKY-FC World Heritage site, is generally rugged and mountainous in the west with gradually reducing slopes eastward and southwards (Map 4). The highest mountain, Khao Rom is 1350m a.s.l. and approximately 7,500 ha. (3.5 % of the park area) lies above 1000 m. This unit is the only one within the DPKY-Forest Complex to include montane habitats. Some small areas of limestone are located in the north-west part of the unit.

The northern parts of the park are drained by the Lam Takong, Lam Phra Phloeng and other tributaries of the Mun River while the southern portion drains (from west to east) via the Nakhon Nayok, Khlong Nong Kaeo and Sai Yai Rivers and east of these, via the Lam Phraya Than. The Sai Yai as well as other rivers and streams in the west are generally steep and rapid-flowing, often running through gorges for part of their length.

Map 4 : Topographical features, boundaries and sub-stations of Khao Yai National Park



The Park contains over 2,000 plant species including the valuable incense wood Mai Krisana *(Aquilarea crassna)*, a species under considerable threat from organized as well as subsistence based illegal harvesting.

The entire area is swathed by evergreen or semi-evergreen forest, with small areas of mixed Dipterocarp / Deciduous forest around the northern margins. These forest types are considered endangered in Thailand.

Much of the forest is tall, good-quality primary forest, with massive trees that are reasonably evenly divided between foothills (<600 m) and sub-montane (600-1000 m) forest. Some areas in the foothills zone, such as along the southern access road from the headquarters descending to Prachinburi, have been logged and the transition to a montane facies starts well below the 1000 m contour. This results in some areas, such as around the park headquarters as well as areas further to the west, showing some of the characteristics of a montane forest.

Khao Yai provides a refuge to several globally and regionally important populations for a number of species including elephant and tiger. Recent surveys show that there are as many as 150-200 elephants in Khao Yai.

A total of 72 mammal species, including 18 endangered species have been recorded. Survey records indicate that as many as 300 species of birds have been recorded, including important populations of rare species such as great hornbills (*Buceros bicornis*).

Unit Name and Date Established	**Elev. Range (m)**	**Habitats**	**Area (ha.)**
Thap Lan National Park Est. 1981	100 - 992	Dry Evergreen	97,800
		Moist Evergreen	33,400
		Mixed Dipterocarp / Deciduous	7,900
		Dry Dipterocarp	6,500
		Corypha palm community	700
		Forest plantation (for rehabilitation)	4,300
		Scrub/deforested/ grassland	71,200
		Water body	1,800
Total area			**223,600**

Most of this unit is comprised of disturbed and regenerating semi-evergreen forest, with some deforested and scrubby areas and plantations.

Small areas of dry dipterocarp forest are present in the lower elevations at the extreme northern boundary and it is assumed that this forest type was probably once considerably more extensive outside the boundary but has been progressively cleared for agriculture.

Most of the park's water courses drain into the Mae Nam Mun, apart from a small area in the south-west, (near the park headquarters) which drains into the Bang Pakong River.

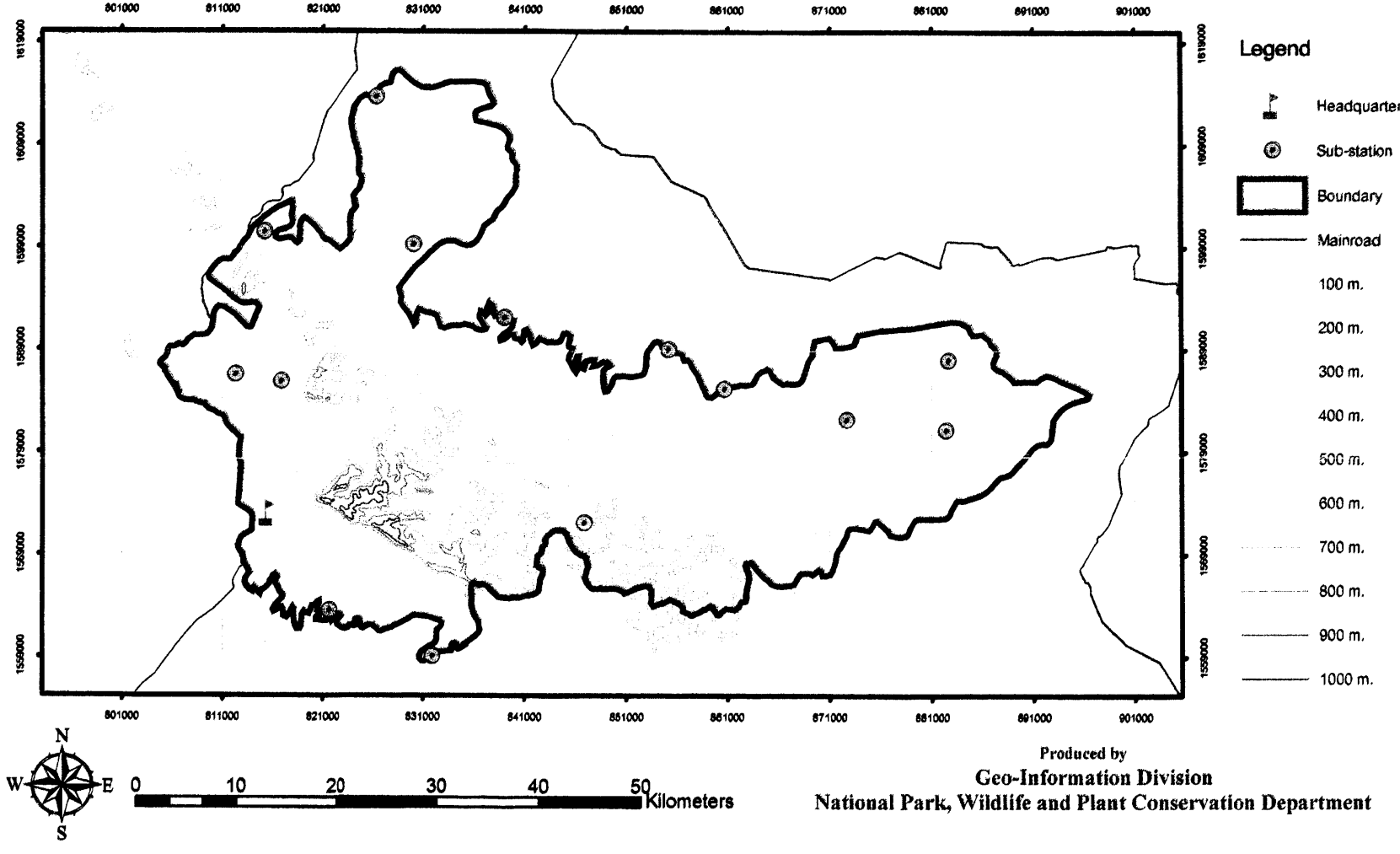
Although some of the forest area has in the past been degraded, the unit provides a sanctuary for a recorded 76 mammal species including elephant, tiger, gibbon and banteng, and is regarded as the remaining home of the corypha palm (also known as the Lan Palm - hence the park's name Thap Lan or camp near the Lan palms) on whose leaves Buddhist sermons were originally inscribed.

This unit contains large areas between 300-500 m asl. and is regarded as a valuable site for the conservation of a wide range of lowland biodiversity (Map 5).

Survey records indicate that as many as 284 species of birds have been found in the unit. Of the 76 mammal species recorded in the unit, about 20 are considered endangered.

Unit Name and Date Established	**Elev. Range (m)**	**Habitats**	**Area (ha.)**
Pang Sida National Park Est. 1982	70 – 849	Dry Evergreen	48,300
		Moist Evergreen	24,700
		Mixed Dipterocarp / Deciduous	5,200
		Forest plantation (for rehabilitation)	400
		Scrub/deforested/ grassland	5,760
		Water body	40
Total area			**84,400**

Map 5 : Topographical features, boundaries and sub-stations of Thap Lan National Park



The infrastructure in Pang Sida NP includes a well-appointed Park HQ and 11 Sub-stations. The park was initially established under the Royal Initiatives Project in 1978 that emphasized watershed and forest protection as well as provision of recreation opportunities under the jurisdiction of the provincial forestry office. Survey information revealed the valuable forests, wildlife, and recreation features of the area and the national park was declared in 1982.

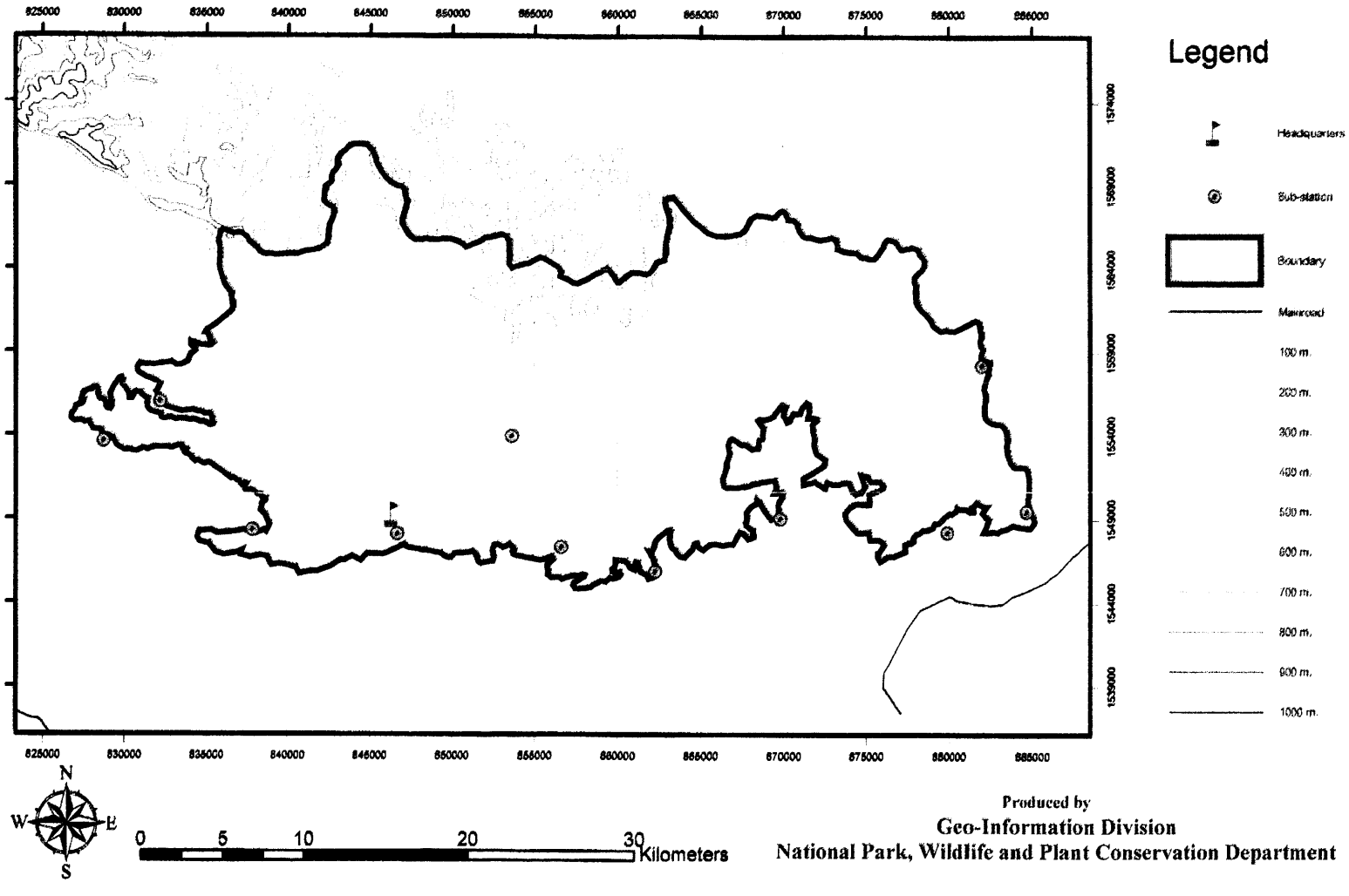
The Phanom Dongrak scarp is at its broadest in western areas and includes parts of the park (Map 6). These provide south-facing hill slope habitats and environments. A total of 238 bird species and 85 mammals have been recorded, including 24 endangered mammal species.

This unit is noteworthy as it provides opportunities to observe two species of wild cattle, gaur (*Bos gaurus*) and banteng (*B. javanicus*) in the wild. The re-discovery of a relict population of crocodiles in 1992 and reported sightings during the formulation phase for this nomination (Prawat Vohandee, Superintendent Khao Yai NP, *pers. comm.*) provide an indication of species that may be re-discovered when further biodiversity inventories are undertaken. Sightings of animal sign, such as scat, tracks and footprints of several species including wild water buffalo (*Bubalus bubalus)* in the lowland forests of the site await definitive confirmation. Prehistoric fossils including dinosaur bones have been uncovered in areas on the southern edge of Pang Sida NP (Prawat Vohandee and Saran Jaisaad, *pers. comm.*).

The park is an important component of the total complex as it has common boundaries with Thap Lan NP to the north, and Ta Phraya NP and Dong Yai Wildlife Sanctuary on its eastern border. The natural ridgeline boundary between Thap Lan NP and Pang Sida NP provides a high level of connectivity.

Unit Name and Date Established	**Elev. Range (m)**	**Habitats**	**Area (ha.)**
Ta Phraya National Park Est. 1996	120-562	Dry Evergreen	30,900
		Moist Evergreen	12,100
		Mixed Dipterocarp / Deciduous	600
		Forest plantation (for rehabilitation)	800
		Scrub/deforested/ grassland	14,800
		Water body	200
Total area			**59,400**

Map 6 : Topographical features, boundaries and sub-stations of Pang Sida National Park



The Ta Phraya unit spans two discrete landforms (Map 7):

(i) uplands at roughly 280–300 m elevation on the rim of the Khorat Plateau, in the northwest,

(ii) lowlands along the entire eastern part of the park including the valley of the Lam Sathon (at roughly 120 m and including the park headquarters area).

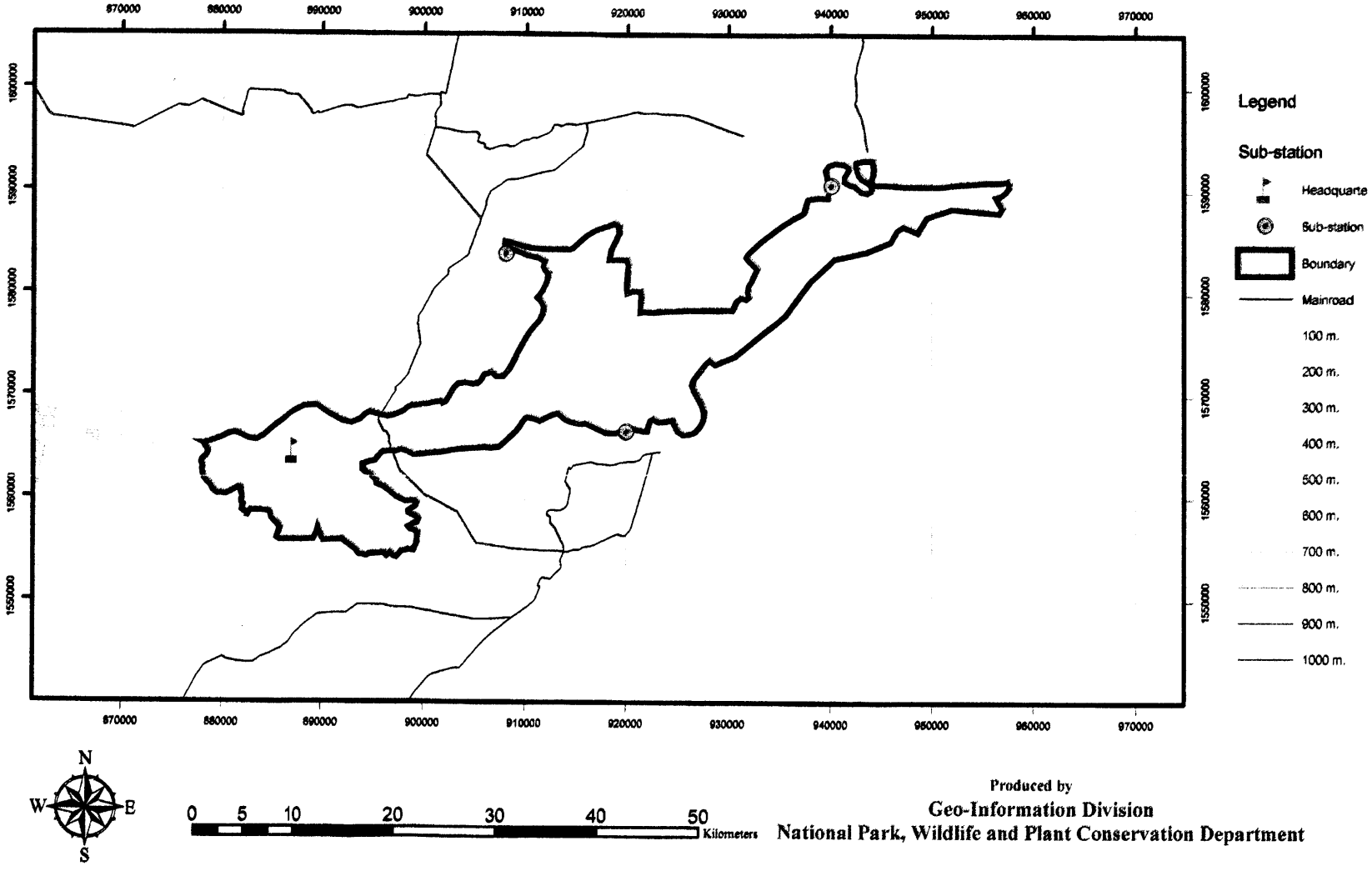
A distinctive scarp, that drops approximately 200 m within a distance of about 1 km, clearly delineates these two zones. The lowland area drains via the Lam Saton and other smaller waterways into the Tonle Sap Lake of Cambodia, while the uplands drain into the Mun River.

The vegetation, which consists mainly of semi-evergreen forest and scrub has, over an extended period, been impacted by human use. A few areas outside the present boundary, mainly lowland areas to the east, support dry dipterocarp trees among rice paddies and other cultivation. As far as is currently known, no significant areas of dry dipterocarp forest are present within the park.

Preliminary investigations indicate the importance of this unit as habitat for both gaur and banteng. This unit also plays a critical role in linking the complex to the Phanom Dongrak Range and associated protected areas in adjoining Cambodia.

Unit Name and Date Established	**Elev. Range (m)**	**Habitats**	**Area (ha.)**
Dong Yai Wildlife Sanctuary Est. 1996	230-685	Evergreen (>600m)	7,900
		Evergreen (<600m)	14,200
		Dry Dipterocarp	3,100
		Scrub/deforested/ grassland	6,100
Total area			**31,300**

Map 7 : Topographical features, boundaries and sub-stations of Ta Phraya National Park



This unit was gazetted in 1996 under the Wild Animals Reservation Protection Act 1960 (B.E. 2503), and is the only Wildlife Sanctuary included in the nomination.

It is, however, regarded as an important component of the complex as it has common boundaries with three of the other units in the complex, Thap Lan NP to the north & west, Pang Sida NP to the southwest, and Ta Phraya NP on its the south border (Map 8).

The terrain in this unit is of generally low hills interspersed with relatively large tracts of grasslands. Dry evergreen forest is the dominant vegetation type with small patches of dry dipterocarp forest at lower elevations. Parts of the unit were logged prior to its gazettement and substantial secondary growth has taken place.

A total of 20 mammal species, including 13 endangered species have been recorded. Species recorded in the sanctuary include elephant, tiger, banteng, and gaur. As well, a number of ungulate species are residents. Kouprey are also believed to have once roamed in this area but there have been no recent sightings or reports. Survey records indicate that as many as 200 species of birds have been found in the unit.

2,700 ha. of eucalyptus plantation have been established in adjoining areas by five separate concessionaires, but it is anticipated that all plantation contracts will be terminated by 2009 and annexed into the unit.

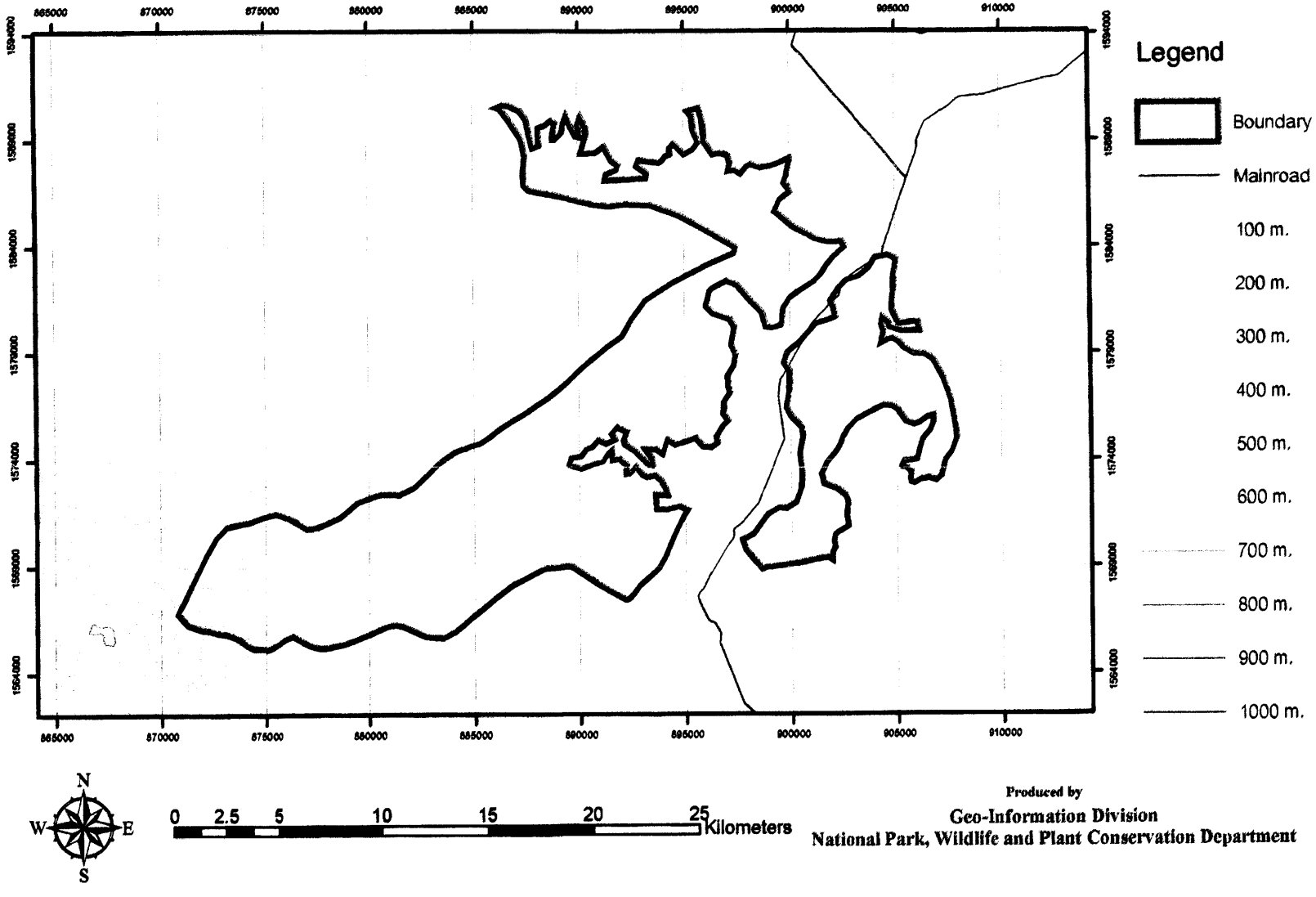
Sources: *Data for the box was extracted from Center for Conservation Biology, n.d. and Wildlife Conservation Society Thailand Programme, WCS, 2003.*

(ii) Physical attributes

The whole of the DPKY Forest Complex is situated along the western end of the Phanom Dongrak range. This distinctive landform delineates the southern margin of the Khorat Plateau. For part of its length, mainly to the east of the DPKY Forest Complex, and including some 50km of the eastern boundary of Ta Phraya National Park, the Phanom Dongrak range demarcates the international boundary between Thailand and Cambodia.

The extreme western portion of the DPKY Forest Complex, which includes the western part of Khao Yai National Park, is steep and rugged and lies on Permo-Triassic igneous rocks of the Khao Yai Volcanics Group. South and eastwards this formation is progressively replaced by Jurassic calcareous and micaceous siltstones of the Phu Kradeung formation and sandstones of the Phra Wihan Formation, Khorat Group.

Map 8 : Topographical features and boundaries of Dong Yai Wildlife Sanctuary



In the eastern part of the complex, covering the entire area of Thap Lan National Park and the upland part of Ta Phraya National Park and spread along the rim of the Khorat Plateau, an area of quartz-rich sandstone of the (Jurassic) Phra Wihan formation can be clearly identified (Geological Survey Division 1984 and 1998).

Lowlands at the foot of the Phanom Dongrak scarp, including the area around the Ta Phraya National Park headquarters, comprise quaternary colluvial deposits, in which rock fragments are mixed among sandy gravel and clays (Geological Survey Division 1998). The Phanom Dongrak scarp is at its broadest in western areas and includes large parts of Khao Yai, Thap Lan and Pang Sida National Parks. Consequently, these areas provide the largest south-facing hill slope habitats and environments in the complex. In Ta Phraya National Park the Phanom Dongrak range narrows abruptly and there is a comparatively steep and rapid descent of some 200-300 m from the rim of the Khorat Plateau to the plains.

Areas on the northern slopes of the Phanom Dongrak Range are, in the main, drained by the Mun River (a tributary of the Mekong); catchments in the southern parts of the DPKY Forest Complex drain mostly via the Prachinburi River into the Bang Pakong River, which enters the Gulf of Thailand. The DPKY Forest Complex receives approx. 1000-3000 mm rainfall per year of which approximately 80 percent falls during the S/W Monsoon (from May to October).

The DPKY Forest Complex represents an important transition zone between the Lower Central Plain, which has a generally higher rainfall, and the drier northeast with the south-facing slopes of the Phanom Dongrak Range almost certainly receiving more precipitation than the north slopes. Rainfall varies considerably with topography and elevation and generally speaking, higher elevations receive greater rainfall than lower elevations.

The highest mountains, which rise to 1350 m, are located in Khao Yai National Park, which makes up a significant portion of the western extremity of DPKY Forest Complex.

(iii) Biological attributes

(a) Habitats

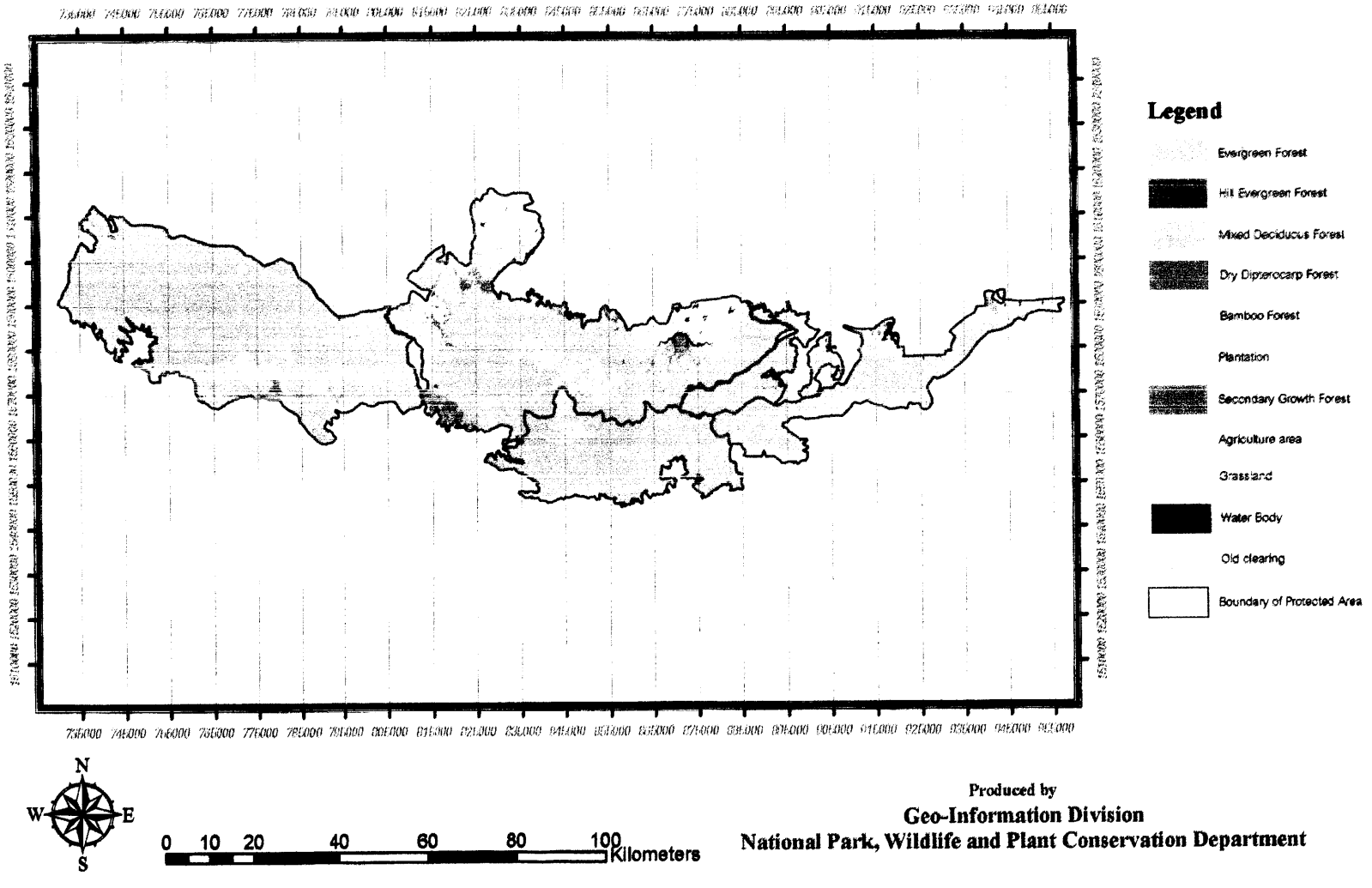
The main habitat types are shown in Map 9. Four types, or sub-types, have been identified as being of special significance: Evergreen Forest, Diptercarp/Deciduous Forest, Karst Ecosystems, and Riverine Ecosystems.

- **Evergreen Forest**

This forest type covers the largest geographic area and provides a wide range of ecosystems and habitats. Three major forest types make up the evergreen forest areas found within the complex: Moist Evergreen, Dry Evergreen, Hill Evergreen/ Lower Montane, as well as a community of Corypha Palms in Thap Lan NP. This combination provides significant botanical diversity.

Evergreen Forest ecosystems include several significant (some globally) target mammal and bird species for conservation as shown in Tables 3 and 4.

Map 9 : Main habitat types of the Dong Phayayen-Khao Yai Forest Complex



Produced by
Geo-Information Division
National Park, Wildlife and Plant Conservation Department

Table 3: Significant target mammal species for conservation of Evergreen Forests

Common Name	Scientific Name	Thai Status	IUCN Status	CITES
Asian Elephant	*Elephas maximus*	EN	EN	App I
Asiatic Black Bear	*Ursus thibetanus*	VU	VU	App I
Asiatic wild dog	*Cuon alpinus*	VU	VU	App II
Barking Deer	*Muntiacus muntjak*			
Black giant squirrel	*Ratufa bicolor*	Target[1]		
Common Porcupine	*Hystrix brachyuran*	Target[1]		
Crab-eating Macaque	*Macaca fascicularis*		LR/NT	App II
Gaur	*Bos gaurus*	VU	VU	App I
Large Spotted Civet	*Viverra megaspila*	VU	VU	
Mousedeer	*Tragulus napu*	EN	EN	
Pig tailed Macaque	*Macaca nemestrina*	Target[1]	VU	App II
Pileated Gibbon	*Hylobates pileatus*		VU	App I
Serow	*Naemorhedus sumatraensis*	Target[1]		
Stump-tailed Macaque	*Macaca arctoides*	Target[1]	VU	App II
Sun Bear	*Ursus malayanus*	Target[1]		
Tiger	*Panthera tigris*	VU	EN	App I
White-handed Gibbon	*Hylobates lar*	VU	LR/NT	App I

[1] Species identified as *Conservation Targets* by the Department of Conservation, Faculty of Forestry, Kasetsart University.

Sources: *Department of Conservation 2003, Round and Lynam 2003*

Table 4: Globally and/or nationally threatened or near threatened bird species of Evergreen Forests

Common Name	Scientific Name	Thai Status	IUCN Status	CITES
Black Eagle	*Ictinaetus malayensis*	NT		
Brown Hornbill	*Anorrhinus tickelli*	At Risk	NT	App II
Brown-rumped Minivet	*Pericrocotus cantonensis*	NT	NT	
Coral-billed Ground Cuckoo	*Carpococcyx renauldi*	VU	NT	
Great Hornbill	*Buceros bicornis*	At Risk		App I
Green Imperial Pigeon	*Ducula aenea*	VU		
Green-backed Flycatcher	*Ficedula elisae*	At Risk		
Javan Frogmouth	*Batrachotomus javensis*	VU		
Jerdon's Baza	*Aviceda jerdoni*		NT	App II
Malayan Night Heron	*Gorsachius melanolophus*	NT		
Mountain Hawk Eagle	*Spizaetus nipalensis*	NT		App II
Oriental Pied Hornbill	*Anthracoceros albirostris*	NT		
Pale-capped Pigeon	*Columba punicea*	VU	VU	
Pompadour Pigeon	*Treron pompadora*	VU		
Siamese Fireback	*Lophura diardi*	VU	VU	
Spot-bellied Eagle Owl	*Bubo nipalensis*	At Risk	NT	App I
White-bellied Pigeon	*Treron sieboldii*	VU	NT	
Wreathed Hornbill	*Aceros undulates*	NT		

Source: *Round and Lynam 2003*

- **Dipterocarp / Deciduous Forest**

Dipterocarp / Deciduous Forests also provide a wide range of ecosystems and habitats and in many instances, species will utilize both Evergreen and Dipterocarp / Deciduous Forests. Characteristics of Dipterocarp / Deciduous Forests include generally lower precipitation, sandy soils, and vegetation species that shed their leaves and are heavily influenced by fire. Three sub-categories of forest combine to make up Dipterocarp / Deciduous Forests in the complex: Mixed Deciduous, Dry Dipterocarp and Savanna /Grassland.

Globally and/or nationally threatened or near threatened mammals that have a preference for Dipterocarp / Deciduous Forests ecosystems are listed in Table 5. Globally and/or nationally threatened or near threatened bird species that are known to inhabit this ecosystem are listed in Table 6.

Table 5: Globally and/or nationally threatened or near threatened mammal species of Dipterocarp / Deciduous Forests

Common Name	Scientific Name	Thai Status	IUCN Status	CITES
Asiatic wild dog	*Cuon alpinus*	VU	VU	App II
Banteng	*Bos javanicus*	CE	EN	
Clouded leopard	*Pardofelis nebulosa*	EN	DD	App I
Crab-eating Macaque	*Macaca fascicularis*		LR/NT	
Leopard cat	*Felis chaus*	Target[1]	VU	App I
Marbled cat	*Pardofelis marmorata*	EN	DD	App I
Serow	*Naemorhedus sumatraenisis*	Target[1]	VU	App I
Stump-tailed Macaque	*Macaca arctoides*	Target[1]	VU	App II
Tiger	*Panthera tigris*	VU	EN	App I

[1] Species identified as *Conservation Targets* by the Department of Conservation, Faculty of Forestry, Kasetsart University.

Sources: *Department of Conservation 2003, Round and Lynam 2003*

Table 6: Globally and/or nationally threatened or near threatened bird species of Dipterocarp/ Deciduous Forests

Common Name	Scientific Name	Thai Status	IUCN Status	CITES
Black-headed Woodpecker	*Picus erythropygius*	NT		
Blossom-headed Parakeet	*Psittacula roseate*	Not listed*		
Golden-crested Myna	*Ampeliceps coronatus*	NT		
Great Slaty Woodpecker	*Mulleripicus pulverulentus*	NT		
Green Peafowl	*Pavo muticus*	EN	VU	App II
Hill Myna	*Gracula religiosa*	NT		
Orange-breasted Pigeon	*Treron bicincta*	NT		
Oriental Pied Hornbill	*Anthracoceros albirostris*	NT		
Pompadour Pigeon	*Treron pompadora*	VU		
Rufous-bellied Woodpecker	*Dendrocopos hyperythrus*	VU		
Rufous-winged Buzzard	*Butastur liventer*	VU		
Spot-bellied Eagle Owl	*Bubo nipalensis*	At Risk	NT	App I
Streak-throated Woodpecker	*Picus xanthopygaeus*	VU		
White-bellied Woodpecker	*Dryocopus javensis*	VU		
White-browed Fantail	*Rhipidura aureole*	EN		
White-rumped Falcon	*Polihierax insignis*		NT	App II

** Species not listed as threatened, but in view of the massive decline in numbers nationwide, its status needs to be closely monitored.*

Source: *Round and Lynam 2003*

- **Karst Ecosystems**

Occurring only in the northwestern part of Khao Yai NP, this ecosystem comprises summits, steep cliffs, narrow gorges, broad valleys, vertical columns and a complex of caves. These elements provide a variety of microhabitats ranging from exposed karst summits to cave interiors. Endemic plants and animals possibly inhabit these islands of karst as will egg-laying vertebrates such as snakes, and lizards. Mammals, particularly bats, are known to use the caves for roosting.

One Globally and/or nationally threatened or near threatened bird species is known to inhabit this ecosystem, the limestone wren babbler (*Napothera Crispifrons).*

- **Riverine Ecosystems**

Riverine ecosystems are an integral part of Evergreen and Dipterocarp / Deciduous Forest types, but are identified as a discrete conservation priority because these ecosystems support species and communities that are confined (to a large degree) to riverine areas. Riverine ecosystems occur throughout the DPKY-FC with varying aquatic life, riverine flora and fauna and physical and riparian forest characteristics. The ecosystems include a diverse array of distinct habitats and physical features, such as cascades, dipslopes, waterfalls, and deep pools. Riverine areas are also a major focus of visitor use and management strategies will be necessary to ensure that visitor use has minimal impact on the conservation and ecological values of these areas

Five globally and/or nationally threatened or near threatened bird species are known to inhabit this priority ecosystem (Table 7).

Table 7: Globally and/or nationally threatened or near threatened bird species of Riverine Ecosystems

Common Name	Scientific Name	Thai Status	IUCN Status	CITES
Brahminy Kite	*Haliastur indus*	NT		App II
Grey-headed Fish Eagle	*Ichthyophaga ichthyaetus*	CR	NT	
Masked Finfoot	*Heliopais personata*	At Risk	VU	
Oriental Darter	*Anhinga melanogaster*	EN	NT	

Source: *Round and Lynam 2003*

Mammals that have a preference for Riverine Ecosystems include mousedeer (*Tragulus javanicus*), wild pig (*Sus scrofa*), and crocodiles (*Crocodilus siamensis*).

(b) Species

- **Birds**

A total of 392 species of birds have been recorded from DPKY-FC forest complex:

- 358 Species are known for Khao Yai National Park
- 220 Species are known for Sakaerat Biosphere Reserve[4]
- 284 Species are known from Thap Lan National Park
- 238 Species are known for Pang Sida National Park
- 200 Species are known from Ta Phraya National Park

Within DPKY-FC, 47 (+-) key species of birds of known and/or likely global or national conservation concern occur within DPKY-FC. The large block of more or less contiguous semi-evergreen forest within the complex is considered to be especially significant in a national context for the following species: Siamese fireback (*Lophura diardi*), great slaty woodpecker (*Mulleripicus pulverulentus*), four species of hornbills (*Bucerotidae*), coral-billed ground cuckoo (*Carpococcyx renauldi*), javan frogmouth (*Batrachostomus javensis*), pompadour pigeon (*Treron pompadora*), green imperial pigeon (*Ducula aenea*), black eagle (*Ictinaetus malayensis*), mountain hawk eagle (*Spizaetus nipalensis*), Malayan night heron (*Gorsachius melanolophus*), silver oriole (*Oriolus mellianus*), golden-crested myna (*Ampeliceps coronatus*), and hill myna (*Gracula religiosa*).

A number of globally and/or nationally near-threatened species are also found in association with lowland dry dipterocarp and other deciduous habitats around the margin of the DPKY Forest Complex, especially near the northern border of Thap Lan National Park, in Sakaerat Biosphere Reserve, and around the margins of Ta Phraya National Park.

Populations within the DPKY Forest Complex are likely to be small because of the extremely limited areas of plains-level deciduous woodland remaining nationwide. Key species of birds associated with this habitat include: streak-throated woodpecker (*Picus xanthopygaeus*), blossom-headed parakeet (*Psittacula roseate*), rufous-winged buzzard (*Butastur liventer*), white-rumped falcon (*Polihierax insignis*), and white-browed fantail (*Rhipidura aureola*).

The occurrence of a further three globally and/or nationally threatened species have also been reported. These are white-winged duck (*Cairina scutulata*), comb duck (*Sarkidiornis melanotis*), and woolly-necked stork (*Ciconia episcopus*). It should be noted that the sightings of these species are unconfirmed, but will be the focus of further investigation.

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4 The Sakaerat Biosphere Reserve, which is in cloxe proximity to the DPKY-FC, is not included in this current nomination. The area has, however, been identified as a high priority for further consideration by the State Party as further biodiversity information becomes available.

A list of bird species recorded in the complex is included in Appendix 3. Map 10 shows the survey points used to assess bird distribution in DPKY-FC.

- **Mammals**

A total of 112 species of mammals are known from DPKY-FC forest complex (Maps 2-7; Appendix 4):

- 72 Species are known for Khao Yai National Park
- 69 Species are known from Thap Lan National Park
- 85 Species are known for Pang Sida National Park
- 21 Species are known from Ta Phraya National Park

Thirty-six key species of mammals of global or national conservation concern are known to occur within the complex. These include mammals associated with semi-evergreen forest (the dominant habitat type in the DPKY Forest Complex) and include: pileated gibbon (*Hylobates pileatu)*, elephant (*Elephas maximus)*, gaur (*Bos gaurus)* and tiger (*Panthera tigris corbetti*), clouded leopard (*Neofelis nebulosa)*, golden cat (*Felis temmencki)* and leopard cat (*Prionailurus bengalensis)*, marbled cat (*Pardofelis marmorata)* and serow (*Capricornis sumatraensis*).

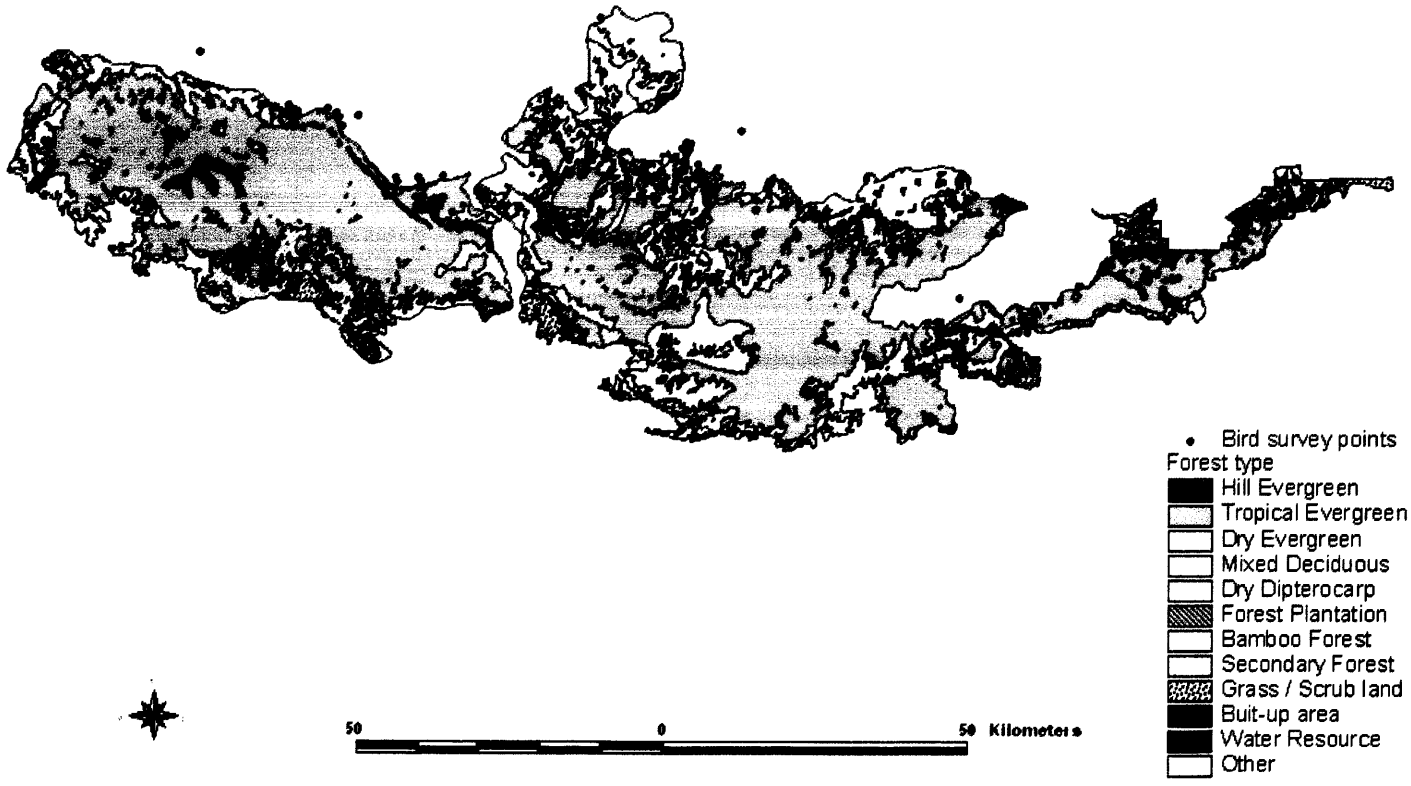
Banteng (*Bos javanicus)*, a globally near-threatened species, is known to occur in association with lowland dry dipterocarp and other deciduous habitats around the margin of the DPKY Forest Complex, especially near the northern border of Thap Lan National Park, in Sakaerat Biosphere Reserve, and around the margins of Ta Phraya National Park. Banteng exist in scattered small populations but, mainly because of the extremely limited areas of plains-level deciduous woodland remaining, these populations must be regarded as highly significant.

b. History and development

Thailand's conservation efforts stretch back to at least the 13th Century to an era known as the Sukhothai Period. During this time, King Ram Khamhaeng the Great created a park for royal recreation known as "Dong tan". For about as long as history has been recorded the people of Thailand have been encouraged to create parks near Buddhist temples and other religious areas. From the end of the Sukhothai Period to the 19th Century, however, conservation efforts were negligible. It was not until the Royal Forest Department (RFD) was established in 1896 that conservation efforts intensified. The RFD held the responsibility for forest resource management (including forest conservation) until 2002.

Initially, conservation work - as we know it today, was largely neglected, but after noticing an alarming decrease in the country's wild elephant population (around 1900), the Government promulgated "the law governing conservation of wild elephants". Thus, elephants became the first wildlife species protected by law. Since 1942, forest reserves have been gradually established throughout the country.

Map 10: Survey points used to assess bird distribution in the DPKY-FC



Following World War II, in response to the deterioration of the nation's natural forests, the RFD intensified efforts to establish national parks and wildlife sanctuaries. However, these areas were subsequently declared "forest parks" due to inadequate budgets and a lack of trained personnel.

In 1958, Field Marshall Sarit Thanarat, then the Prime Minister, recognised the importance of nature conservation and directed the Ministries of Agriculture and Interior to establish national parks and other protected areas and to draft enabling legislation. In 1959 the Cabinet established two committees: the National Parks Committee and the Wild Animals Reservation and Protection Committee. The main function of these two bodies was to: (i) recommend areas for inclusion under the new protected areas system, (ii) prepare legislation, and (iii) advise the Government on matters relating to protected areas. The Permanent Secretary of the Ministry of Agriculture was appointed chairman of both committees, and each committee contained not more than 14 appointed members. With advice from Dr. Boonsong Lekagul and Dr. George D. Ruhle (US National Park Service), in 1959 the Thai Government proposed 14 sites totaling 10,000 sq. km for national park status.

In 1960 (with a revision in 1992) the Government passed the Wild Animal Reservation and Protection Act (WARPA), and the following year the National Park Act (NPA) was formally promulgated. Both of these legal documents provide regulations and procedures for establishing wildlife sanctuaries and non-hunting areas (under WARPA) and national parks (under NPA).

Khao Yai became the first national park in 1961 and Salak Phra the first wildlife sanctuary in 1965. From that time until the present the number of national parks and wildlife sanctuaries established has increased significantly.

In 2002, the newly created Department of National Parks, Wildlife and Plant Conservation (DNP) under the new Ministry of Natural Resources and Environment (MNRE) came into being. The DNP is responsible for the management, planning and administration of a Protected Area (PA) system that covers some 21 percent of the country. Within the PA system, the National Parks (both marine and terrestrial) and Wildlife Sanctuaries constitute the majority of this area. Each unit is managed as a separate entity with a superintendent and staff in charge of day-to-day operations and management.

To date, Thailand has, using IUCN definitions, 319 protected areas in 4 categories covering 108,064 sq. km or approx. 21 percent of the total country area (Table 8). The PA system protects significant biodiversity values, ecosystem functions, and livelihood opportunities for millions of people.

Table 8: Thailand's protected area system

Protected area category	IUCN Category	Number of units	Size of coverage (sq. km)	Percent of country land area
National Parks	II	145	68,928	13.46
- Terrestrial		119	61,707	12.05
- Marine		26	7,221	1.41
Wildlife Sanctuaries	Ia	53	34,848	6.81
Non-hunting Areas	VI	52	3,408	0.67
Forest parks	III	69	880	0.17
Total		319	108,064	21.11

Note: *The Table does not include Class I watershed Protection Forest (IUCN Category Ib), Mangrove Forest Reserves (IUCN Category VI), and other small protected areas.*

Source: *Department of National Parks, Wildlife and Plant Conservation 2003.*

Thailand's protected area system covers all types of major ecosystems in all regions of Thailand, including mountainous, lowland, wetland, coastal, and marine ecosystems (Faculty of Forestry 1987). These areas are very rich in genetic and species diversity (Kutintara 1993, Groombridge 1992, Groombridge and Jenkins 1994). Protected areas are beneficial to human life and economic development of the country at local, regional and national levels (Chettamart *et al.* 1991, International Centre for Environmental Management, ICEM, 2003) including the direct and indirect benefits from nature tourism, which distributes income and job opportunities to the local and overall economy (Thailand Development Research Institute, TDRI, 1993, Dearden 1991).

Even though Thailand has been successful in increasing the number of protected areas over the last 30 years, threats and problems still exist, causing a continuous deterioration of ecosystems and erosion of biodiversity. Main issues include: hunting (subsistence, wild meat and wildlife trade) encroachment and settlement, impacts of large-scale development projects in and around protected areas, land use planning, impacts from surrounding socio-economic activities such as tourism, and the increasing impacts of global and regional climatic changes.

Legal Institution, Policy, and Related Laws

The protected area system of Thailand is under the supervision of the newly established Department of National Parks, Wildlife and Plant Conservation (DNP), which is under the recently established Ministry of Natural Resources and Environment (MNRE).

Various divisions within the DNP administer terrestrial national parks, forest parks, marine national parks, wildlife sanctuaries and non-hunting areas, as well as the CITES Convention and protected watershed areas. The principal laws for administration of the above protected areas are:

- National Parks Act (NPA) (1961),
- Wild Animals Reservation and Protection Act (WARPA 1992),
- National Forest Reserved Act (NFRA, 1989), and
- The Cabinet Resolution on Watershed Classification (1989).

The Royal Thai Government has not yet developed a national conservation policy or national protected area system plan, which would provide a useful framework for conservation. Nevertheless, a great deal of human and financial resources have gone towards protecting and managing the country's natural resources, and the 7th and 8th National Socio-Economic Development Plans state a general conservation policy that advocates that conservation areas should cover not less that 25 percent of the terrestrial area of the country, and urges administrative and management activities such as boundary demarcation.

Thailand is also a signatory to several international conventions related to conservation activities. These include:

- Convention Concerning the Protection of the World's Cultural and Natural Heritage (The World Heritage Convention),
- Convention on International Trade in Endangered Wild Flora and Fauna Species (CITES),
- Man and Biosphere Programme (MAB),
- Convention on Biological Diversity (CBD),
- Convention on Wetlands of International Importance (Ramsar)
- Biodiversity Convention
- Convention on Wetlands of International Importance (RAMSAR)

c. Form and date of most recent records of property

A comprehensive document entitled "The Status of Birds and Large Mammals in Thailand's Dong Phayayen – Khao Yai Forest Complex" (Round and Lynam 2003, in conjunction with the Department of National Parks, Wildlife and Plant Conservation) provides a current assessment of biodiversity health within the complex (Attachment 1).

d. Present state of conservation

The project team responsible for drafting this nomination undertook an evaluation of management effectiveness of each of the units within the DPKY-FC. Table 9 presents a summary of the assessment that was completed on the state of conservation within the complex. The rankings are based on a scale of 1-5, where 5 is defined as the **best possible** management regime.

Table 9: Summary state of conservation assessment for the Dong Phayayen-Khao Yai Forest Complex

Protected area functions	Rating of protected area units					
	KYNP	TLNP	PSNP	TPNP	DYWS	DPKY-FC
1. Base Line & Other Surveys (understanding the present situation)						
• Surveys						
- Flora	4	3	3	2	2	2.8
- Fauna	4.5	3.5	3.5	2	3	3.3
- Resource use	4	4	4	2.5	3	3.5
- Land use	4	4	3	3	3	3.4
• Mapping/ documenting	4.5	4	4	3	3.5	3.8
2. Monitoring (identifying changes to the situation)						
• Flora	3.5	3	3	2	2.5	2.8
• Fauna	4	3	3	2	2.5	2.9
• Resource use / land use	4	4	3	2	3	3.2
• Socio-economic	3.5	3	3	1.5	3	2.8
• Monitoring Effectiveness	3.5	3	2.5	1.5	2.5	2.6
3. Management Strategies & Actions (responding)						
• Awareness raising/ education	4	3.5	3	2	3.5	3.2
• Advocacy	5	4	4	4	4	4.2
• Coordination/liaison	4	4	3	3	4	3.6
• Capacity building	4	4	4	4	4	4.0
• Resource planning/land use planning	4	3.5	3	2.5	3	3.2
• Development of rules, regulations, management systems	4	3.5	3.5	3	3	3.4
• Enforcement	4	4	4	3	4	3.8
• Management Planning	5	5	5	2	2	3.8
• Annual and Quarterly Work Planning/ Budgets	4	4	4	4	4	4.0
• Staffing	5	5	5	5	5	5
• Development interventions	5	3.5	3.5	2	2	3.2
4. Review						
• Monitoring and evaluation	3.5	2.5	2.5	2.5	2.5	2.7
Overall Rank	4.13	3.68	3.48	2.66	3.14	**3.42**

Note: *All ranking is based on a scale of 1-5 [1 the lowest rank and 5 the highest].*

It is recognized that regular management audits are an essential component for sound protected area management. As such, park superintendents and senior protected area managers have an important role to play in establishing systems that allow the effectiveness of management to be determined. Currently there are no reliable systems for evaluating and reporting on management effectiveness within the DNP and a simple and flexible system, which can be scaled up or down to suit a broad range of management contexts and needs, will be necessary to effectively manage the DPKY-FC as a cohesive unit. The system should integrate performance monitoring, evaluation and reporting into the overall management cycle for the area – preferably through provisions that are made in management plans. Application of an 'outcomes-based' evaluation system for the complex will provide for informed and transparent management and can be expected to lead to delivery of desired conservation outcomes.

e. Policies and programmes related to the presentation and promotion of the property

To date, no definitive policies and programmes that relate to the presentation and promotion of the proposed site have been developed.

4. Management

a. Ownership

The Royal Thai Government

b. Legal status

The sites included in this nomination, and referred to as the Dong Phayayen - Khao Yai Forest Complex, include 5 designated protected area units, namely: Khao Yai National Park (KYNP), Thap Lan National Park (TLNP), Pang Sida National Park (PSNP), Ta Phraya National Park (TPNP), and Dong Yai Wildlife Sanctuary (DYWS). The complex covers an area of 615,500 ha. or 6,155 sq. km (Table 10).

Table 10: Legal status of the sites to be included in the World Heritage Site nomination

Legal status & date of establishment	Provinces	Coordinates							Area (ha.)
Khao Yai National Park 18 Sept. 1962	Saraburi, Nakhon Nayok, Nakhon Ratchasima, Prachinburi	latitude longitude	14° 101°	05' 05'	- -	14° 101°	15' 50'	N E	216,800
Thap Lan National Park 24 Dec. 1981	Nakhon Ratchasima, Prachinburi	latitude longitude	14° 101°	05' 50'	- -	14° 102°	33' 40'	N E	223,600
Pang Sida National Park 22 Feb. 1982	Sra Kaew	latitude longitude	14° 101°	00' 55'	- 	14° 102°	10' 35'	N E	84,400
Ta Phraya National Park 22 Nov. 1996	Sra Kaew, Burirum	latitude longitude	14° 102°	05' 30'	- -	14° 103°	22' 14'	N E	59,400
Dong Yai Wildlife Sanctuary 22 Nov. 1996	Burirum	latitude longitude	14° 102°	08' 27'	- -	14° 102°	22' 47'	N E	31,300
						Total area			**615,500**

c. Protective measures and means of implementation

The Ministry of Natural Resources and Environment (MNRE) and the Department of National Parks, Wildlife and Plant Conservation (DNP) acknowledged the need for a consistent and coordinated approach to the management and protection of the environmental, conservation and biodiversity values of the five units that makeup the DPKY-FC.

All units have a complement of enforcement staff that is responsible for boundary inspections, enforcement, patrolling, and compliance activities. A considerable number of Sub-stations are already established in strategically important locations and, as resources allow, additional posts are planned to supplement these. In addition, each PA unit has access to effective communications systems (radios and mobile phones), transport, and (when required) firearms are available to deal with difficult and/or dangerous enforcement cases (Table 11).

The main responsibility for developing and implementing effective protection measures lies with each of the five superintendents in each unit that makeup the DPKY-FC. Present levels of coordination within the complex are not optimal, but all superintendents are making serious efforts to improve coordination, particularly with respect to problems relating to poaching and encroachment. Although each unit carries out its own enforcement and protection responsibilities slightly differently, protective measures can be generally divided into two approaches:

(i) **direct** preventive and corrective measures against damage or disturbance to conservation values such as habitats and flora and fauna through direct policing, and

(ii) **control** measures to address the source (or sources) of threat through, for example, programmes to establish relationships with communities that live within buffer zone areas.

The inhabitants of communities in areas surrounding a particular unit can, in some instances, damage or disturb wildlife and their habitats. Direct preventative and corrective measures such as *policing* are deemed to be an effective solution to prevent these occurrences. The MNRE and DNP have committed significant resources to improve the effectiveness of park rangers through additional training and changes to management style and structure. In addition, park rangers have been equipped with the necessary equipment to effectively police the units, including vehicles, communication facilities, and guns. Strategically located sub-stations have been constructed or rehabilitated at many different locations within the complex, and are a significant part of a premeditated management effort to protect and maintain boundaries, prevent illegal logging and poaching, and to deal with fires, etc.

Table 11: Unit designation, substations, and general comments

Unit Name and Designation	Management Districts and number of sub-stations (as of January 2004) and comments on protection resources
Khao Yai National Park	• 8 Districts. • Park HQ and 21 substations (8-10 persons in each). • Park awarded recognition for: best enforcement system and best superintendent in Thailand (2003). • Staff numbers are adequate but the balance between staff involved in PA management and those involved in services for tourists should be reconsidered. For example, the proportion of staff involved in conservation should be at least 70 percent of the total staff number. • Transport and communications facilities are adequate. • 2-3 mobile teams on stand-by to deal with urgent matters and to support staff located in remote areas. • Enforcement actions dealt with each month total an average of 8 (serious nature). • Patrols from sub-stations are scheduled for 4 per month lasting 3-4 days. • Staff expectations are that enforcement activities will decrease as outreach programmes take effect. • Volunteers being used from local communities for supporting PA staff (some used to be poachers). • Some rangers in charge of sub-stations hold degrees. • The DNP supported Khao Yai Conservation Project has been working with 104 villages along the park boundary.
Thap Lan National Park	• 5 Districts. • Park HQ and 14 Sub-stations. • 20 vehicles. • Good radio and cell phone communications. • Some monitoring programmes for elephants and carnivores are being undertaken. • Natural ridgeline boundary between Thap Lan NP and Pang Sida provides a very high level of connectivity. • A number of significant boundary issues need to be addressed to rationalize the present boundary, which currently includes agriculture land and settlements that may total as much as 48,000 ha.

Table 11: (continued)

Unit Name and Designation	Management Districts and number of Sub-stations (as of January 2004) and comments on protection resources
	• Tourism/visitor development high priority for park resources. • There is a policy directive from cabinet to remove settlements from park areas, provided alternative land can be located. • Encroachment and other land use conflicts have been going on for some time. These include reservoirs and agriculture. There are three reservoirs inside or on the park boundary. • Conservation awareness and community contact needs significant attention – not adequately addressed at this stage. • Tourism / visitor use seen as high priority. • Superintendent suggested that the major management challenges for this park were: - Habitat Protection - Encroachment - Boundary demarcation
Pang Sida National Park	• 4 Districts. • Park HQ and 11 Sub-stations. • Staff numbers are adequate. • Transport and communications facilities are sufficient. • Patrols from sub-stations are scheduled as required. • Limited outreach programmes with local communities.
Ta Phraya National Park	• Park HQ and 4 Sub-stations. • Staff numbers are adequate. • Transport and communications facilities are sufficient. • Patrols from sub-stations are scheduled as required. • Limited outreach programmes with local communities.

Table 11: (continued)

Unit Name and Designation	Management Districts and number of Sub-stations (as of January 2004) and comments on protection resources
Dong Yai Wildlife Sanctuary	• Sanctuary HQ and 4 Sub-stations. • Staff numbers are adequate. • Transport and communications facilities are sufficient. • Patrols from sub-stations are scheduled as required. • Some education and outreach programmes. • Good levels of support from district administration.

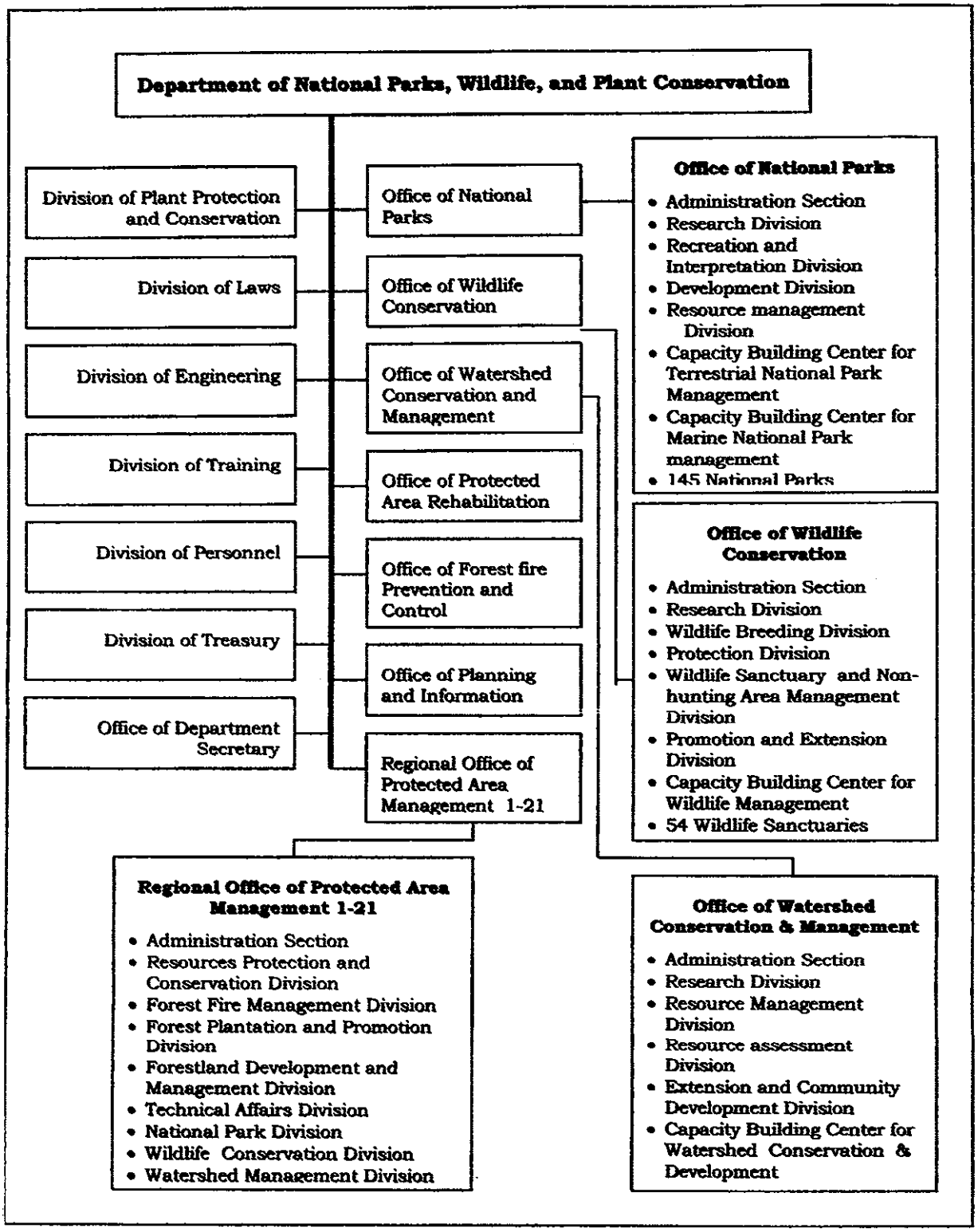
d. Agency/agencies with management authority

The Department of National Parks, Wildlife and Plant Conservation, under the Ministry of Natural Resources and Environment, is a key participant in the management of DPKY-FC. Figure 1 shows its organizational structure. The responsible Offices to the management of DPKY-FC are the Office of National Parks and Office of Wildlife Conservation.

Each protected area included in the DPKY-FC is managed by qualified, experienced, and professional managers, as well as a park superintendent. Each superintendent reports directly to the Director of National parks Office. The DNP also receives active support from a number of other agencies including national and international NGOs, police and ranger units, customs officials, and the police and army.

e. Level at which management is exercised and name and address of responsible person for contact purposes

Names and addresses of responsible persons for management of the DPKY-FC are shown in Tables 12 and 13.



Source: *DNP 2003*

Figure 1: Organizational structure of the Department of National Parks, Wildlife, and Plant Conservation (DNP)

Table 12: Names and addresses of responsible persons for the management of the protected area units of the DPKY-FC

Protected Area	Superintendent's Name	Contact Details
Khao Yai National Park	Mr. Prawat Vohandee	**Address:** P.O. Box 9, Pakchong District, Nakhon Ratchasima 30130, Thailand **Phone:** 663-7319002 **Fax:** 669-8445936 **Mobile Phone:** 01-2068954
Thap Lan National Park	Mr. Saran Jaisaad	**Address:** P.O. Box 37, Kabinburi District, Prachinburi 25110, Thailand **Phone:** 663-7219408 **Fax:** - **Mobile Phone:** 01-9270042
Pang Sida National Park	Mr. Montri Buakaew	**Address:** P.O. Box 55, Muang District, Sa Kaew 27000, Thailand **Phone:** 663-7246100 **Fax:** - **Mobile Phone:** 01-9072533
Ta Phraya National Park	Mrs. Uaiphorn Sangthien	**Address:** P.O. Box 9, Non Dindaeng District, Burirum 31260, Thailand **Phone:** - **Fax:** - **Mobile Phone:** 01-7235663
Dong Yai Wildlife Sanctuary	Mr. Suthichart Rabieb	**Address:** P.O. Box 1, Non Dindaeng District Burirum 31260, Thailand **Phone:** - **Fax:** - **Mobile Phone:** 01-7620911

Table 13: Names and addresses of key DNP persons responsible for various aspects of DPKY-FC management

Director General Office	Name & Designation	Contact Details
Office of the Director General	Mr. Somchai Phiensathaporn Director General	**Address:** 61 Phaholyothin Road, Chatuchak, Bangkok, 10900, Thailand **Phone:** 662-5794296 **Fax:** 662-5796868
Office of National Parks	Mr. Thanee Viriyarattanaporn Director	**Address:** 61 Phaholyothin Road, Chatuchak, Bangkok, 10900, Thailand **Phone:** 662-5795269 **Fax:** 662-5795964 **Mobile Phone:** 01-8499161 **Email:** Thanee@dnp.go.th
Research Division	Dr. Songtam Suksawang Director	**Address:** 61 Phaholyothin Road, Chatuchak, Bangkok, 10900, Thailand **Phone:** 662-5614292 ext. 746 **Fax:** 662-5795964 **Mobile Phone:** 01-8195988 **Email:** S_songtam@hotmail.com
Recreation and Interpretation Division	Mr. Suchai Oamaphiyan Director	**Address:** 61 Phaholyothin Road, Chatuchak, Bangkok, 10900, Thailand **Phone:** 662-5614292 ext. 723 **Fax:** 662-5620758 **Mobile Phone:** 01-7468244 **Email:** Suchai@dnp.go.th
National Park Development Division	Mr. Vinich Rakchart Director	**Address:** 61 Phaholyothin Road, Chatuchak, Bangkok, 10900, Thailand **Phone:** 662-5614292 ext. 723 **Fax:** 662-5620758 **Mobile Phone:** 01-6031345 Email: Vinich@dnp.go.th

f. Agreed plans related to the property[5]

The Khao Yai Conservation Project (KYCP) was initiated by two international conservation agencies, WCS and WildAid, in partnership with the DNP. The primary objective was to *develop ways to address the poaching of wildlife and disturbance to wildlife habitats.* This objective is consistent with established DNP policy.

The KYCP officially started in December 1999 with a two and a half year mandate. The first phase concluded in June 2002. During the implementation period KYCP matured as a Wildlife Protection Program and, given appropriate streamlining, it is believed that this model could be adapted for use in other protected areas in Thailand and Southeast Asia.

A brief synopsis of the Project's accomplishments to date is given below, including background information from relevant studies to support the various approaches adopted.

Synopsis of project progress

Khao Yai and its wildlife have benefited from the KYCP through its strategic approach - the blending of three key components; (i) Protection, (ii) Community Outreach and (iii) Wildlife Monitoring. These approaches contributed towards improved park management and the involvement of park staff in all activities. Information gained from one component was integrated into the planning and implementation of activities associated with the other two components within an applied system of adaptive management. This is a unique approach for Thailand, where traditionally park employees were responsible for protection but rarely engaged in outreach and wildlife monitoring, leaving these important management activities to outside agencies or universities.

Anti-poaching and patrolling efforts were developed to address the most immediate threats to wildlife: poaching and habitat destruction. When carried out in conjunction with trade investigations and research, these served to suppress the supply of illegal wildlife and products, which independent studies have shown were primary concerns for Khao Yai NP (Brockleman and Baimai 1993, Griffin 1994, WCS and Global Survival Network, GSN, 1999).

A thirty strong KYCP Patrol Team conducted 300 long-range patrols since the start of the project, and these resulted in 350 arrests. 70 percent of the poachers came from districts that were identified by project staff as communities heavily involved in poaching. The majority of the violations involved Aloe wood cutting and more than 4000 kg of Aloe wood was confiscated during this period.

More recently, increasing numbers of illegal immigrants from Cambodia are being employed as Aloe wood poachers; apparently, Thai poachers are withdrawing in the face of improved enforcement techniques.

Rangers have cooperated with local authorities to locate and investigate aloe wood processing factories in areas adjacent to the park and have also been

5 This section has been adapted from the executive summary of a report entitled, *Ecological Monitoring of Wildlife at Khao Yai National Park.* A.J. Lynam, C. Kanwatanakid, and C. Suckaseam. 2003.

successful in gaining cooperation and intelligence from converted poachers about illegal activities. Additional information on poacher movements is fed to the rangers from the Outreach and Wildlife Monitoring Teams.

The Royal Thai Police Office also supported suppression of wildlife crimes. Through a written order, police staff were directed by the Police Director-General to work closely with Khao Yai staff. Park rangers evolved into a highly motivated professional anti-poaching unit. The Park Superintendent commented that poachers may now operate for shorter periods, which potentially means less poaching of animals for food.

Community Outreach and Awareness Training was used to help address long-term needs. These included initiatives aimed at fostering positive attitudes towards conservation amongst local community members, and in the short-term, providing viable alternatives for those engaged in poaching activities. A five member Outreach Team has been working in communities adjacent to Khao Yai identified as those heavily dependent on park resources (WCS and GSN 1999), and where wildlife populations have been decimated (Trisurat *et al.* 1996, WCS and RFD 2000). In the past, a reliance on confrontational approaches for solving conflicts has led to violence and the collapse of a working relationship between park staff and local communities.

One thousand five hundred children from various parts of Thailand had an opportunity to participate in Youth Camps organized by KYCP staff to promote environmental awareness. As well, several small-scale farming initiatives were developed in target areas as alternative income generation activities for ex-poachers. During 2002, these initiatives were especially effective in discouraging women from poaching. While it is conceded that these interventions were localized in a few villages, they provided useful models that could be replicated in other villages with support from local communities and other government agencies. Poachers living in target villages have reduced their illegal activities, possibly in response to the project's activities. If outreach work was expanded, we might expect more villagers to leave the business of poaching.

The KYCP also organized a number of environmental festivals and public events at and around the park to stimulate environmental consciousness, and bring awareness about the project. Clearly, villagers' impressions of the project were improved by the participation and interest of DNP.

Efforts to manage wildlife, and prevent the decline and extinction of endangered species are often hampered by a lack of current information on their status, distribution and threats. Park managers need to know where threatened animals live and to understand the threats to their survival in order to manage them (Margules *et al.* 1994). Monitoring trends in wildlife, especially those hunted and eaten by aloe wood poachers, or targets for the illegal wildlife trade were achieved at Khao Yai. Using science-based approaches, a 22-member team established a system for detecting trends in abundance of endangered species and sensitive habitats, and monitoring poacher activity. The team consisted of researchers, former poachers (who now work as wildlife trackers), and specially trained park rangers. A combination of field techniques was employed, including infrared based camera-traps and line transect sampling. Camera-traps were used to record wildlife activity (including counting tigers and elephants), as well as the movements of poachers. Line transects were developed to provide population estimates. Thousands of hours of field effort were expended in monitoring wildlife at 19 permanent stations that covered the entire park (WCS and RFD 2001).

Monitoring stations were visited at 4-6 week intervals and information from field efforts has shown the spatial and temporal trends in wildlife. The Wildlife Monitoring Team feeds information on wildlife and poachers to a central database housed at the project center. The database, in addition to reports of poacher activity from teams while they are in the field, has resulted in the arrest of dozens of poachers, facilitating the work of the Patrol Team and directly contributing to the suppression of wildlife crime.

With over 100 staff and multiple activities supported by the KYCP, effective coordination was necessary to maintain continuity and to ensure the transfer of information between programs. A KYCP office with permanent staff helped to ensure cooperation and consistency with existing management programs. Regular meetings of project and DNP staff were held to monitor progress and to guide the project's development.

g. Sources and levels of finance

All units included in the DPKY-FC are, in the main, funded by the Government of Thailand. Table 14 shows the government budgets for the last 5 years (1998-2002) of the protected area units within DPKY-FC.

h. Sources of expertise and training in conservation and management techniques

The DNP provide a range of opportunities for developing management capacity. National and international NGOs, particularly WCS, WWF, WFT and Wild Aid actively support the department with various training courses. Staff have completed advanced academic courses both in Thailand and abroad. Study tours have been used to good effect for field staff.

i. Visitor facilities and statistics

Table 15 summarizes the facilities and services currently available in DPKY-FC, and Table 16 shows visitor statistics of the DPKY-FC.

Table 14: Annual government budgets of protected area units within the DPKY-FC

Year	Government budgets (baht)[1]				
	Khao Yai National Park	Thap Lan National Park	Pang Sida National Park	Ta Phraya National Park	Dong Yai Wildlife Sanctuary [6]
2003	33,653,260	11,419,770	7,575,660	3,688,510	3,648,200
2002	17,361,140	12,245,230	7,239,660	3,607,650	3,698,100
2001	17,245,040	10,425,090	7,308,720	3,698,310	4,565,400
2000	18,131,210	10,282,200	7,372,130	3,738,080	3,448,200
1999	20,091,180	10,963,200	7,524,360	4,568,080	3,487,800
1998	27,365,160	11,720,820	6,857,600	5,161,280	4,880,400

[1] *40 Baht = 1 USD*

Source: *DNP 2003*

6 Visitor activities are not permitted in Wildlife Sanctuaries.

Table 15: Visitor facilities and services of the DPKY-FC

Facilities	Unit Name				
	Khao Yai National Park	Thap Lan National Park	Pang Sida National Park	Ta Phraya National Park	Dong Yai Wildlife Sanctuary [7]
Budget style Accommodation	x	x	x	-	-
Bungalows	x	x	x	-	-
Camping Ground	x	x	x	x	x
Food service	x	x	x	-	-
Visitor Center/ information Center	x	x	x	-	-
Trails	x	x	x	x	x
Viewing Towers	x	-	x	-	-
Picnic Shelters	x	x	x	-	-
Park Naturalists/ Guides	x	x	x	-	x
Interpretive Programs	x	x	x	-	x

7 Visitor activities are not permitted in Wildlife Sanctuaries.

Table 16: Visitor statistics

Year	Unit Name				
	Khao Yai National Park	Thap Lan National Park	Pang Sida National Park	Ta Phraya National Park	Dong Yai Wildlife Sanctuary
2003*	581,350	55,650	25,790	280	No visitor / recreation permitted
2002	695,740	58,120	29,530	980	
2001	525,306	83,665	33,620	385	
2000	479,809	181,400	31,960	100	
1999	489,969	57,500	24,212	2,720	
1998	1,148,928	47,000	27,730	1,840	
1997	961,566	63,00	23,550	2,035	
1996	538,023	55,316	34,190	-	
1995	557942	38,759	25,570	-	
1994	817,261	45,204	25,050	-	
1993	729,818	41,281	58,270	-	
* January to September					

Source: *DNP 2003*

j. Property management plan and statement of objectives

The DNP recognizes the need to coordinate the management of the five PA units and it is expected that World Heritage status would make a significant contribution to this course of action.

(i) Management Plan of Khao Yai-Tablan-Pangsida-Tapraya National Parks Complex

A management plan for the complex was drafted in 1997 and is made up of three sections:

- basic information on the four parks (Dong Yai Wildlife Sanctuary has been subsequently added to the complex).
- the main threats and management issues facing the complex,
- management and conservation guidelines.

More details for the management plan appear in Attachment II.

(ii) Site Conservation Management Plans

Table 17 shows the status of the operational management plans of PA units within the complex. Objectives outlined in each management plan are consistent with internationally accepted PA objectives.

Table 17: Status of the operational management plans of protected area units within the DPKY-FC

	Khao Yai National Park	Thap Lan National Park	Pang Sida National Park	Ta Phraya National Park	Dong Yai Wildlife Sanctuary
Year MP prepared / revised	1986 revised 1992	1992	1992	Scheduled to be prepared in 2004	Scheduled to be prepared in 2004

k. Staffing levels

The most senior field based park/sanctuary management position in Thailand is the Superintendent. Under the Superintendent, there are adequate number of staff assigned to different tasks and duties depending on the size, number of sub-stations, and visitation number of each PA unit. Table 18 shows different staffing levels and categories.

Table 18: Staffing levels and categories for units within the DPKY-FC

Staff categories	Staff number					
	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS	DPKY-FC
Professional	9	5	6	3	3	26
Permanent employee	68	18	21	7	8	122
Seasonal employee	305	211	135	49	56	756
Total	**382**	**234**	**162**	**59**	**67**	**904**

Source: *DNP 2004*

5. Factors Affecting the Property

a. Development pressures

Although the DPKY Forest Complex is made-up of a number of large contiguous forest areas the complex is not entirely contiguous. Internal fragmentation by north-south roads or major tracks occurs in several places. These include:

- A major arterial road entering from the north at Pak Chong and emerging north of Prachinburi completely bisects Khao Yai (the northern segment of this road, from Pak Chong to the present park headquarters was constructed before the park was declared). The southern leg, from the Khao Yai Forestry Training Center complex was bulldozed in 1982.
- A highway to the east, Highway 304, separates the contiguous units of Thap Lan and Pang Sida from Khao Yai. Two areas of cultivated land and patchy woodlots lay on either side of this road forming a potential wildlife corridor between Khao Yai and Thap Lan.
- Ta Phraya NP is contiguous with Pang Sida NP, to the west and with Dong Yai Wildlife Sanctuary to the north and west, but is bisected by two roads, Highway 348 in the west, and a security road used by the Army in the east. The eastern third of Ta Phraya is made-up of a narrow finger of forest land extending about 2-6 km in width north of the Thai - Cambodian border.

Some areas of the DPKY-FC, over many years, havebeen utilized by people and this has caused some disturbance and damage to wildlife and habitats. Before its establishment as a national park in 1962, Khao Yai contained several villages of "outlaws" (reasonably typical for other areas within the complex). The people from these villages cleared forest for agriculture, including areas around the existing park headquarters, as well as several other upland areas that currently support grassland and regenerating secondary forest. In addition, most, if not all of the units within the DPKY-FC formerly supported groups of insurgents, who in all probability carried on a high level of hunting during the 1970s, particularly in the eastern part of the complex.

These settlers also collected forest products and it is assumed that during this period they would have impacted greatly upon wildlife, particularly larger species. Sports hunting also occurred in Khao Yai during the early days following its establishment (Lekagul and McNeely 1988). Ease of access, to a large extent facilitated by a network of roads and highways (especially in the eastern portions close to the Thai-Cambodian border), allowed relatively straightforward access and egress.

Information on past human land use for other units within the DPKY-FC is more fragmentary. In addition to local users, Thap Lan was known to be targeted and actively hunted by sports hunters from Bangkok and other major towns during the 1980s and 1990s. This use continues, and evidence from camera

traps used during wildlife surveys shows photographs of people with guns, traps and wildlife moving through various parts of the complex.

Most areas are still infiltrated by forest-product collectors (WCS and GSN 1999). A major non-timber forest product (NTFP) poached from within the Dong Phayayen - Khao Yai Forest Complex includes aloe wood or *mai hom*, the heartwood of the tree *Aquilaria spp.* A fragrant oil is extracted from Aloe wood and it would seem that harvesting of it has been taking place for at least 60 years (WCS and GSN 1999). Civil unrest in Cambodia during the 1970s and 1980s discouraged exploration of Ta Phraya and other border forests, although hunting of large mammals, especially elephants was rampant (P. Klinklay, *pers. comm.*.). Until the late 1980s the area around the present-day Ta Phraya National Park headquarters supported a training camp for Khmer Rouge soldiers.

Small-scale encroachment around park perimeters continues and in the eastern part of the complex this has been due mainly to clearance for agriculture. Further west, especially around the northwestern and southeastern margins of Khao Yai, some encroachment of the park area has been perpetrated by developers, establishing resorts and large estates. Timber cutting for traditional use also continues in several areas, notably around Khao Yai and Ta Phraya.

b. Environmental pressures

Noteworthy instances where environmental pressure is reported to be impacting on the Conservation values of the complex have not been recorded.

c. Natural disasters and preparedness

No significant natural disasters have been recorded in the complex.

d. Visitor/tourism pressures

Apart from Khao Yai National Park where tourism levels present specific areas for concern, particularly close to waterfalls, rivers and some other attractions, there is only limited tourism development within the DPKY-FC. Visitor numbers are generally low in most units.

A recent well-publicized push by Provincial Governors / CEOs to "open up the national parks for more tourism development" (Bangkok Post Dec 2003) is cause for concern and will need to be evaluated. The type and scale of development being advocated includes commercial resort type facilities, cable cars and other attractions that are more properly located outside national parks and would unquestionably conflict with World Heritage Criteria and status.

Several commercial companies offer tourism activities, such as jungle trekking and river rafting and these are progressively developing. By international standards, however, these activities are relatively small-scale and apart from localized impacts around feature points such as waterfalls, river pools and lookout points, negative impacts from these are, to date, limited.

e. Number of inhabitants within property, buffer zone

The number of inhabitants within Thap Lan NP boundaries are unconfirmed. The cabinet passed a resolution in 1998 to systematically determine the number of illegal inhabitants within national park boundaries, and there is a policy directive to remove illegal settlements from park areas, provided alternative land can be located. National park inhabitants that have established legal settlements will be permitted to stay within park boundaries. However, to ensure long-term ecological integrity of the park, legal settlements will be subject to land use planning directives.

Photograph 6: *Khao Yai National Park is the only unit in the complex where tourism levels present specific areas for concern. This is the case particularly close to waterfalls, rivers and some other attractions. (Photo © Bruce Jefferies)*

6. Monitoring

In recognition of the significance of the Dong Phayayen – Khao Yai Forest Complex stated in Section 2, a set of indicators for monitoring the conservation state of the complex are needed. At least 8 key indicators with several measurement attributes are proposed as shown in Table 19.

Table 19: Proposed conservation monitoring matrix for the DPKY-FC

Key Indicator	Measurement Attribute	Methods	Timing and Frequency
Wildlife hunting	Sambar deer, muntjak and mousedeer, barking deer, wild pig, sun and black bear, and all primates and birds	Wildlife surveys along line transects, belt transects for population densities, camera traps, night and day surveys	Twice per year - each transect surveyed 6 times per survey
Timber extraction	Particular tree species (e.g. Aloe wood)	Regular patrolling	Regularly and randomly throughout the year
NTFP collection	All non-timber forest products	Regular patrolling	Regularly and randomly throughout the year
Impacts from land use outside the DPKY-FC	Forest conversion, logging, agriculture development, settlements and infrastructure development	Regular DPKY-FC patrolling extended to include areas away from the boundary, recording and documentation of land use, preparation of reports	Integral part of DPKY-FC patrolling, carried whenever patrolling is undertaken
Degradation of riverine ecosystems - *fishing*	Cyprinids, siluirids, crustaceans	Conduct aquatic fish surveys at a representative series of identified streams (spot sampling)	Each site once a year (always in the same month)

Table 19: (continued)

Key Indicator	Measurement Attribute	Methods	Timing and Frequency
Degradation of riverine ecosystems - *ecosystem health*	Reptiles & Amphibians	Conduct herpetological surveys along identified stretches of streams within the DPKY-FC	Twice a year covering wet and dry seasons
Collection of plants	Orchids, aroids, and any other ornamental plant	Regular patrols within the entire area of KYNP (the only unit within the complex with Karst) to detect human presence; regular checks of the higher areas of the limestone massif to detect and record collection of orchids; regular inspections of markets and surrounding villages to detect trade in plants	Patrols and inspections should be regular but randomly timed
Vital information gaps with respect to the Park's ecosystems and human uses	Research projects; researchers; research infrastructure; research / survey plots / grids	Implement a system of reporting to Park admin. for all research projects and researchers; conduct bi-annual reviews of progress for long-term projects, and monthly progress reviews for short term projects; conduct periodic inspections of research and survey sites/plots/ grids; inspect research equipment regularly	Monitoring of research activities should be timed according to the nature of the research; monitoring of research should not compromise or affect research in any manner

7. Documentation

a. Photographs

Digital photo files are included in a CD (Attachment II).

b. Copies of the DPKY-FC integrated management plan

See Attachment III.

c. Bibliography

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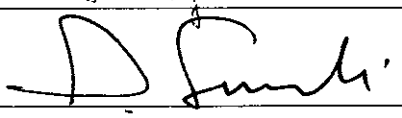
8. Signature on Behalf of the State Party.

Date: 27 January 2004

Signature: 

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Appendix 1
List of Mammals in DPKY-FC

Scientific Name	English Name	Thai Status	IUCN	CITES	Khao Yai	Sakaerat	Thap Lan	Pang Sida	Taphrya	UEFC SITES
Tupaia glis	Common Treeshrew				X	X	X	X		4
Dendrogale murnia	Northern Smooth-tailed Treeshrew							X		1
Hylomys suillus	Pig-tailed Shrew				X	X		X		3
Crocidura horsfieldi	Horsfield's Shrew				X					1
Crocidura etrusca	Dwarf Shrew				X	X				2
Cynopterus brachyotis	Lesser Short-nosed F.Bat					X	X	X		3
Cynopterus sphinx	Great Short-nosed F.Bat				X	X	X	X		4
Cynopterus horsfieldi	Peg-th Short-nosed F.Bat					X				1
Megaerops ecaudatus	Tailless F.Bat					X	X	X		3
Rousettus leschenaulti	Leschenault's Rousette				X	X	X	X		4
Macroglossus sobrinus	Great Long-tongued F.Bat				X		X	X		3
Eonycteris spelaea	Cave-dwelling Nec-eat Bat				X	X	X	X		4
Taphozous saccolaimus	Blyth's Tomb Rat					X				1
Taphozous theobaldi	Tomb Bat				X					1
Megaderma spasma	Lesser False Vampire				X	X	X	X		4
Rhinolophus malayanus	N. Malayan Horseshoe Bat				X	X	X	X		4
Rhinolophus affinis	Intermed'Horseshoe Bat				X		X	X		3
Rhinolophus stheno	L.Brown Horseshoe Bat				X					1
Rhinolophus thomasi	Thomas'Horseshoe Bat				X					1

Appendix 1-2

Scientific Name	English Name	Thai Status	IUCN	CITES	Khao Yai	Sakaerat	Thap Lan	Pang Sida	Taphrya	UEFC SITES
Rhinolophus acuminatus	Dobson's Horseshoe Bat					X	X	X		3
Rhinolophus pusillus	Least Horse Shoe Bat					X	X	X		3
Rhinolophus coelophyllus	Peter's Horse Shoe Bat					X				1
Rhinolophus luctus	Great Eastern Horseshoe Bat					X		X		2
Rhinolophus pearsoni	Pearson's Horseshoe Bat				X	X				2
Hipposideros bicolor	Bicolored Roundleaf Bat				X	X	X	X		4
Hipposiderous galeritus	Cantor's Roundleaf Bat							X		1
Hipposideros diadema	Large Malay Roundleaf Bat				X	X		X		3
Hipposideros armiger	Great Roundleaf Bat				X		X	X		3
Hipposideros larvatus	Intermediate Roundleaf Bat				X			X		2
Pipistrellus mimus	Pygmy Pipistrelle					X				1
Pipistrellus javanicus	Javan Pipistrelle					X				1
Tylonycteris pachypus	Lesser Club Foot Bat						X	X		2
Scotophilus kuhlii	Lesser Yellow Bat					X				1
Murina cyclotis	Tube-nosed Bat						X	X		2
Harpiocephalus harpia	Hairy-winged Bat						X	X		2
Kerivoula hardwickei	Hardwicke's Bat						X	X		2
Chaerephon plicata	Wrinkled-lipped Bat				X					1
Nycticebus coucang	Slow Loris				X	X	X	X		4
Macaca nemestrina	Pig-tail Macaque		VU		X		X	X	X	4
Macaca arctoides	Stump-tailed Macaque	VU	VU					X		1
Macaca fascicularis	Crab-eating Macaque		LR/NT				X	X	X	3

Appendix 1-3

Scientific Name	English Name	Thai Status	IUCN	CITES	Khao Yai	Sakaerat	Thap Lan	Pang Sida	Taphrya	UEFC SITES
Presbytis cristata	Silvered Langur		LR/NT				X	X		2
Hylobates lar	White-handed Gibbon	VU	LR/NT	App I	X					1
Hylobates pileatus	Pileated Gibbon	EN	VU	App I	X		X	X		3
Manis javanica	Malay Pangolin		LR/NT	App II			X	X		2
Lepus peguensis	Siamese Hare				X	X	X	X	X	5
Ratufa bicolor	Black Giant Squirrel			App II	X	X		X		3
Callosciurus finlaysoni	Variable Squirrel				X	X	X	X		4
Callosciurus caniceps	Grey-bellied Squirrel				X	X	X	X		4
Tamiops rodolphei	Cambodian Striped Tree Squirrel						X	X		2
Tamiops macclellandi	Burmese Striped Tree Squirrel.				X					1
Menetes berdmorei	Indochinese Ground Squirrel.				X	X	X	X		4
Dremomys rufigenis	Red-cheeked Squirrel				X					1
Petaurista petaurista	Red Giant Flying Squirrel				X		X	X		3
Hylopetes phayrei	Phayre's Flying Squirrel					X				1
Hylopetes lepidus	Red-cheeked Flying Squirrel.				X	X				2
Hylopetes spadiceus	Grey-cheeked Flying Squirrel					X				1
Petinomys setosus	White-bellied Flying Squirrel				X					1
Belomys pearsoni	Hairy-footed Flying Squirrel	VU				X				1
Rhizomys sumatrensis	Large Bamboo Rat						X	X		2
Rhizomys pruinosus	Hoary Bamboo Rat						X	X		2
Cannomys badius	Bay Bamboo Rat						X	X		2
Chiropodomys gliroides	Pencil-tailed Tree Mouse							X		1

Appendix 1-4

Scientific Name	English Name	Thai Status	IUCN	CITES	Khao Yai	Sakaerat	Thap Lan	Pang Sida	Taphrya	UEFC SITES
Bandicota savilei	Lesser Bandicoot Rat				X					1
Bandicota indica	Great Bandicoot Rat							X		1
Mus shortridgei	Shortridge's Mouse					X				1
Mus caroli	Ryukyu Mouse				X	X				2
Berylmys berdmorei	Lesser White-toothed Rat					X	X	X		3
Maxomys surifer	Yellow Rajah Rat				X	X	X	X		4
Maxomys whiteheadi	Whitehead's rat	VU			X					
Niviventer bukit	Chestnut Rat				X	X	X	X		4
Rattus sikkimensis	Sladen's Rat				X	X		X		3
Rattus exulans	Polynesian Rat							X		1
Rattus rattus	Roof Rat				X	X	X	X		4
Leopoldamys sabanus	Noisy Rat				X	X				3
Hystrix brachyura	Malayan Porcupine		VU		X		X	X	X	4
Atherurus macrourus	Brush-tail Porcupine		EN		X	X	X	X		4
Canis aureus	Asiatic Jackal						X	X		2
Cuon alpinus	Asian Wild Dog	VU	VU	App II	X		X	X	X	4
Ursus thibetanus	Asiatic Black Bear	VU	VU	App I	X		X	X		4
Helarctos malayanus	Malay Sunbear	VU	DD	App I	X		X	X	X	4
Mustela sibirica	Siberian Weasel					X				2
Martes flavigula	Yellow-throated Marten				X		X	X		3
Arctonyx collaris	Hog-Badger				X		X	X		3
Melogale personata	Burmese Ferret-Badger				X	X	X	X		4

Appendix 1-5

Scientific Name	English Name	Thai Status	IUCN	CITES	Khao Yai	Sakaerat	Thap Lan	Pang Sida	Taphrya	UEFC SITES
Lutrogale perspicillata	Smooth-coated Otter	VU			X		X	X		3
Aonyx cinerea	Small-clawed Otter				X		X	X		3
Viverricula malaccensis	Small Indian Civet				X	X	X	X	X	5
Viverra zibetha	Large Indian Civet				X		X	X	X	4
Viverra megaspila	Large-Spotted Civet	VU	V		X		X	X	X	4
Arctogalidia trivirgata	Three-striped Palm Civet						X	X		2
Paradoxurus hermaphroditu	Common Palm Civet		VU		X	X	X	X	X	5
Paguma larvata	Masked Palm Civet				X		X	X		3
Arctictis binturong	Binturong		VU		X		X	X		3
Herpestes javanicus	Javan Mongoose				X	X	X	X	X	5
Herpestes urva	Crabeating Mongoose				X		X	X		3
Pardofelis marmorata	Marbled Cat	EN	DD	App I	X					1
Prionailurus viverrina	Fishing Cat				X		X	X		3
Prionailurus bengalensis	Leopard Cat		EN	App II	X			X	X	3
Felis chaus	Jungle Cat	CR					X	X		2
Catopuma temmincki	Asian Golden Cat	EN	LR/VU	App I	X		X	X		3
Neofelis nebulosa	Clouded Leopard	VU	VU	App I	X			X	X	3
Panthera pardus	Leopard	VU	LR	App I			X	X	X	3
Panthera tigris	Tiger	VU	EN	App I	X		X	X		3
Elephas maximus	Elephant	EN	EN	App I	X		X	X		3
Sus scrofa	Common Wild Pig		VU		X		X	X	X	4
Tragulus napu	Greater Mouse Deer								X	1

Scientific Name	English Name	Thai Status	IUCN	CITES	Khao Yai	Sakaerat	Thap Lan	Pang Sida	Taphrya	UEFC SITES
Tragulus javanicus	Lesser Mouse Deer				X	X	X	X	X	5
Muntiacus muntjak	Barking Deer				X		X	X		3
Cervus unicolor	Sambar Deer				X		X	X		3
Bos javanicus	Banteng	CR	VU				X	X		2
Bos gaurus	Gaur	VU	VU	App I	X			X	X	3
Naemorhedus sumatraensis	Serow		VU	App I	X			X	X	3
			Species Richness		**74**	**47**	**68**	**85**	**20**	**112**

Appendix 2
List of endemic angiosperm species identified in the DPKY-FC

Family	Scientific name	Habitat
Apocynaceae	*Alyxia thailandica*	evergreen and dry dipterocarp forests, 700-1,400 m.
Capparaceae	*Capparis echinocarpa*	evergreen, mixed deciduous and bamboo forest, 50-750 m.
Cyperaceae	*Frimbristylis trichoides*	shallow water in open bog, generally growing with mosses, up to 1,300 m.
	Carex thailandica	Dry evergreen forest, 100-500 m.
	Carex speciosa	Scrub forest and open grassy hillsides, 800-2,500 m.
Melastomataceae	*Phyllagathis siamensis*	growing on rocks by a stream in evergreen forest, 700 m.
Menispermaceae	*Cyclea varians*	evergreen, deciduous and bamboo forests as well as on limestone, 250-1,000 m.
Myrsinaceae	*Ardisia impressa (var. impressa)*	evergreen and mixed deciduous forests, 400-850 m.
	Ardisia impressa (var. grandidens)	evergreen forest up to 500 m.
	Ardisia egrandulosa	evergreen forest, 300-950 m.
Oleaceae	*Chionanthus velutinus*	Mixed deciduous forest, 200 m.
Sterculiaceae	*Reevesia pubescens (var. siamensis)*	Old clearing along edge of evergreen forest, 600-1,300 m.
Scrophulariaceae	*Limnophila verticillata*	Low altitude marsh
	Lindernia khaoyaiensis	Open boggy areas of sandstone under dense vegetation, 1,200 m.
Theaceae	*Eurya nitida (var. siamensis)*	Open grassy slope and edge of evergreen forest, 800-1,800 m.

Sources: *Middleton 1991, Chayamarit 1991, Renner et al., 2001, Forman,1991, Larsen and Chi-Ming 1996, Green 2000, Yamazai 1990, Keng 1973-1981, Phengklai 2001*

Appendix 3
Comprehensive list of Bird species in the DPKY-FC by protected area unit

Order and nomenclature follows Round (2000) except where marked *.

L&R Species number allotted in Lekagul and Round (1991) *A Guide to the Birds of Thailand.*

X = Presence confirmed by substantiated records.

Authorities for species not recorded during the 2002 / 03 survey, or for which precise details are not held on file, are coded as follows:

1. Sight record/compilation for Thap Lan by Mr. Pornchai Wisutatharn
2. Listed by RFD Master Plan for Thap Lan NP
3. Listed by Nabhitabhata (1999) for Ta Phraya NP
4. Listed by RFD Master Plan for Pang Sida NP
5. Listed by Ngampongsai and Lauhachinda (1988) for Sakaerat
6. Sight record, Wichian Kongtong, for Sakaerat
7. Listed for Sakaerat by TISTR (2000)

Mc Listed for Khao Yai by McClure (1974)

RL Reliable local report

U Record considered unconfirmed

Status

R= Resident: breeding population or presumed breeding population present in at least one PKY-FC site

N= Non-breeding visitor

B= Breeding visitor

P= Passage migrant

V= Vagrant; in most cases, species known from three or fewer records. Includes some species which are almost certainly more regular than present number of records indicate, as well as species which may overfly PKY-FC but for which the habitat within its boundaries is not considered to regularly support them.

Species shown in **bold type** are those which are either globally or nationally threatened or near-threatened

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
137	Chinese Francolin *Francolinus pintadeanus*	R	X	X	X		
140	Blue-breasted Quail *Coturnix chinensis*	R	X		X		
131	Scaly-breasted Partridge *Arborophila chloropus*	R	X	X	X	X	
122	Red Junglefowl *Gallus gallus*	R	X	X	X	X	
119	Silver Pheasant *Lophura nycthemera*	R	X	1	X		
121	**Siamese Fireback *Lophura diardi***	R	X	X	X	X	
127	**Green Peafowl *Pavo muticus***			1	LR	LR	
67	Lesser Whistling-duck *Dendrocygna javanica*	R	X	1	X	X	
65	**[White-winged Duck *Cairina scutulata]***		U				
64	**[Comb Duck *Sarkidiornis melanotis*]**					U3	
63	Cotton Pygmy-goose *Nettapus coromandelianus*	Vagrant	Mc	1			
142	Yellow-legged Buttonquail *Turnix tanki*	R	X	1			
143	Barred Buttonquail *Turnix suscitator*	R	X	1	X	X	
394	White-browed Piculet *Sasia ochracea*	R	X	2	X		

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
427	Grey-capped Woodpecker *Dendrocopos canicapillus*	R	X	X		X	
425	Fulvous-breasted Woodpecker *Dendrocopos macei*	R		X			
423	*Rufous-bellied Woodpecker* ***Dendrocopos hyperythrus***	R		X			
412	Rufous Woodpecker *Celeus brachyurus*	R	X	2	X	X	
416	**White-bellied Woodpecker *Dryocopus javensis***	R	Mc	X			
408	Lesser Yellownape *Picus chlorolophus*	R	X	X	X		
407	Greater Yellownape *Picus flavinucha*	R	X	X	X	X	
402	Laced Woodpecker *Picus vittatus*	R	X	X	X	X	
404	**Streak-throated Woodpecker *Picus xanthopygaeus***	R		X	U		
406	**Black-headed Woodpecker *Picus erythropygius***	R	U	X			
405	Grey-headed Woodpecker *Picus canus*	R	X	X	X	X	
398	Common Flameback *Dinopium javanense*	R	X	X	X	X	
397	Greater Flameback *Chrysocolaptes lucidus*	R	X	X	X	X	
401	[Bamboo Woodpecker *Gecinulus viridis*]		U				

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
419	Black-and-buff Woodpecker *Meiglyptes jugularis*	R	X	X	X		
420	Heart-spotted Woodpecker *Hemicircus canente*	R	X	X	X	X	
415	**Great Slaty Woodpecker *Mulleripicus pulverulentus***	R	X	X	X		
379	Lineated Barbet *Megalaima lineata*	R	X	X	X	X	
380	Green-eared Barbet *Megalaima faiostricta*	R	X	X	X	X	
386	Moustached Barbet *Megalaima incognita*	R	X	X	X	3	
388	Blue-eared Barbet *Megalaima australis*	R	X	X	X	X	
389	Coppersmith Barbet *Megalaima haemacephala*	R	X	X	X	X	
374	**Oriental Pied Hornbill *Anthracoceros albirostris***	R	X	X	X	X	
376	**Great Hornbill *Buceros bicornis***	R	X	1	X	3	
367	**Brown Hornbill *Anorrhinus tickelli***	R	X	LR			
371	**Wreathed Hornbill *Aceros undulatus***	R	X	X	X		
365	Hoopoe *Upupa epops*	R, N	X	X	X	X	
340	Orange-breasted Trogon *Harpactes oreskios*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
341	Red-headed Trogon *Harpactes erythrocephalus*	R	X	1	X		
363	Indian Roller *Coracias benghalensis*	R	X	X	X	X	
364	Dollarbird *Eurystomus orientalis*	R	X	1	X	X	
345	Common Kingfisher *Alcedo atthis*	N	X	X	X	X	
346	Blue-eared Kingfisher *Alcedo meninting*	R	X	1	X	X	
348	Black-backed Kingfisher *Ceyx (e.) erithacus*	R,N	X	X	X		
349	Banded Kingfisher *Lacedo pulchella*	R	X	X	X	X	
351	Stork-billed Kingfisher *Halcyon capensis*	R	X	1	X	3	
352	Ruddy Kingfisher *Halcyon coromanda*	Vagrant	X				
353	White-throated Kingfisher *Halcyon smyrnensis*	R	X	X	X	X	
354	Black-capped Kingfisher *Halcyon pileata*	N	X	X	X	X	
362	Blue-bearded Bee-eater *Nyctyornis athertoni*	R	X	1	X	X	
359	Green Bee-eater *Merops orientalis*	R	X	X	X	X	
360	Blue-throated Bee-eater *Merops viridis*	N	X	1	X	X	
358	Blue-tailed Bee-eater *Merops philippinus*	N	X	1	X		

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
357	Chestnut headed Bee-eater *Merops leschenaulti*	R	X	X	X	X	
281	Chestnut-winged Cuckoo *Clamator coromandus*	B	X		X		
282	Large Hawk Cuckoo *Hierococcyx sparverioides*	N	X	1			
284	Moustached Hawk Cuckoo *Hierococcyx vagans*	R				X	
285	Hodgson's Hawk Cuckoo *Hierococcyx fugax*	R	X		X		
286	Indian Cuckoo *Cuculus micropterus*	R	X		X	X	
288	Oriental Cuckoo *Cuculus saturatus*	N	X	1			
290	Banded Bay Cuckoo *Cacomantis sonneratii*	R	X	X	X	X	
291	Plaintive Cuckoo *Cacomantis merulinus*	R	X	1	X	X	
293	Asian Emerald Cuckoo *Chrysococcyx maculatus*	N	X	1			
294	Violet Cuckoo *Chrysococcyx xanthorhynchus*	R	X		X		
296	Drongo Cuckoo *Surniculus lugubris*	R	X	1	X		
297	Asian Koel *Eudynamys scolopacea*	R	X	X	X	X	
300	Green-billed Malkoha *Phaenicophaeus tristis*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
304	**Coral-billed Ground Cuckoo *Carpococcyx renauldi***	R	X		X	3	
305	Greater Coucal *Centropus sinensis*	R	X	X	X	X	
306	Lesser Coucal *Centropus bengalensis*	R	X	1	X	3	
279	Vernal Hanging Parrot *Loriculus vernalis*	R	X	X	X	X	
274	**[Alexandrine Parakeet Psittacula eupatria]**	R					
276	**Blossom-headed Parakeet *Psittacula roseata***	R	X	X	X		
275	Red-breasted Parakeet *Psittacula alexandri*	R	X	X	X	X	
449	Himalayan Swiftlet *Aerodramus brevirostris*	N	X	1			
456	White-throated Needletail *Hirundapus caudacutus*	N	X				
457	Silver-backed Needletail *Hirundapus cochinchinensis*	(R)	X	X			
458	Brown-backed Needletail *Hirundapus giganteus*	R	X	X	X	X	
451	Asian Palm Swift *Cypsiurus balasiensis*	R	X	X	X	X	
454	Pacific Swift *Apus pacificus*	N	X		X	X	
455	House Swift *Apus nipalensis*	R	X	1	X	X	
459	Crested Treeswift *Hemiprocne coronata*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
307	Barn Owl *Tyto alba*	R			X	X	
308	Oriental Bay Owl *Phodilus badius*	R	X	X		X	
312	Mountain Scops Owl *Otus spilocephalus*	R	X				
313	Oriental Scops Owl *Otus sunia*	R,N	X	X	X	X	
314	Collared Scops Owl *Otus bakkamoena*	R	X	X	X	X	
318	**Spot-bellied Eagle Owl *Bubo nipalensis***	R	X		X		
321	Brown Fish Owl *Ketupa zeylonensis*	R	X				
322	Buffy Fish Owl *Ketupa ketupu*	R	X				
323	Brown Wood Owl *Strix leptogrammica*	R	X			3	
315	Collared Owlet *Glaucidium brodiei*	R	X	X	X		
316	Asian Barred Owlet *Glaucidium cuculoides*	R	X	X	X	X	
317	Spotted Owlet *Athene brama*	R	X	1	X	X	
309	Brown Boobook *Ninox scutulata*	R	X	X	X	X	
329	**Javan Frogmouth *Batrachostomus javensis***	R	X				
330	Great Eared Nightjar *Eurostopodus macrotis*	R	X	X	X	X	
332	Grey Nightjar *Caprimulgus indicus*	N	X	X	X	3	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
333	Large-tailed Nightjar *Caprimulgus macrurus*	R	X	X	X	X	
335	Savanna Nightjar *Caprimulgus affinis*	R	U	1	X		
262	Rock Pigeon *Columba livia*	R	X	X	X	X	
265	**Pale-capped Pigeon *Columba punicea***	N	X				
268	Oriental Turtle Dove *Streptopelia orientalis*	N	X				
270	Spotted Dove *Streptopelia chinensis*	R	X	X	X	X	
269	Red Collared Dove *Streptopelia tranquebarica*	R	X	X	X	X	
266	Barred Cuckoo Dove *Macropygia unchall*	R	X	2	X	3	
272	Emerald Dove *Chalcophaps indica*	R	X	X	X	X	
271	Zebra Dove *Geopelia striata*	R		X	X	X	
255	**Orange-breasted Pigeon *Treron bicincta***	R	X		4		
251	**Pompadour Pigeon *Treron pompadora***	R	X		X	3	
250	Thick-billed Pigeon *Treron curvirostra*	R	X	X	X	X	
257	**[Yellow-footed Pigeon *Treron phoenicoptera*]**	R	U				
246	Pin-tailed Pigeon *Treron apicauda*	N	X				
248	Wedge-tailed Pigeon *Treron sphenura*	R	X				

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
249	**White-bellied Pigeon** ***Treron sieboldii***	R	X				
259	**Green Imperial Pigeon** ***Ducula aenea***	R	X	X	X	X	
261	Mountain Imperial Pigeon *Ducula badia*	R	X	X	X	U3	
159	**Masked Finfoot** ***Heliopais personata***	Vagrant	X				
147	Slaty-legged Crake *Rallina eurizonoides*	N	X		X		
154	White-breasted Waterhen *Amaurornis phoenicurus*	R	X	X	X	X	
150	Ruddy-breasted Crake *Porzana fusca*	N	X				
156	Common Moorhen *Gallinula chloropus*	N	X	X	X		
206	Eurasian Woodcock *Scolopax rusticola*	N	X		X		
208	Pintail Snipe *Gallinago stenura*	N	X	X	X	3	
176	Whimbrel *Numenius phaeopus*	Vagrant	X				
182	Spotted Redshank *Tringa erythropus*	Vagrant	X				
186	Marsh Sandpiper *Tringa stagnatilis*	Vagrant	Mc				
187	Green Sandpiper *Tringa ochropus*	Vagrant	X			X	
188	Wood Sandpiper *Tringa glareola*	Vagrant	X	1		3	
189	Common Sandpiper *Actitis hypoleucos*	N	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
160	**Pheasant-tailed Jacana *Hydrophasianus chirurgus***	Vagrant		1			
161	Bronze-winged Jacana *Metopidius indicus*	Vagrant?		1			
215	Black-winged Stilt *Himantopus himantopus*	Vagrant	Mc	1			
167	Pacific Golden Plover *Pluvialis fulva*	Vagrant	X				
163	**Grey-headed Lapwing *Vanellus cinereus***	Vagrant	X				
164	Red-wattled Lapwing *Vanellus indicus*	R	X	1	X	X	
213	Oriental Pratincole *Glareola maldivarum*	Vagrant	X				
214	Small Pratincole *Glareola lactea*	Vagrant		X			
241	Whiskered Tern *Chlidonias hybridus*	Vagrant				X	
240	White-winged Tern *Chlidonias leucopterus*	Vagrant	X				
68	Osprey *Pandion haliaetus*	N	X	X	X	3	
72	**Jerdon's Baza *Aviceda jerdoni***	B	X	2	X		
73	Black Baza *Aviceda leuphotes*	N, R	X	X	X	X	
81	Oriental Honey-buzzard *Pernis ptilorhyncus*	N, R	X	2	X	X	
69	Black-shouldered Kite *Elanus caeruleus*	R	X				

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
70	**Black Kite *Milvus migrans***	N	X				
71	**Brahminy Kite *Haliastur indus***	Vagrant			X	3	
87	**Grey-headed Fish Eagle *Ichthyophaga ichthyaetus***	R	X				
89	Short-toed Eagle *Circaetus gallicus*	Vagrant	X				
90	Crested Serpent Eagle *Spilornis cheela*	R	X	X	X	X	
106	Eastern Marsh Harrier *Circus spilonotus*	N	X	1			
107	Hen Harrier Circus cyaneus	Vagrant	X				
108	Pied Harrier *Circus melanoleucos*	N	X		X		
74	Crested Goshawk *Accipiter trivirgatus*	R	X	X	X	X	
78	Shikra *Accipiter badius*	R	X	X	X	X	
77	[Chinese Sparrowhawk *Accipiter soloensis*]		U			U3	
80	Japanese Sparrowhawk *Accipiter gularis*	N	X		X	X	
79	Besra *Accipiter virgatus*	R	X	1	X		
76	[Eurasian Sparrowhawk *Accipiter nisus*]		U		U		
83	**Rufous-winged Buzzard *Butastur liventer***	R	Mc	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
84	Grey-faced Buzzard *Butastur indicus*	N	X	1			
82	Common Buzzard *Buteo buteo*	N	X				
98	**Black Eagle *Ictinaetus malayensis***	R	X	X	X		
101	Imperial Eagle *Aquila heliaca*	Vagrant	X				
97	Booted Eagle *Hieraaetus pennatus*	Vagrant	X				
95	Rufous-bellied Eagle *Hieraaetus kienerii*	R	X				
92	Changeable Hawk Eagle *Spizaetus cirrhatus*	R	X		X		
91	**Mountain Hawk Eagle *Spizaetus nipalensis***	R	X	X		X	
109	**White-rumped Falcon *Polihierax insignis***	R		X			
110	Collared Falconet *Microhierax caerulescens*	R	X	X			
112	Common Kestrel *Falco tinnunculus*	N	X	1			
115	Oriental Hobby *Falco severus*	R	X	1			
116	Peregrine Falcon *Falco peregrinus*	R,N	X				
1	Little Grebe *Tachybaptus ruficollis*	R	X	1		X	
6	**Oriental Darter *Anhinga melanogaster***	N	X				

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
5	Little Cormorant *Phalacrocorax niger*	N	X	1			
24	Little Egret *Egretta garzetta*	N	X	X		X	
15	Grey Heron *Ardea cinerea*	N	X	1		3	
16	Purple Heron *Ardea purpurea*	N	X	1			
19	Cattle Egret *Bubulcus ibis*	N	X	1	X	3	
17	Chinese Pond Heron *Ardeola bacchus*	N	X	X	X	X	
25	Little Heron *Butorides striatus*	N	X	X	X	X	
27	Black-crowned Night Heron *Nycticorax nycticorax*	N		1			
28	**Malayan Night Heron *Gorsachius melanolophus***	R	X		X		
29	Yellow Bittern *Ixobrychus sinensis*	R,N	X	1	X	3	
30	**Schrenck's Bittern *Ixobrychus eurhythmus***	Vagrant	X				
31	Cinnamon Bittern *Ixobrychus cinnamomeus*	R,N	X	1	X	3	
26	Black Bittern *Dupetor flavicollis*	Vagrant	X	1			
42	**Spot-billed Pelican *Pelecanus philippensis***	Vagrant	X	X		LR	
34	**Asian Openbill *Anastomus oscitans***	Vagrant	X			X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
36	**Black Stork *Ciconia nigra***	Vagrant	X				
37	**[Woolly-necked Stork *Ciconia episcopus*]**	R				U3	
40	**Lesser Adjutant *Leptoptilos javanicus***	Vagrant	X				
39	**Greater Adjutant *Leptoptilos dubius***	Vagrant	X				
446	Eared Pitta *Pitta phayrei*	R	X		X	X	
443	Blue Pitta *Pitta cyanea*	R	X	1	X		
441	Hooded Pitta *Pitta sordida*	B	X		X		
438	Blue-winged Pitta *Pitta moluccensis*	B	X	2	X		
428	Dusky Broadbill *Corydon sumatranus*	R	X	2	X		
429	**[Black-and-red Broadbill *Cymbirhynchus macrorhynchos*]**	R					
430	Banded Broadbill *Eurylaimus javanicus*	R	X	X	X	X	
432	Silver-breasted Broadbill *Serilophus lunatus*	R	X	1	X	X	
433	Long-tailed Broadbill *Psarisomus dalhousiae*	R	X	X	X		
559	Asian Fairy Bluebird *Irena puella*	R	X	X	X	X	
509	Blue-winged Leafbird *Chloropsis cochinchinensis*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
508	Golden-fronted Leafbird *Chloropsis aurifrons*	R	X	X	X	X	
816	Tiger Shrike *Lanius tigrinus*	P	X		X	X	
815	Brown Shrike *Lanius cristatus*	N	X	X	X	X	
817	Burmese Shrike *Lanius collurioides*	N	X	X		X	
819	Long-tailed Shrike *Lanius schach*	R	X	1	X		
818	Grey-backed Shrike *Lanius tephronotus*	N	X	X			
561	Eurasian Jay *Garrulus glandarius*	R	Mc	X	X		
564	Blue Magpie *Urocissa erythrorhyncha*	R		1	X	X	
563	Green Magpie *Cissa chinensis*	R	X	2	X	X	
565	Rufous Treepie *Dendrocitta vagabunda*	R		X		X	
567	Racket-tailed Treepie *Crypsirina temia*	R	X	X	X	X	
569	Large-billed Crow *Corvus macrorhynchos*	R	X	X	X	X	
820	Ashy Woodswallow *Artamus fuscus*	R	X	1	X	X	
554	Black-naped Oriole *Oriolus chinensis*	N	X	X	X	X	
555	Slender-billed Oriole *Oriolus tenuirostris*	N	X		U	U3	
556	Black-hooded Oriole *Oriolus xanthornus*	R	U	X	4		

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
557	Maroon Oriole *Oriolus traillii*	N	X				
558	**Silver Oriole *Oriolus mellianus***	N	X				
490	Large Cuckooshrike *Coracina macei*	R		X	X	3	
492	Indochinese Cuckooshrike *Coracina polioptera*	R	U	X			
493	Black-winged Cuckooshrike *Coracina melaschistos*	N	X	X	X		
496	Rosy Minivet *Pericrocotus roseus*	N	X	X		3	
496	**Brown-rumped Minivet *Pericrocotus cantonensis***	N	X	X	X		
495	Ashy Minivet *Pericrocotus divaricatus*	N	X	X	X	3	
497	Small Minivet *Pericrocotus cinnamomeus*	R		X			
502	Scarlet Minivet *Pericrocotus flammeus*	R	X	X	X	X	
486	Bar-winged Flycatcher-shrike *Hemipus picatus*	R	X	X	X	X	
806	**White-browed Fantail *Rhipidura aureola***	R		X			
808	Pied Fantail *Rhipidura javanica*	R	X	X	X	X	
546	Black Drongo *Dicrurus macrocercus*	R,N	X	X	X	3	
547	Ashy Drongo *Dicrurus leucophaeus*	R,N	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
548	Crow-billed Drongo *Dicrurus annectans*	P	X	1	X		
549	Bronzed Drongo *Dicrurus aeneus*	R	X	X	X	X	
550	Lesser Racket-tailed Drongo *Dicrurus remifer*	R	X	X		U3	
551	Hair-crested Drongo *Dicrurus hottentottus*	R	X	X	X	X	
552	Greater Racket-tailed Drongo *Dicrurus paradiseus*	R	X	X	X	X	
809	Black-naped Monarch *Hypothymis azurea*	R,N	X	X	X	X	
813	Asian Paradise-flycatcher *Terpsiphone paradisi*	R,N	X	X	X	X	
812	**Japanese Paradise-flycatcher *Terpsiphone atrocaudata***	Vagrant					
504	Common Iora *Aegithina tiphia*	R	X	X	X	X	
505	Great Iora *Aegithina lafresnayei*	R	X	X	X	X	
488	Large Woodshrike *Tephrodornis gularis*	R	X	X	X	X	
489	Common Woodshrike *Tephrodornis pondicerianus*	R		X			
749	White-throated Rock Thrush *Monticola gularis*	N	X	X	X	3	
751	Blue Rock Thrush *Monticola solitarius*	N	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
752	Blue Whistling Thrush *Myophonus caeruleus*	R,N	X	X	X		
754	Orange-headed Thrush *Zoothera citrina*	N	X	X	X		
755	Siberian Thrush *Zoothera sibirica*	P	X	1			
757	Scaly Thrush *Zoothera dauma*	N	X				
	Japanese Thrush *Turdus cardis*	Vagrant	X				
764	Eyebrowed Thrush *Turdus obscurus*	N	X	X			
766	Dusky Thrush *Turdus naumanni*	Vagrant	X				
770	Dark-sided Flycatcher *Muscicapa sibirica*	N	X	X	X	X	
772	Asian Brown Flycatcher *Muscicapa dauurica*	N	X	X	X	3	
771	Ferruginous Flycatcher *Muscicapa ferruginea*	P	X				
778	Yellow-rumped Flycatcher *Ficedula zanthopygia*	P	X	1	X		
779	**Green-backed Flycatcher *Ficedula elisae***	P	X				
777	Mugimaki Flycatcher *Ficedula mugimaki*	N	X				
785	Slaty-backed Flycatcher *Ficedula hodgsonii*	N	X				

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
775	Red-throated Flycatcher *Ficedula parva*	N	X	X	X	3	
791	Blue-and-white Flycatcher *Cyanoptila cyanomelana*	Vagrant	X		X		
797	Verditer Flycatcher *Eumyias thalassina*	N	X	X	X	3	
796	Vivid Niltava *Niltava vivida*	N	X				
800	Hainan Blue Flycatcher *Cyornis hainanus*	R	X	X		X	
801	Chinese Blue Flycatcher *Cyornis glaucicomans*	Vagrant	X				
802	Hill Blue Flycatcher *Cyornis banyumas*	R	X	X			
803	Tickell's Blue Flycatcher *Cyornis tickelliae*	R	X	2	X		
790	Grey-headed Flycatcher *Culicicapa ceylonensis*	N	X	X	X	3	
721	Rufous-tailed Robin *Luscinia sibilans*	N	X		X		
722	Siberian Rubythroat *Luscinia calliope*	N	X	X			
724	Bluethroat *Luscinia svecica*	Vagrant	X				
726	Siberian Blue Robin *Luscinia cyane*	N	X	X	X	X	
727	Orange-flanked Bush Robin *Tarsiger cyanurus*	Vagrant	X				
729	Oriental Magpie Robin *Copsychus saularis*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
730	White-rumped Shama *Copsychus malabaricus*	R	X	X	X	X	
741	Slaty-backed Forktail *Enicurus schistaceus*	R	X				
742	White-crowned Forktail *Enicurus leschenaulti*	R	X				
745	Common Stonechat *Saxicola torquata*	N	X	1	X	3	
746	Pied Bushchat *Saxicola caprata*	R	X	X	X	X	
748	Grey Bushchat *Saxicola ferrea*	Vagrant	X				
835	**Golden-crested Myna *Ampeliceps coronatus***	R	X	X	X	X	
836	**Hill Myna *Gracula religiosa***	R	X	X	X	X	
834	White-vented Myna *Acridotheres grandis*	R	X	X	X	X	
832	Common Myna *Acridotheres tristis*	R	X	X	X	X	
831	Vinous-breasted Myna *Acridotheres burmannicus*	R		X	X	X	
830	Black-collared Myna *Gracupica nigricollis*	R	X	X	X	X	
829	Asian Pied Myna *Gracupica contra*	R			X		
826	Purple-backed Starling *Sturnia sturnina*	Vagrant	X				
825	White-shouldered Starling *Sturnia sinensis*	Vagrant	X	1			

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
823	Chestnut-tailed Starling *Sturnia malabarica*	N/R?	X	1			
578	Chestnut-bellied Nuthatch *Sitta castanea*	R		X			
579	Velvet fronted Nuthatch *Sitta frontalis*	R	X	X	X	X	
574	Great Tit *Parus major*	R		X			
576	Sultan Tit *Melanochlora sultanea*	R	X	X		X	
464	Sand Martin *Riparia riparia*	N	X				
465	Dusky Crag Martin *Hirundo concolor*	R	X				
466	Barn Swallow *Hirundo rustica*	N	X	X	X	X	
469	Red-rumped Swallow *Hirundo daurica*	N	X	X	X		
469	[Striated Swallow *Hirundo striolata*]		U			U3	
471	Asian House Martin *Delichon dasypus*	N	X	X			
514	Black-headed Bulbul *Pycnonotus atriceps*	R	X	X	X	X	
515	Black-crested Bulbul *Pycnonotus melanicterus*	R	X	X	X	X	
519	Red-whiskered Bulbul *Pycnonotus jocosus*	R	X	1	X		
521	Sooty-headed Bulbul *Pycnonotus aurigaster*	R	Mc	X	X	X	
523	Stripe-throated Bulbul *Pycnonotus finlaysoni*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
525	Yellow-vented Bulbul *Pycnonotus goiavier*	R	X	1	X		
527	Streak-eared Bulbul *Pycnonotus blanfordi*	R	X	X		X	
532	Puff-throated Bulbul *Alophoixus pallidus*	R	X	X	X	X	
539	Grey-eyed Bulbul *Iole propinqua*	R	X	X	X	X	
543	Ashy Bulbul *Hemixos flavala*	R	X	1			
544	Black Bulbul *Hypsipetes leucocephalus*	N	X				
693	Zitting Cisticola *Cisticola juncidis*	R		1		3	
694	Bright-capped Cisticola *Cisticola exilis*	R	X	1	X		
699	Brown Prinia *Prinia polychroa*	R		X		X	
696	Rufescent Prinia *Prinia rufescens*	R	X	X	X	X	
695	Grey-breasted Prinia *Prinia hodgsonii*	R	X	X	X	X	
697	Yellow-bellied Prinia *Prinia flaviventris*	R	X	1	X		
698	Plain Prinia *Prinia inornata*	R	X	X	X	X	
869	Chestnut-flanked White-eye *Zosterops erythropleurus*	N	X	X			
871	Oriental White-eye *Zosterops palpebrosus*	R	X	2	X		
870	Japanese White-eye *Zosterops japonicus*	N	X				

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
872	[Everett's White-eye *Zosterops everetti]*	R	U				
709	Asian Stubtail *Urosphena squameiceps*	N	X	X			
714	Baikal Bush Warbler *Bradypterus davidi*	N	X	X			
690	Lanceolated Warbler *Locustella lanceolata*	N	X	X			
686	Black-browed Reed Warbler *Acrocephalus bistrigiceps*	N	X				
688	Blunt-winged Warbler *Acrocephalus concinens*	N	X				
685	Oriental Reed Warbler *Acrocephalus orientalis*	N	X	1		3	
683	Thick-billed Warbler *Acrocephalus aedon*	N	X	X	X		
701	Common Tailorbird *Orthotomus sutorius*	R	X	X		X	
702	Dark-necked Tailorbird *Orthotomus atrogularis*	R	X	X	X	X	
667	Dusky Warbler *Phylloscopus fuscatus*	N	X	X	X	3	
666	Buff-throated Warbler *Phylloscopus subaffinis*	N	X				
668	[Yellow-streaked Warbler *Phylloscopus armandii]*	N	U				
669	Radde's Warbler *Phylloscopus schwarzi*	N	X	X	X		
680	Chinese Leaf Warbler *Phylloscopus sichuanensis*	N	X				

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
679	Yellow-browed Warbler *Phylloscopus inornatus*	N	X	X	X	3	
671	Arctic Warbler *Phylloscopus borealis*	N	X			X	
672	[Greenish Warbler *Phylloscopus trochiloides*[	N	U				
673	Two-barred Warbler *Phylloscopus plumbeitarsus*	N	X	X	X	X	
670	Pale-legged Leaf Warbler *Phylloscopus tenellipes*	N	X	X	X		
674	Eastern Crowned Warbler *Phylloscopus coronatus*	N	X	X	X		
675	Blyth's Leaf Warbler *Phylloscopus reguloides*	N	X	X			
676	White-tailed Leaf-Warbler *Phylloscopus davisoni*	R	X				
678	Sulphur-breasted Warbler *Phylloscopus ricketti*	N	X				
661	Omei Spectacled Warbler *Seicercus omeiensis* *	N	X	X			
661	Plain-tailed Warbler *Seicercus soror*	N	X	X	(X)	X	
664	Yellow-bellied Warbler *Abroscopus superciliaris*	R	X	1			
621	White-crested Laughingthrush *Garrulax leucolophus*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
622	Lesser Necklaced Laughingthrush *Garrulax monileger*	R	X	1	X	X	
625	Black-throated Laughingthrush *Garrulax chinensis*	R	X	1	X		
591	Abbott's Babbler *Malacocincla abbotti*	R	X	X	X	X	
583	Puff-throated Babbler *Pellorneum ruficeps*	R	X	X	X	X	
594	Scaly-crowned Babbler *Malacopteron cinereum*	R	X	X	X	X	
596	Large Scimitar Babbler *Pomatorhinus hypoleucos*	R	X	X		X	
598	White-browed Scimitar Babbler *Pomatorhinus schisticeps*	R	X	X		X	
603	**Limestone Wren Babbler *Napothera crispifrons***	R	X				
617	Striped Tit Babbler *Macronous gularis*	R	X	X	X	X	
619	Chestnut-capped Babbler *Timalia pileata*	R	X	X	X	X	
620	Yellow-eyed Babbler *Chrysomma sinense*	R	X	1		X	
643	White-browed Shrike Babbler *Pteruthius flaviscapis*	R	X				
641	Chestnut-fronted Shrike Babbler *Pteruthius aenobarbus*	R	X				
640	White-bellied Yuhina *Yuhina zantholeuca*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
474	Indochinese Bushlark *Mirafra erythrocephala*	R		2	X	X	
862	Thick-billed Flowerpecker *Dicaeum agile*	R	X	X	X	X	
863	Yellow-vented Flowerpecker *Dicaeum chrysorrheum*	R	X	1	X		
866	Plain Flowerpecker *Dicaeum concolor*	R	X			3	
868	Buff-bellied Flowerpecker *Dicaeum i. cambodianum*	R	X				
867	Scarlet-backed Flowerpecker *Dicaeum cruentatum*	R	X	X	X	X	
838	Brown-throated Sunbird *Anthreptes malacensis*	R			X		
840	Ruby-cheeked Sunbird *Anthreptes singalensis*	R	X	X	X	X	
842	Purple-throated Sunbird *Nectarinia sperata*	R	X	1	X		
844	Olive-backed Sunbird *Nectarinia jugularis*	R	X	X	X	X	
845	Purple Sunbird *Nectarinia asiatica*	R	Mc	X	4		
848	Black-throated Sunbird *Aethopyga saturata*	R	X				
849	Crimson Sunbird *Aethopyga siparaja*	R	X	X	X	X	
852	Little Spiderhunter *Arachnothera longirostra*	R	X	X	X	3	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
874	Plain-backed Sparrow *Passer flaveolus*	R	X	X	X	X	
873	Eurasian Tree Sparrow *Passer montanus*	R	X	X	X	X	
484	Forest Wagtail *Dendronanthus indicus*	N	X	1	X	X	
480	White Wagtail *Motacilla alba*	N	X	X	X	3	
482	Yellow Wagtail *Motacilla flava*	N	X	2	X		
481	Grey Wagtail *Motacilla cinerea*	N	X	X	X	X	
477	Richard's Pipit *Anthus richardi*	Vagrant	X				
477	Paddyfield Pipit *Anthus rufulus*	R	X	X	X	X	
	Blyth's Pipit *Anthus godlewskii*	Vagrant	X				
476	Olive-backed Pipit *Anthus hodgsoni*	N	X	X	X	3	
478	Red-throated Pipit *Anthus*	Vagrant	X				
877	**Baya Weaver *Ploceus philippinus***	R		2	X		
881	Pin-tailed Parrotfinch *Erythrura prasina*	R	X	1			
883	White-rumped Munia *Lonchura striata*	R	X	X	X	X	
885	Scaly-breasted Munia *Lonchura punctulata*	R	X	X	X	X	
890	Common Rosefinch *Carpodacus erythrinus*	Vagrant	X				
893	Yellow-billed Grosbeak *Eophona migratoria*	Vagrant	X				

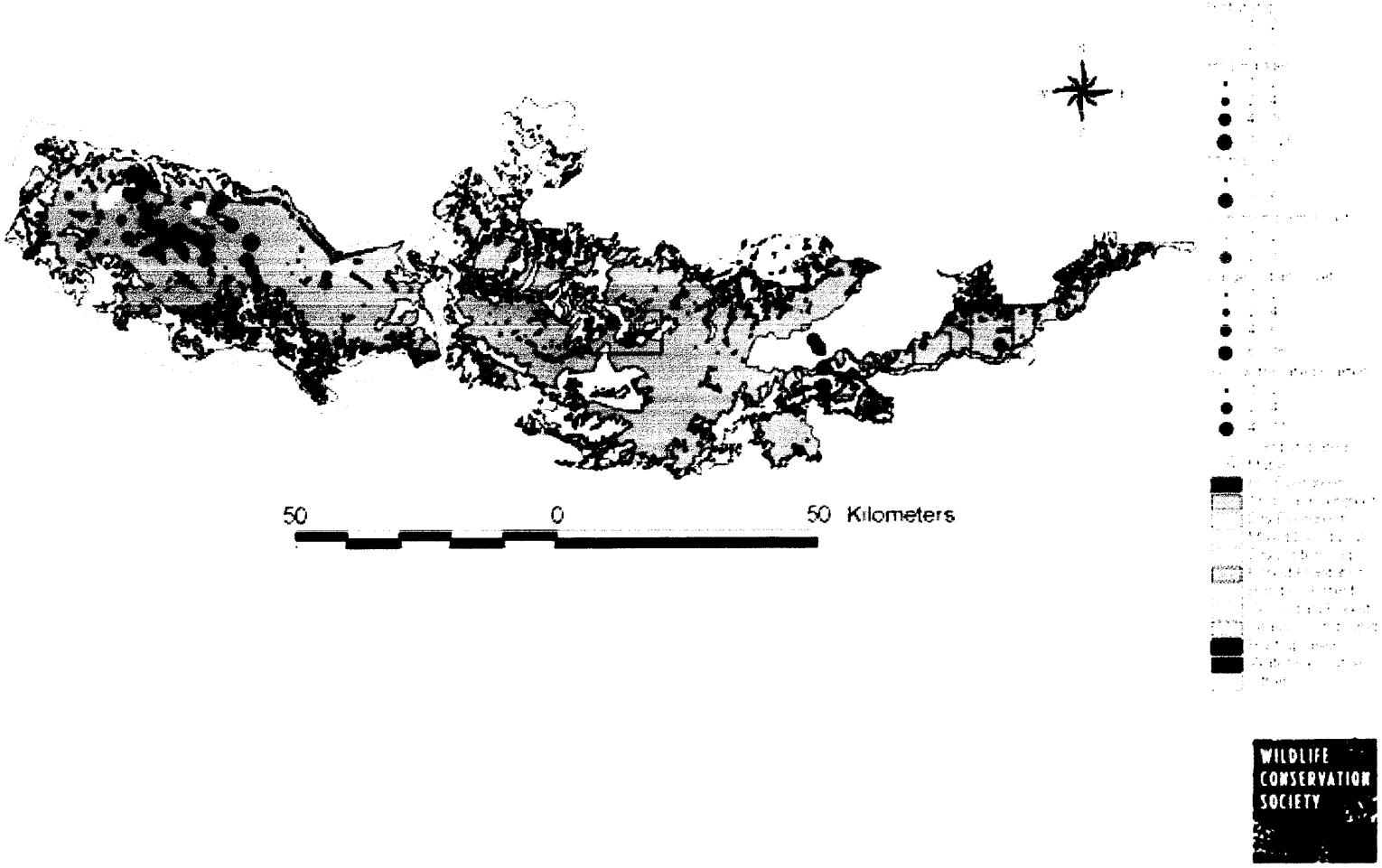
L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
899	**Yellow-breasted Bunting *Emberiza aureola***	Vagrant	X				
901	Chestnut Bunting *Emberiza rutila*	Vagrant	X		X		

Appendix 4
Maps of Distribution and Relative Abundance of species in the Dong Phayayen - Khao Yai Forest Complex

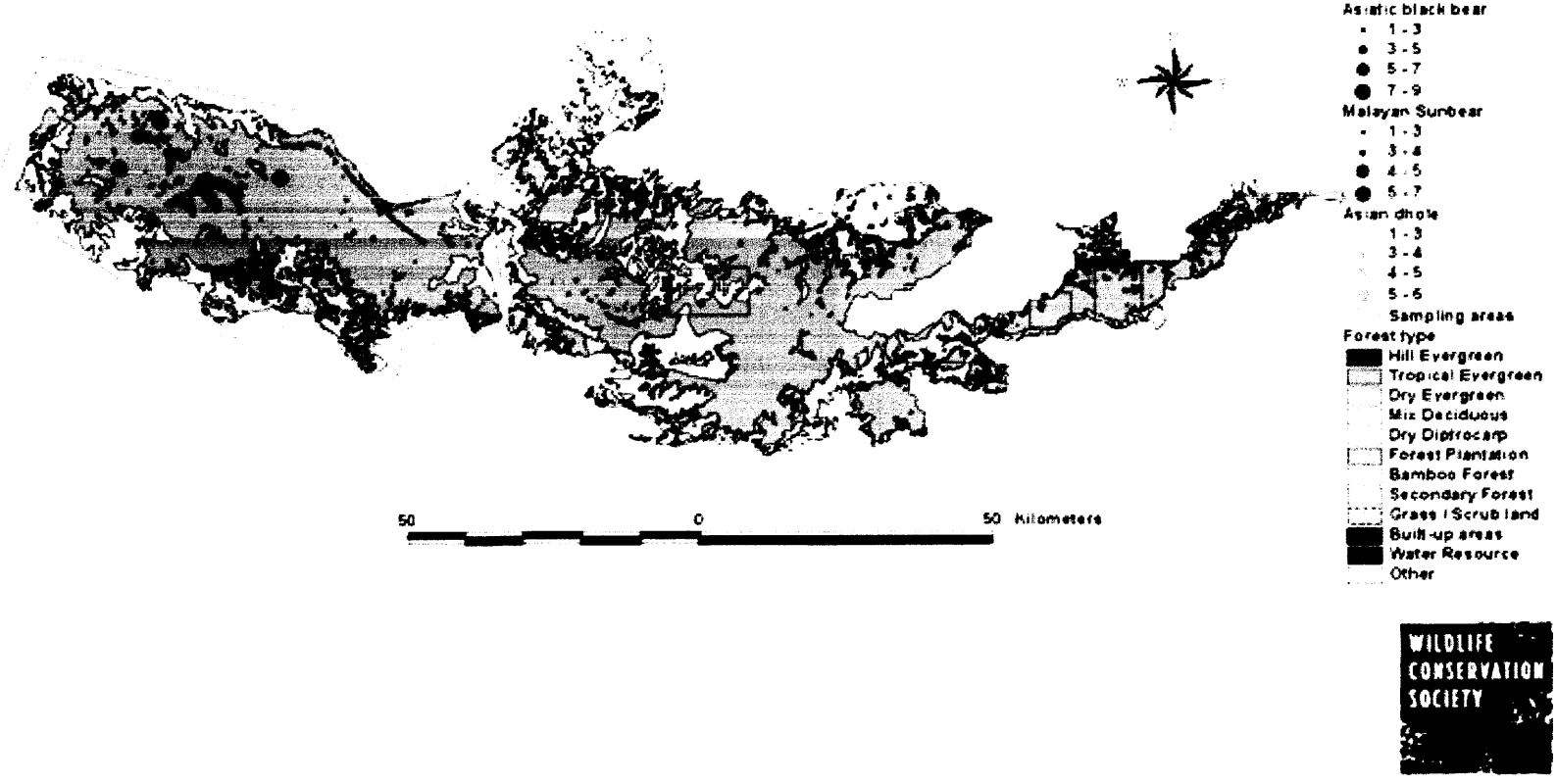
1. Distribution & Relative Abundance of Wild Cats

WILDLIFE CONSERVATION SOCIETY

2. Distribution & Relative Abundance of other Carnivores

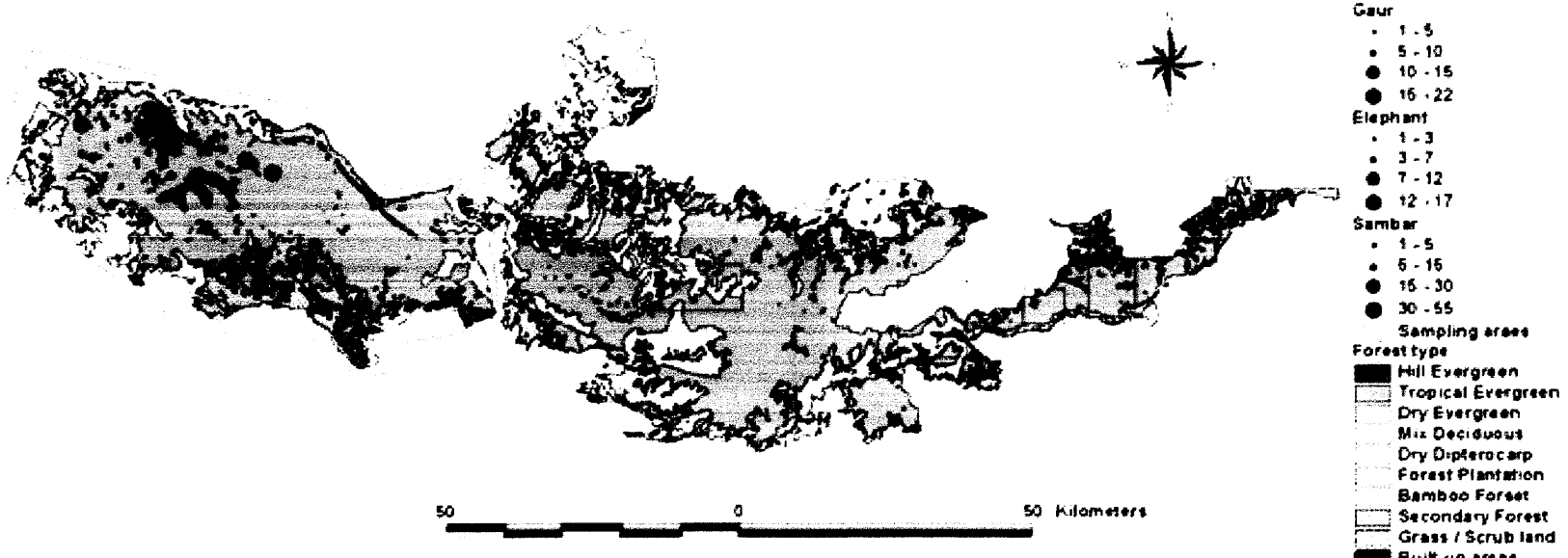


3. Distribution & Relative Abundance of Bears & Dogs

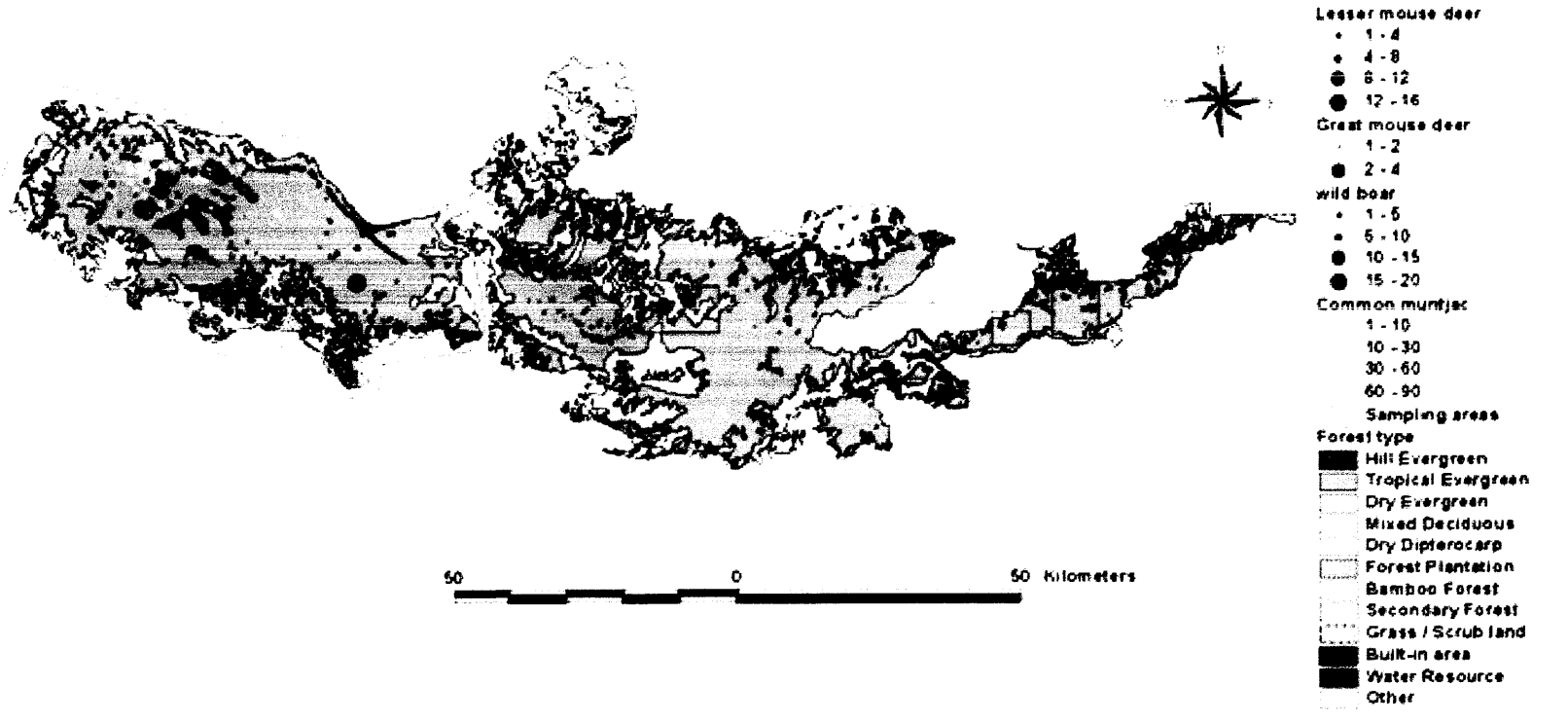


4. Distribution & Relative Abundance of Primates

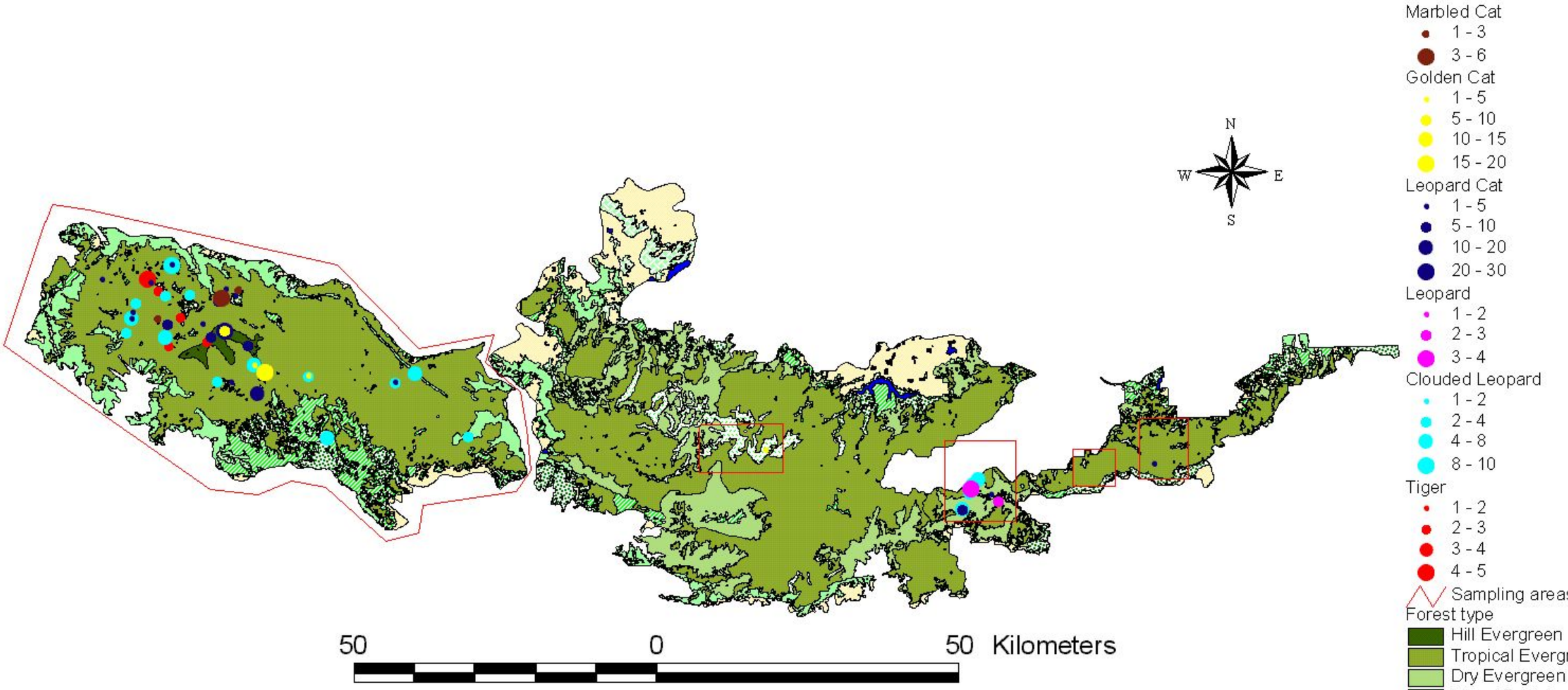
5. Distribution & Relative Abundance of Ungulates (no.1)



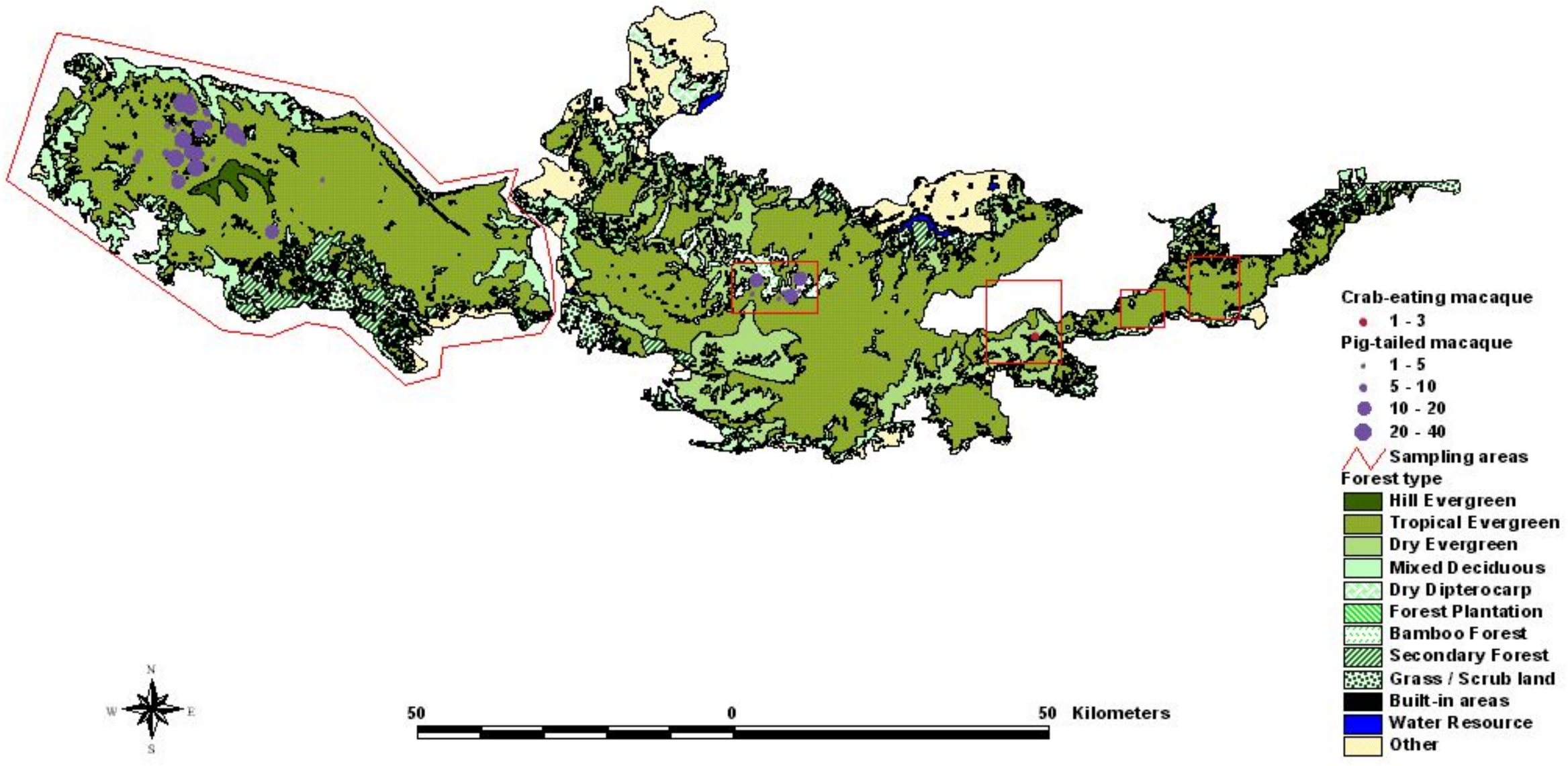
6. Distribution & Relative Abundance of Ungulates (no.2)



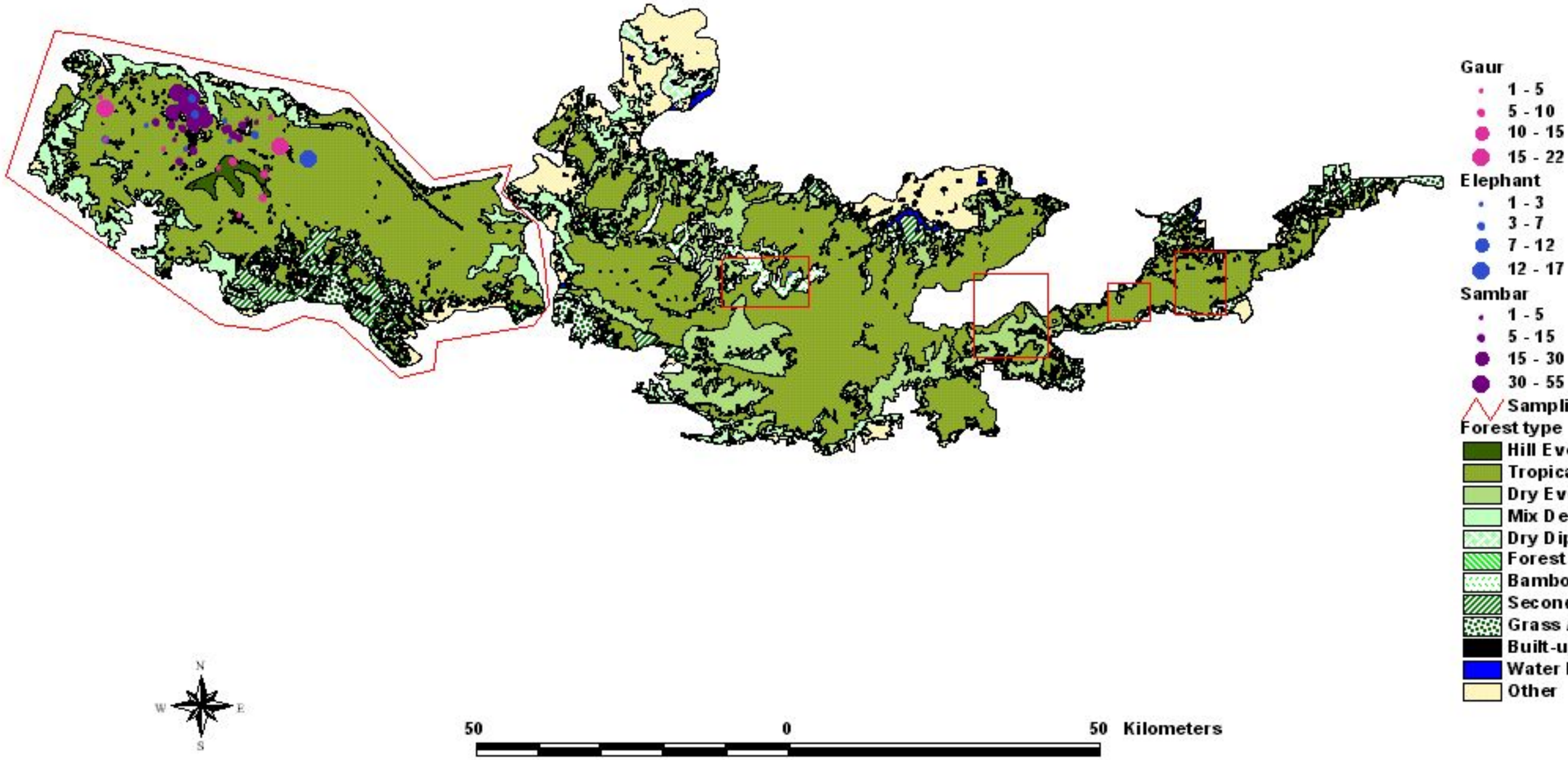
Capture rate of Feline species in Upper Eastern Forest Complex (UEFC)



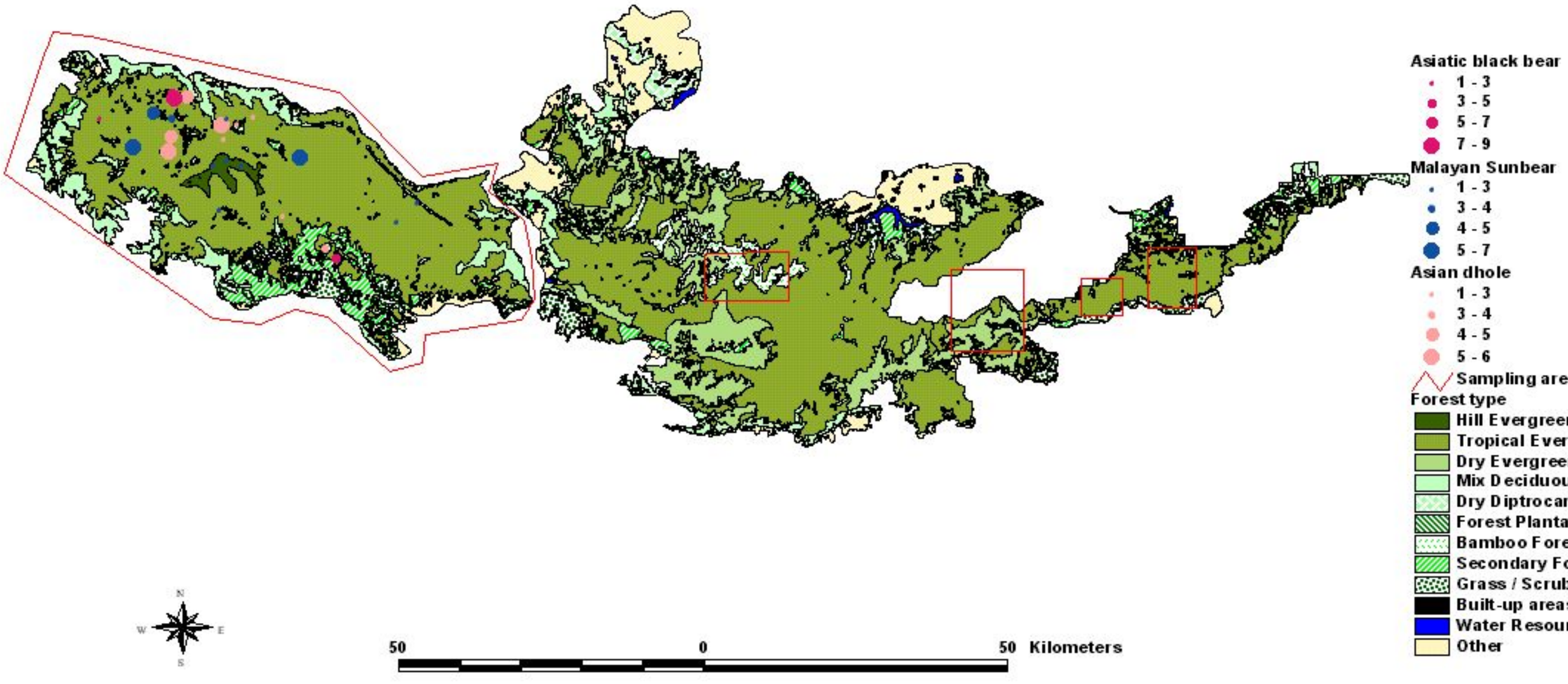
Capture rate of Primate in Upper Eastern Forest Complex (UEFC)



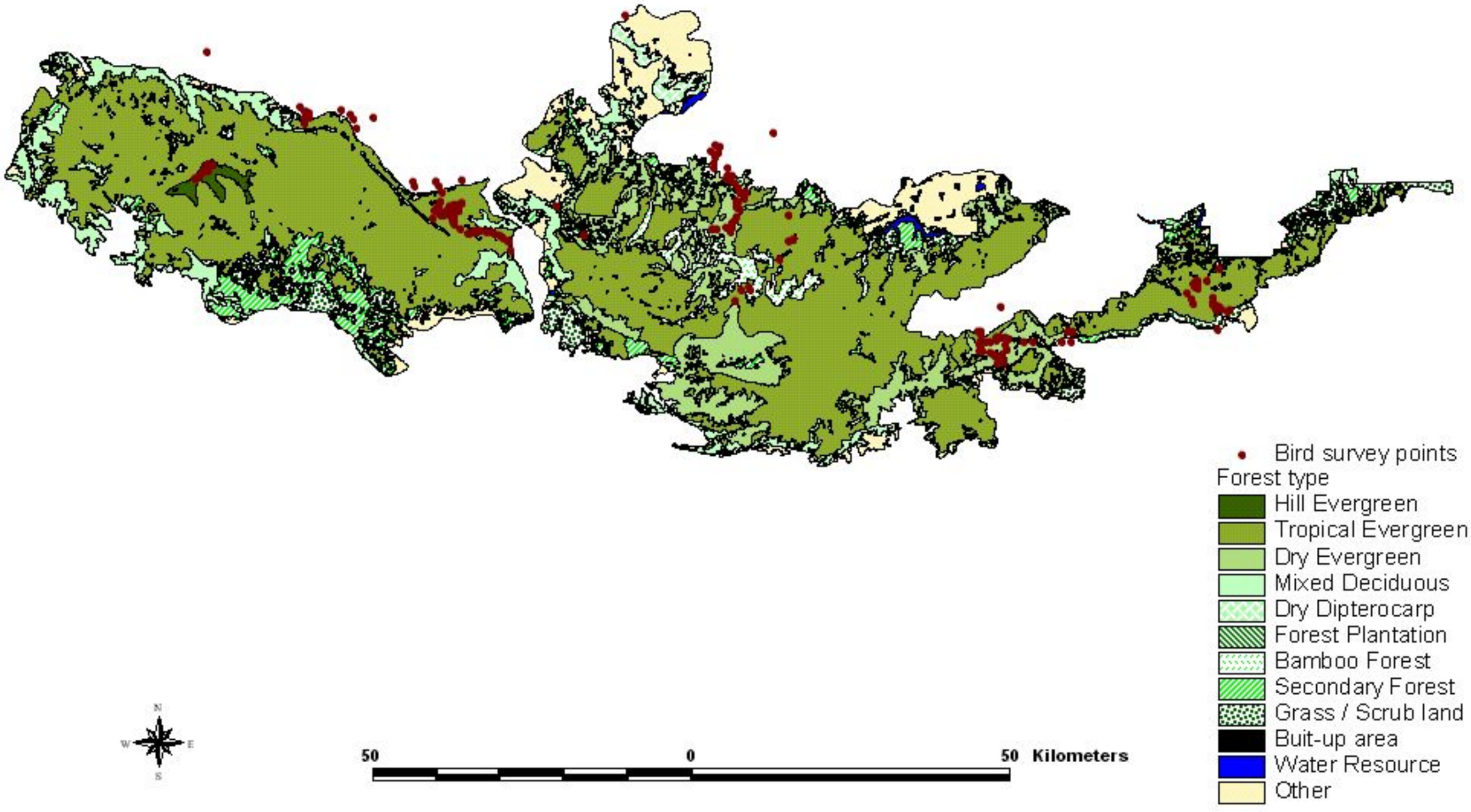
Capture rate of Ungulates in Upper Eastern Forest Complex (UEFC)



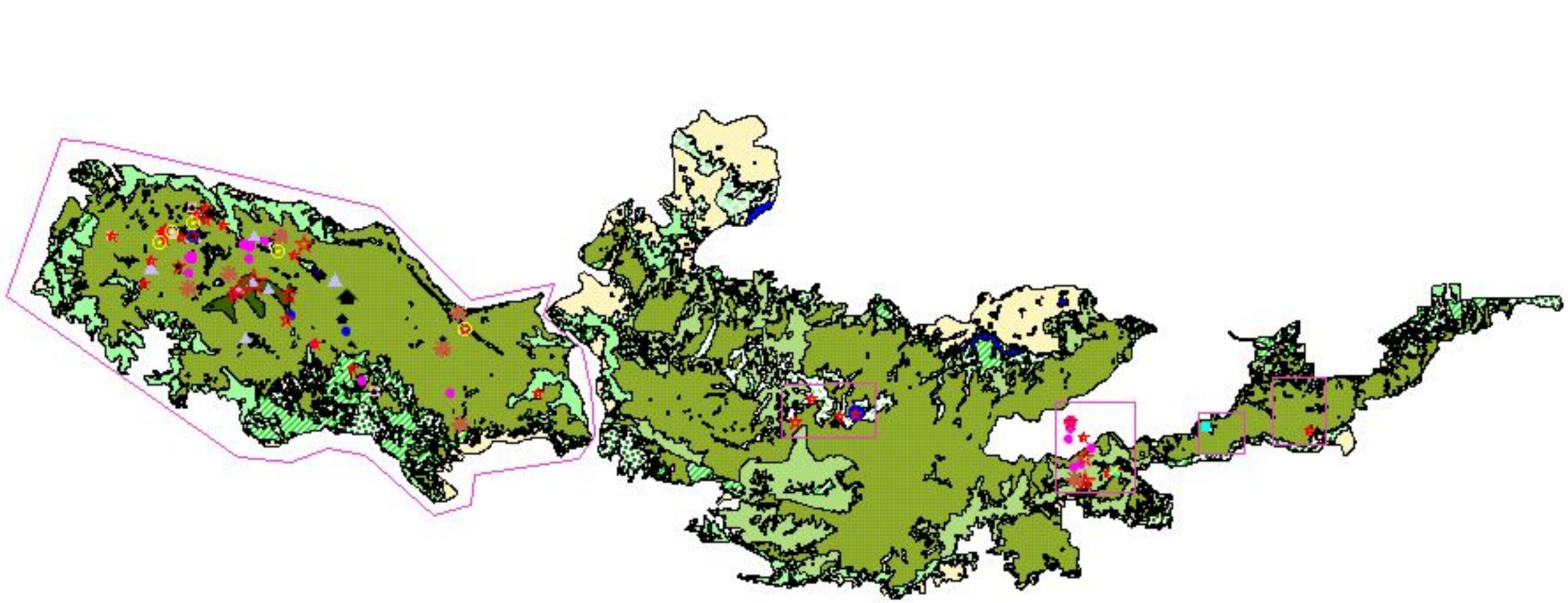
Capture rate of Bear and Dhole in Upper Eastern Forest Complex (UEFC)



Bird survey points in the eastern forest complex



Canivore species captured in eastern forest complex

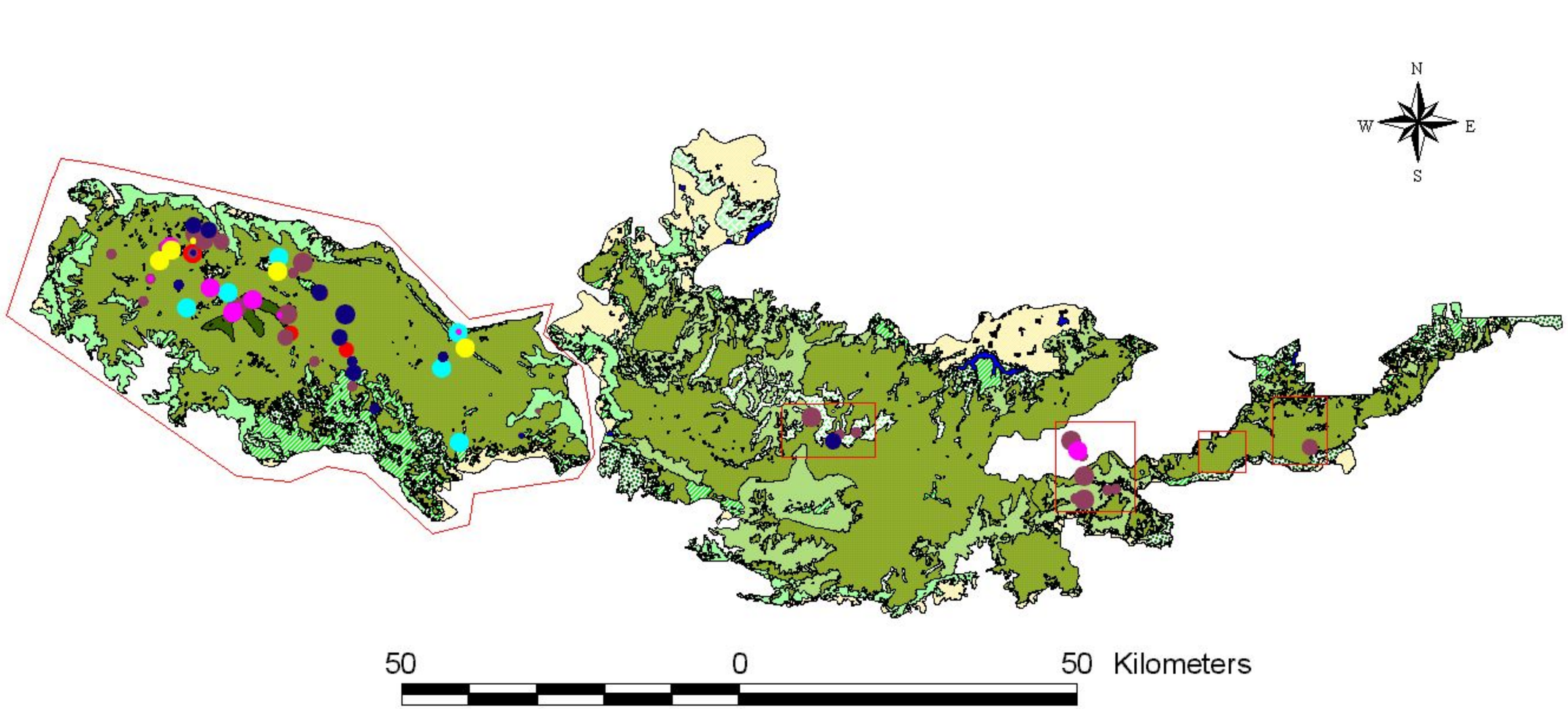


Sampling area
Binturong
1
Hog Badger
1
2
8
Common palm civet
1
Small Indian civet
2
Large spotted civet
1
Large Indian civet
1
2
3
5
6
Yellow-throated marten
1
2
5
Asiatic black bear
1
Malayan sunbear
1
2
Asian dhole
1
2
Forest type
Hill Evergreen
Tropical Evergreen
Dry Evergreen
Mixed Deciduous
Dry Dipterocarp
Forest Plantation
Bamboo Forest
Secondary Forest
Grass / Scrubland
Built-up area
Water Resource
Other

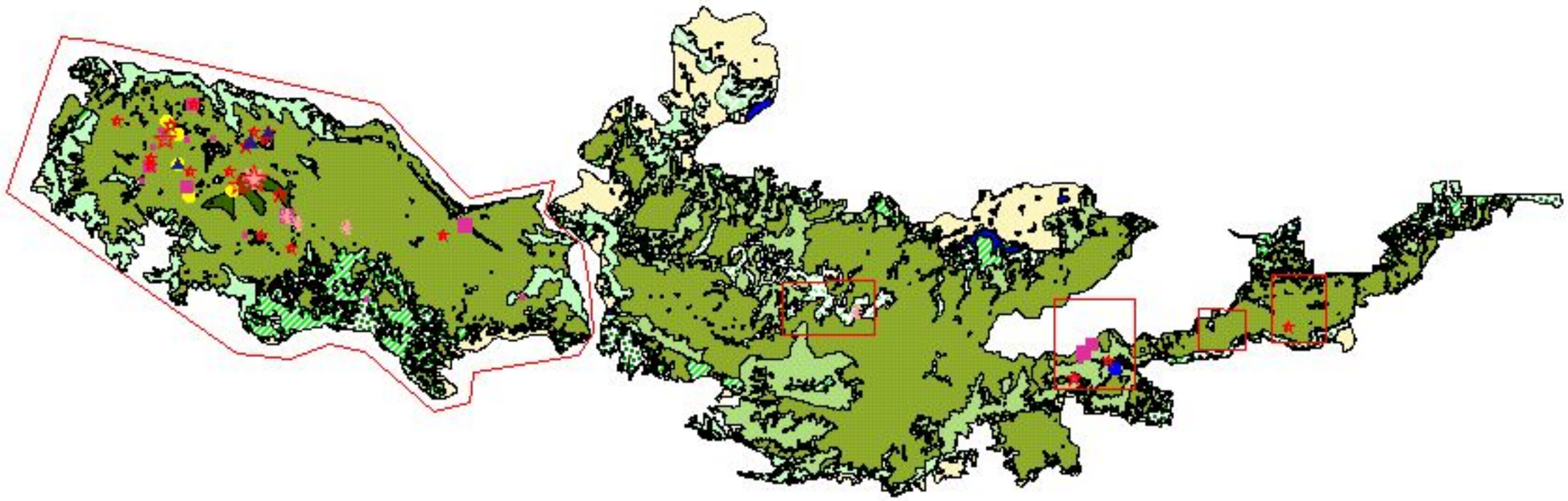
N
W
E
S

50 0 50 Kilometers

Capture rate of Carnivore species in Upper Eastern Forest Complex (UEFC)



Feline species captured in eastern forest complex



Sampling areas
Marbled cat
1
2
Leopard cat
1
2
3
4
6
Golden cat
1
2
Clouded Leopard
1
2
3
Leopard
1
Tiger
1
Forest
Hill Evergreen
Tropical Evergreen
Dry Evergreen
Mixed Deciduous
Dry Dipterocarp
Forest Plantation
Bamboo Forest
Secondary Forest
Grass / Scrub land
Buit-up area
Water Resource
Other

N
W
E
S

50 0 50 Kilometers

Table 1 Mitigation Plan to Reduce Impacts from Roads in Dong Phayayen – Khao Yai Forest Complex.

ROAD	SHORT TERM	LONG TERM
1. Pakchong-Noen Horm	- Install signs to remind drivers where there are crossing spots for wildlife. - Set up speed limits. - Identify a sensitive habitat and build up road bumps to reduce speed. - Set up time limits for access to the park (i.e., opening and closing time of park entrances, no passing after 6:00 pm). - Set up checking points to control pollutions (i.e., air and noise pollutions). - Set up checking points to control alcohol consumptions. - Limit numbers of cars during particular seasons (i.e., rainy season). - Set limit for weight of the car. - Limit car uses (i.e., for tourist use only) and ban truck or business transportation in some seasons (e.g., rainy season, or high season for tourists visits). - Collect data on mortality levels of wildlife as a result of vehicular collisions, and the impacts on wildlife populations. - Educate tourists and visitors about road impacts. - Conduct ecological impact assessment to develop mitigation plan to minimize negative impacts on sensitive habitat, rare, endemic, or endangered species. - Recruit assistance from volunteers, such as NGOs or local community, to publicize impacts from driving over speed limit in the park. This includes volunteers to work with park staff in sensitive spots during long weekends or high season.	- Develop and implement a monitoring system to minimize impacts from roads. - Set up database and conduct a long-term research project to collect data on mortality levels of wildlife as a result of vehicular collisions, and analyze the impacts on wildlife populations. - Conduct a long-term ecological research project on potential impacts of the road to ecological processes and biodiversity. - Investigate the feasibility of restoring habitats that are important to key species. - To reduce the impacts of traffic on wildlife and habitats, especially in long weekends or high seasons, introduce alternate means of access to the national park, i.e., providing a shuttle service to and from a designated area. - Cooperate with local communities or other governmental organizations in how road are developed and maintained near the park to minimize the impacts from road uses. - Do not allow expansion of the road.
2. Pang Sida- Thab Larn (Road No.3462)	Closed.	Closed.

3. Kabin Buri-Wang Nomkheaw (Road No.304)	- Set up speed limits. - Set up time limits for access to the park. - Set up checking points to control pollutions (i.e., air and noise pollutions). - Set up checking points to control alcohol consumptions. - Set limit for weight of the car. - Collect data on mortality levels of wildlife as a result of vehicular collisions, and the impacts on wildlife populations.	- Set up database and conduct a long-term research project to collect data on mortality levels of wildlife as a result of vehicular collisions, and analyze the impacts on wildlife populations. - Investigate the feasibility of restoring habitats that are important to key species. - Conduct research to determine the feasibility of developing wildlife corridors to reduce the impacts of fragmentation (i.e., Km 27-29 as a corridor and Km 42-48 a culvert). - To reduce the impacts on mortality levels of wildlife as a result of vehicular collisions, conduct a research to determine the feasibility of building fences at the sensitive spots along the park boundary. - Do not allow to expand the road.
4. Ta Phraya- Noen Dindeang (Road No.348)	- Limit numbers of cars during particular seasons. - Set up time limits for access to the park. - Set limit for weight of the car. - Set up checking points to control pollutions (i.e., air and noise pollutions).	Conduct research to determine the feasibility of developing wildlife corridors or culvert).

นกกินปลีอกเหลือง Olive - backed Sunbird


กากหมากตาฤษี Balanophora fungosa

MANAGEMENT PLAN FOR THE DONG PHAYAYEN - KHAO YAI FOREST COMPLEX

By

Department of National Parks, Wildlife and Plant Conservation
Ministry of Natural Resources and Environment

in Collaboration with

Department of Conservation, Faculty of Forestry, Kasetsart University

JANUARY 2004

Table of Contents

	Page
Cover page	i
Table of Contents	ii
List of Maps and Tables	iv
Foreword	v
Acknowledgments	vi
Abbreviations	vii
Definitions	viii
1. Introduction	**1**
2. Description of the Complex	**2**
3. Significance of the Complex	**5**
3.1 Representation	5
3.1.1 Geological Representation	6
3.1.2 Biological and Ecological Representation	7
3.1.3 Natural Beauty and Aesthetic Importance	7
3.1.4 In-situ Conservation of Biological Diversity	8
4. Threats and Management Issues	**10**
4.1 Threats	10
4.1.1 Development Pressures	10
4.1.2 Environmental Pressures	12
4.1.3 Natural Disasters	12
4.1.4 Visitor and Tourism Pressures	12
4.1.5 Pressures from Inhabitants Within or Adjacent to the Complex	13
4.2 Management Issues	14
4.2.1 Research and Monitoring	14
4.2.2 Preservation of Ecosystem Integrity	15
4.2.3 Tourism Issues	16
4.2.4 Stakeholder Participation	17
4.2.5 Management of Complex Units	18

Page

5. Management Plan **19**
5.1 Rationale and Purpose of the Plan 19
5.2 Management Goals and Objectives 20
5.2.1 Management Goals 20
5.2.2. Management Objectives 21
5.3 Management Plan Limitations and Opportunities 22

6. Plan for Action **23**
6.1 Research and Monitoring 24
6.2 Protection of Ecological Values 25
6.3 Visitor Planning and Management 28
6.4 Stakeholder Participation 29
6.5 Management Capability Enhancement Plan 30

7. Selected Bibliography **32**

Appendices
Appendix 1a: 45
Global and/or national mammal species of high conservation priority found within the DPKY-FC.

Appendix 1b: 46
List of globally and/or nationally threatened or near threatened bird species by protected area unit.

Appendix 2: 49
Summary of threats, management issues, objectives, and action plans for the DPKY-FC Complex.

List of Maps and Tables

Page

Map 1:
Location of the Dong Phayayen - Khao Yai Forest Complex, Thailand. 3

Map 2:
Dong Phayayen - Khao Yai Forest Complex with road network in the region. 4

Table 1:
Summary of threats and management issues for the DPKY-FC. 11

Foreword

The aim of this management plan is to provide a clearly defined direction for conservation of the Dong Phayayen - Khao Yai Forest Complex. Park unit managers face a very difficult challenge - managers must protect ecological integrity, while providing for a range of recreational opportunities and experiences to a growing number of domestic and international tourists. This management plan will help managers strike a balance between these conflicting goals.

The Dong Phayayen - Khao Yai Forest Complex also faces a number of threats and management issues, including habitat fragmentation, poaching and encroachment, the spread of invasive alien species, climate change, forest fires, a lack of baseline information, inadequate resources, and conflict with stakeholder groups. This document acknowledges the need to more effectively address these threats and issues. Plans for action, as detailed in the pages that follow, provide managers with a set of recommendations to resolve the threats and issues that have been identified by protected area unit superintendents.

The Dong Phayayen - Khao Yai Forest complex is one of Thailand's greatest natural treasures. As the place to conserve key species, key habitats, and invaluable stores of genetic material, the Complex will increasingly become one of the most important protected areas at national, regional, and international scales. But ongoing protection of Complex values will require commitment from all parties concerned - the Royal Thai Government, the Department of National Parks, Wildlife and Plant Conservation, Ministry of Natural Resources and Environment, protected area unit staff, non-governmental organizations, local communities, and the wider public. This management plan is a call to all stakeholder groups to assist in the protection of one of Thailand's most beautiful, and ecologically significant natural areas. As a first step towards protection of the ecological, genetic, scientific, aesthetic, and spiritual values of the Complex, I urge park managers to ensure that the management plan, as laid out in this document, is implemented.

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The Department of National Parks, Wildlife and Plant Conservation recognizes several of its staff for their time and effort put into the preparation of this management plan, including:

- Dr. Songtam Suksawang, Research Division Director, who provided guidance and support throughout the preparation process.
- All superintendents of the five protected areas that make up the DPKY-FC for their time out from busy schedules to provide practical knowledge and insight pertaining to threats and management issues, both during and after the management plan workshop in Bangkok.
- Dr. Ronnasit Maneesai who served a significant role as the workshop secretary as well as developer of a draft management plan.

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Abbreviations

ASEAN	Association of South-East Asian Nations
CC	Carrying Capacity
CIDA	Canadian International Development Agency
CFAN	CIDA Forestry Advisors Network
CSIRO	Commonwealth Scientific and Industrial Research Organization
DNP	Department of National Parks, Wildlife and Plant Conservation
DPKY-FC	Dong Phayayen - Khao Yai Forest Complex
DYWS	Dong Yai Wildlife Sanctuary
EBM	Ecosystem-based Management
GIS	Geographic Information System
ICDP	Integrated Conservation and Development Project
ICM	Integrated Coastal Management
IUCN	World Conservation Union
KUFF	Kasetsart University Faculty of Forestry
KYNP	Khao Yai National Park
LAC	Limits of Acceptable Change
MNRE	Ministry of Natural Resources and Environment
MVP	Minimum Viable Population
NGO	Non-Governmental Organization
NPO	National Parks Office
NPS	National Park Service (US)
PSNP	Pang Sida National Park
PVA	Population Viability Analysis
ROS	Recreation Opportunity Spectrum
RTG	the Royal Thai Government
TLNP	Thap Lan National Park
TPNP	Ta Phraya National Park
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
VERP	Visitor Experience Resource Protection
VIM	Visitor Impact Management
WCO	Wildlife Conservation Office
WCPA	World Commission on Protected Areas
WEFCOM	Western Forest Complex Ecosystem Management
WHS	World Heritage Site
WWF	World Wildlife Fund

Definitions

Adaptive Management
Involves viewing management as a continuous experiment. Adaptive management integrates learning into its planning process, to continually improve management for the protection of ecological integrity.

Complex
Dong Phayayen - Khao Yai Forest Complex (all 5 protected units combined)

Ecosystem-based Management (EBM)
Management based on biophysical rather than administrative boundaries. Themes of an EBM approach include: stress on the role of scientific knowledge as a basis for management, a cooperative and participatory process, and explicit definition of management goals.

National Parks
The National Parks Division (NPD), which was created to administer and manage national parks, has established the following guiding principles for park administration: "National Parks are lands preserved for protection of the environment, especially forests, wildlife and unique scenery, which impresses the viewer as worthy of preservation in its natural state. National parks shall be protected from destruction, alternative uses and incompatible activities so that future generations may enjoy and study these natural treasures in perpetuity."

The Complex consists of four national parks: Khao Yai, Thap Lan, Pang Sida, Ta Phraya.

Protected areas/units
Refers to individual protected units, e.g., Khao Yai National Park, Thap Lan National Park, and Pang Sida National Park, Ta Phraya National Park, Dong Yai Wildlife Sanctuary, except where other protected areas are indicated.

Stakeholders
All parties (e.g., government sector, private sector, local community group(s), NGOs) that benefit from, or are impacted by, the Complex directly or indirectly.

Wildlife Sanctuary

Wildlife sanctuaries are "lands preserved and protected from human activity which may disturb wildlife". Tourists are generally restricted to areas designated as "Nature Education Centres" within the sanctuaries. Both national parks and Wildlife Sanctuaries are established primarily to conserve wildlife and wildlife habitat. The main administrative distinction is that recreation and tourism are encouraged in national parks but discouraged in wildlife sanctuaries. The Complex consists of one wildlife sanctuary, Dong Yai.

Management Plan for the Dong Phayayen - Khao Yai Forest Complex

1. Introduction

Dong Phayayen - Khao Yai Forest Complex (DPKY-FC) plays a significant role in protection of the region's biological diversity (genetic, species and habitat diversity), and ecological and biological processes (e.g., watershed protection, protection of Complex inter- and intra-species relationships). The Complex conserves a rich diversity of plant, animal, and insect species, provides a refugia for rare and/or endemic species, and serves as a invaluable educational, recreational, and spiritual experience for the growing numbers of domestic and international tourists who are eager to connect with nature. Because of these important values, and to ensure ongoing support for protection of the Complex at local, regional, national, and international levels, the Royal Thai Government (RTG) has nominated Dong Phayayen - Khao Yai Forest Complex to be included on the list of World Heritage Sites.

Though protected units within the Complex have been gazetted as national parks (excepting Dong Yai, which is a wildlife sanctuary), the units are increasingly facing a number of internal (e.g. tourism and infrastructure development) and external pressures (e.g., encroachment) that threaten the ecological, recreational, and educational values of the Complex.

To ensure that the DPKY has a clearly defined direction for conservation of the park's values (including protection of natural resources and the development and/or maintenance of recreational opportunities), an interdisciplinary team from the *Department of National Parks, Wildlife and Plant Conservation* (including all protected area unit superintendents), in collaboration with academics from the *Department of Conservation, Faculty of Forestry, Kasetsart University*, convened in January of 2004 to develop a management plan. The plan is designed to meet overall Complex management goals, which include: preserving all ecosystem representations; maintaining geological, ecological, and evolutionary processes that generate and maintain biodiversity, and; optimization of economic uses without compromising natural values. The management plan is based on existing scientific information and current issues facing the Complex. The plan consists of five major parts:

1. description of the Complex;
2. significance of the Complex;
3. threats and management issues;
4. management goals and objectives; and
5. plan for action.

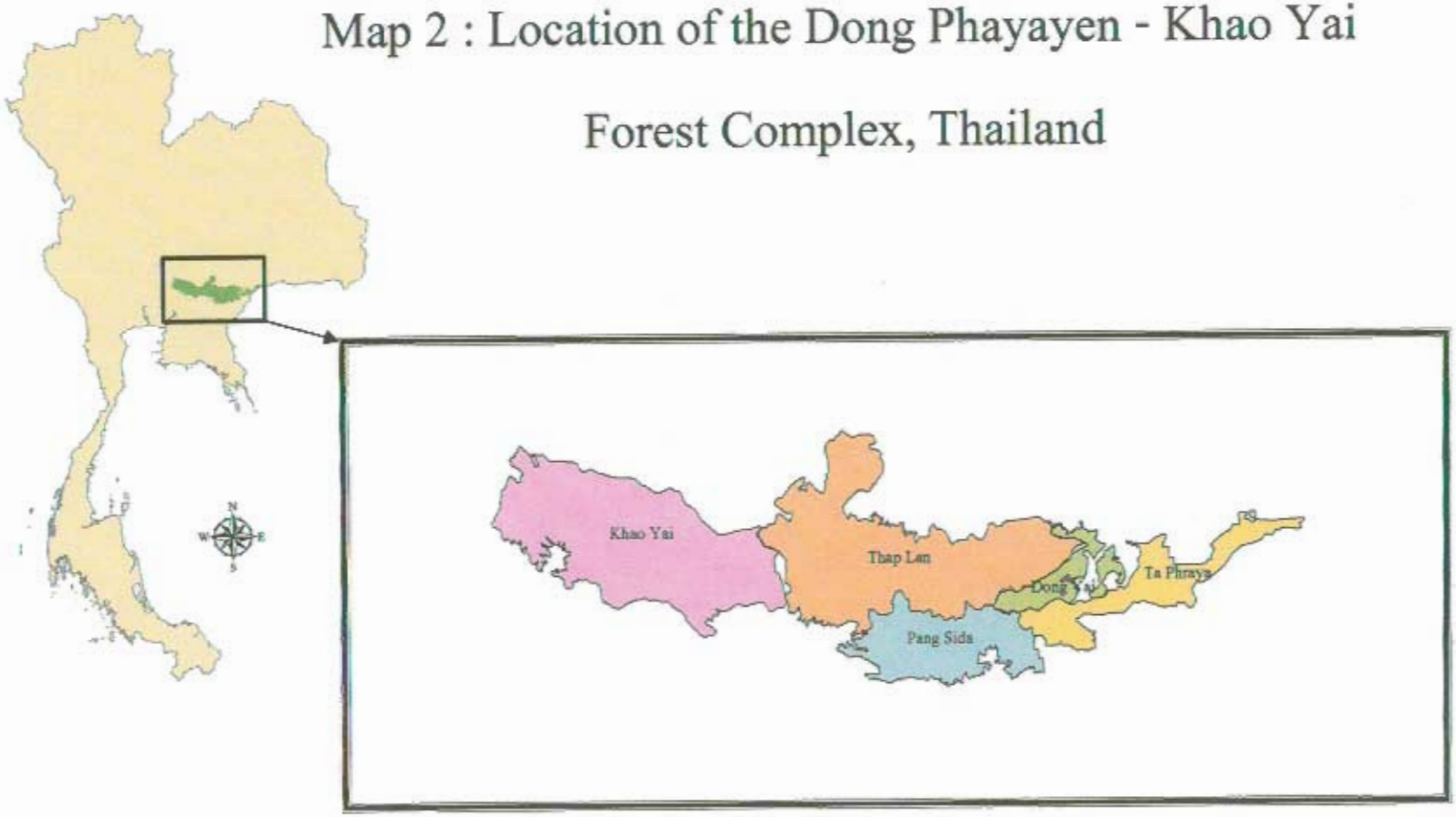
The management plan is designed to be flexible, in recognition of the dynamic nature of socio-political conditions. In addition, threats and management issues are different from one unit to another; therefore, the management plan provides for a range of strategies for managers (and other stakeholders) to implement. It should be noted, and stressed, that this is an *integrated* management plan. Each unit should develop its own management plan, with a set of objectives and actions that recognizes each unit's unique set of conditions. Dong Yai Wildlife Sanctuary and Ta Phraya National Park currently do not have any management plans in place; these units should produce their own management plans as soon as possible, using the integrated plan as a framework. Khao Yai, Thap Lan, and Pang Sida National Parks should update their management plans in accordance with the goals, objectives, and plans of action as laid out in this document.

The Complex management plan uses an ecosystem-based management (EBM) approach, which is required for effective influence over threats that originate outside the boundaries of the Complex. Such an approach extends the usefulness of the management plan to all parties concerned (e.g., local communities and other stakeholders), who share responsibility for protection of the Dong Phayayen - Khao Yai Forest Complex. Although community involvement in conservation (e.g., community-based forestry) has a long tradition in Thailand, application of ecosystem-based management techniques at a large scale is still in its infancy. An ecosystem-based approach to management was implemented through the "Western Forest Complex Ecosystem Management" project or the WEFCOM project, and management of the Dong Phayayen - Khao Yai Forest complex will apply the lessons learned from WEFCOM to administer the units. The experiences learned from application of the EBM approach to the Complex will be applied to the rest of Thailand's 19 protected area units. This is a challenge not only to Thailand, but to other tropical countries as well.

2. Description of the Complex

The Dong Phayayen - Khao Yai Forest Complex is located between latitude 14° 00′ and 14° 33′ N and longitude 101° 05′ and 103° 14′ E (Map 1). The Complex straddles the political boundaries of several provinces within northeast and eastern Thailand, including Saraburi, Nakhon Nayok, Nakhon Rachasima, Prachinburi, Srakaew, and Burirum provinces. The Complex covers 615,500 hactares (or 6,155 km^2), and 5.7% of Thailand's protected area system (or 1.2% of the country's total land area). The Complex consists of four national parks (Khao Yai, Thap Lan, Pang Sida, Ta Phraya) and one wildlife sanctuary (Dong Yai) (Map 2). These two categories are similar to the World Conservation Union (IUCN) Categories II (National Park) and Ia (Strict Nature Reserve).

Map 2 : Location of the Dong Phayayen - Khao Yai Forest Complex, Thailand



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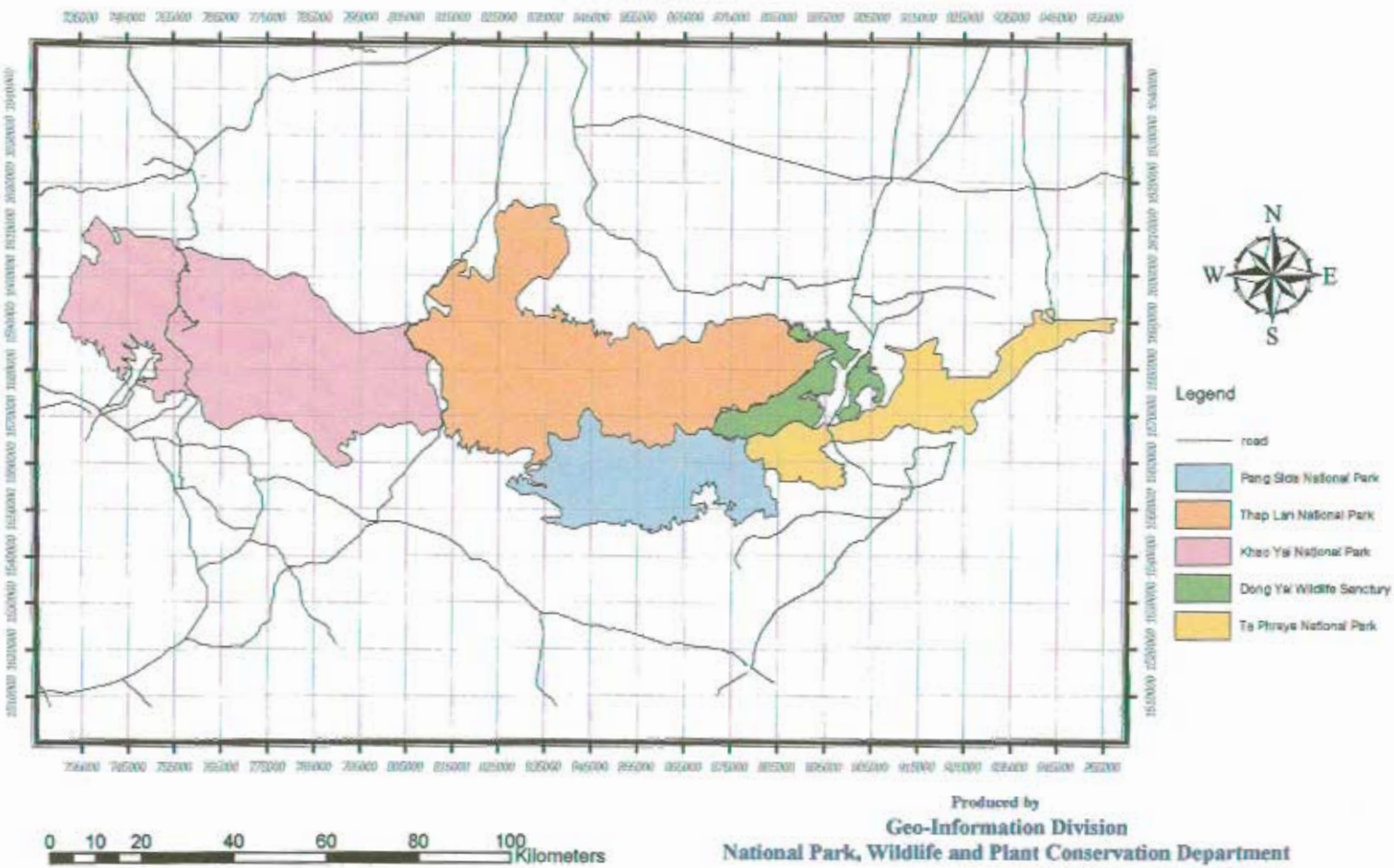
Geo - Information Division

National Park, Wildlife and Plant Conservation Department

Map 3 : Dong Phayayen-Khao Yai Forest Complex with road network in the region



The Complex is administered by the newly established Department of National Parks, Wildlife and Plant Conservation (DNP), which is under the recently established Ministry of Natural Resources and Environment (MNRE). Two principal laws used to administer the Complex are the *National Park Act* (1961) and the *Wild Animal Reservation and Protection Act* (1992).

3. Significance of the Complex

3.1 Representation

The DPKY-FC is one of the largest and most comprehensive representations of Thailand's biodiversity richness, particularly its variety of tropical forest ecosystems, including:

(i) Evergreen Forest

- Moist Evergreen Forest
- Dry Evergreen Forest
- Hill / Lower Montane Forest
- Corypha Palm Community (*Corypha lecomtei)*
- Escarpments
- Figs
- Orchids
- Tree Ferns

(ii) Diptercarp / Deciduous Forest

- Mixed Deciduous Forest
- Dry Diptercarp Forest / Deciduous Forest
- Savanna / Grassland

(iii) Karst

(iv) Riverine Forest

These forest types and associated species of birds and animals are a consequence of the evolutionary history of the complex including the formation and uplift of the earth's crust. This formed a fault zone along the geologically linear feature that has been used to define the biogeographic region that is identified as the Korat Plateau. The habitats within this part of the ecoregion contain floral and faunal assemblages that are as complete as are currently known to exist anywhere in the Indochina bioregion.

In addition, the DPKY-FC is noteworthy and ecologically significant in comparison to other sites in the region for the following reasons:

- The Complex contains a very wide range of habitats ranging from the moist evergreen forest of Khao Yai NP through to

the drier and mixed Diptercarp / Deciduous forests that make up the eastern part of the Complex.
- The Complex is large (the total size of the area is 615,500 ha) and topographically varied.
- The Complex is under increasingly effective management with conservation management plans in place for the majority of units.
- In comparison to Thailand's only other natural World Heritage Site (Huay Kha Khaeng - Thung Yai located on Thailand's western border with Myanmar), the DPKY-FC contributes important additional ecosystems, species and habitats (e.g. areas of lowland evergreen forests).

It is, therefore, reasonable to assume that a comprehensive approach to the management and protection of the Complex has the potential to make a significant conservation contribution to both the biogeographical realm as well as global conservation objectives.

3.1.1 Geological Representation

During the period now recognized in geological time definitions as the *Himalayan orogeny* some 60 million years ago, the Indian subcontinent moved north into Asia. Topography was heavily modified as geological pressures increased, tilting the southern rim of the Korat Plateau higher and creating a fault zone. This uplift was followed by progressive mountain building activity caused by the ongoing movement of these two sub-continental plates, which produced the heat that melted the earth's crust and produced magma, creating a volcanic belt (MacKinnon and MacKinnon 1992). A subsequent up-thrust occurred 20 million years ago, and during this period mountain building activity was accompanied by considerable faulting and volcanic activity that progressively shaped the present form of Indochina. A final period of mountain building activity occurred between the Pliocene and the Pleistocene about 3 million years ago, with further faulting and the creation of rift valleys and horizontal offsetting of various segments of the land surface.

These dynamic and ongoing geological processes have resulted in the formation of an abrupt escarpment that runs, virtually unbroken, from Khao Yai National Park in the west through the other protected area units that make up the DPKY-FC, all the way to the eastern end of the Dongrak Range in Cambodia, a distance of more than 200 kms. This distinctive escarpment, rising in places to some 500 m, represents an active and ongoing global geological process.

3.1.2 Biological and Ecological Representation

Two related factors are considered to be of importance here. First is the hydrological significance of the Complex. Khao Yai, at the western end of the protected area complex, receives the most rainfall, probably as much as 3,000 mm per year in some areas. It has a significant headwater function, with five major watersheds, one of which, the Mae Nam Mun provides water and life to the driest part of Thailand, the Northeast, before becoming a tributary of the Mekong. There is an intricate feedback loop between the altitude of Khao Yai, the presence of moist, evergreen forest and the precipitation. Although most rain is brought by the monsoons in May through October, even in the dry season the forests remain humid as the cooler air condenses on the leaves of the forest.

To the east of Khao Yai, through to Thap Lan, Pang Sida and ultimately Ta Phraya, these processes change. The altitude of the scarp gently declines from west to east. The distance from the rain-bearing monsoons increases. Precipitation amounts decline steadily to under 1,000 mm. The forests become increasingly deciduous, and canopies more open.

Inclusion of this Complex as a World Heritage Site would help protect and emphasize the important changes in the relationships between topography, climate and vegetation. As global climate change becomes more pronounced, protection of virtually uninterrupted complexes that contain such gradients will become increasingly important for conservation. No other protected area complex within this biogeographical zone contains such a well-marked, longitudinal gradient.

The second factor that needs to be mentioned within this context is the size and diversity of the DPKY. Processes such as the relationships described above require large areas to remain intact. Many of the species contained within the area (e.g., hornbills, tigers, elephants) require large areas of habitat that are fast disappearing elsewhere. Protection of this complex of parks provides sufficient habitat to help conserve biodiversity into the future.

3.1.3 Natural Beauty and Aesthetic Importance

The entire escarpment provides a distinctive and highly aesthetic landscape feature. Khao Yai National Park (KYNP), due to its topography and higher precipitation has numerous spectacular waterfalls, which form the main attraction for many of Khao Yai's 700,000 visitors per year (DNP 2003). Wildlife viewing is also an important aesthetic (and spiritual) experience, and KYNP provides perhaps the best opportunities in Thailand to see many large, spectacular species, such as hornbills, tigers, sambar deer,

gibbons, and elephants. Park management has sought to enhance wildlife viewing opportunities through diverse management strategies, including the provision of viewing towers in selected areas.

The other Complex units also have outstanding aesthetic attractions. Pang Sida, for example, is noted for its rugged topography. This unit also provides one of the very few, and the best, remaining opportunities in Thailand (and the world) to see Siamese crocodiles (*Crocodylus siamensis*). In Pang Sida, Thap Lan, and Ta Phraya, opportunities to view two of the four species of wild cattle - gaur and banteng - are also possible.

3.1.4 In-Situ Conservation of Biological Diversity

Perhaps the most outstanding contribution of the protected area Complex is in its current and future contribution to the conservation of an assemblage of tropical forest species that are coming under increasing pressure elsewhere. The Complex contains some of the largest remaining protected populations of many species in the biogeographical realm. Of particular note are the populations of Asian elephants (*Elephas maximus*) and tigers (*Panthera tigris*). The site is also known to contain populations of Malayan sun bears (*Helarctos malayanus*), Asiatic black bears (*Ursus thibetanus*), dholes (*Cuan alpinus*), clouded leopards (*Neofelis nebulosa)*, leopards (*Panthera Pardusl)*, gaur, and banteng, although relatively little is known about their populations. Both gaur and banteng are on the international list of threatened animal species, and both sub-species found in the area are of the rarest sub-species. Preliminary estimates suggest some 150 gaur and 10 banteng in KYNP and Pang Sida (Srikosamatara and Suteethorn 1995). KYNP is also the only site where the white-handed (*Hylobates lar)* and pileated (*Hylobates pileatus)* gibbons overlap in range and produce cross-bred offspring, and is hence of considerable scientific interest. Substantial populations of other primates, such as pig-tailed macaques (*Macaca nemestrina*), long-tail macaques (*M. fascicularis*), slow loris (*Nycticebus coucang*) and silvered langurs (*Presbytis cristata)* also remain.

The discovery of a relict population of crocodiles in Pang Sida in 1992 when the crocodiles were thought to be extinct is not only important its own right, but also provides some indication of the species that may be re-discovered when biological inventories of the complex are completed. There have been reported sightings of footprints of several species thought to be extirpated from the region (e.g., the wild water buffalo (*Bubalus bubalus*) in the lowland forests of Pang Sida) that await confirmation.

The nominated site also extends west from the Dong Rak Range in Cambodia, the site where the kouprey (*Bos sauveli*) was first

discovered. Although it has been suggested that the kouprey may exist within the complex, this is considered a somewhat remote possibility. However, if populations of the kouprey are rediscovered, the large amount of habitat provided by the nominated site could provide ideal conditions for a re-introduction project. The park complex is directly adjacent to the Banteay Chmor protected landscape in Cambodia. Designation of the Complex as a World Heritage Site will help encourage neighbouring countries to extend full protection measures to adjacent sites.

Full inventories of bird populations have yet to be undertaken. Significant populations of hornbills still remain, and, in KYNP alone, there are some 34 threatened bird species. The complex also contains 23 species of threatened or endangered mammal species. Given the size of the complex, even the most wide-ranging and space-demanding species should be well enough protected to ensure that populations will continue to flourish into the future.

Other characteristics of the complex that are of noteworthy attention include the following:

- The DPKY-FC contains samples of all key habitats that characterize the six biogeographic regions making up this part of the Biogeographic Realm, and includes all major rainforest habitat types of north-eastern Thailand.
- At least 2,500 plant species out of 15,000 plant species in Thailand have been identified in various habitats within DPKY-FC with as many as 16 species identified as endemics.
- Habitat variation also harbors a high diversity of fauna (> 805 species) with an estimated 112 mammals identified, including threatened mammal species of outstanding universal value from both a scientific and conservation perspective.
- Important habitats for key bird species are also contained within the complex, with some 392 species identified, including 3 species endemic to Thailand and 6 species listed as threatened by the IUCN.
- Some preliminary surveys on herpetofauna reveal that the Complex harbors at least 205 species of reptiles and amphibians, with 9 species identified as endemics.

Given the local, national, regional, and international ecological, aesthetic, scientific, and educational values of the Dong Phayayen - Khao Yai Forest complex - the last Southeast Asian frontier - a proposal has been put forth to include the Complex on the list of World Heritage Sites (WHS). Nomination of the Complex as a WHS will strengthen local, national and regional support for greater protection of the Complex's ecological values, which will not only benefit the people of Thailand, but the people of neighbouring countries and regions as well. As the place to conserve key species (e.g., tigers, guar, elephants), key habitats

(e.g., low land deciduous and diptercarp forests), and invaluable stores of genetic material, the Complex will increasingly become one of the most important protected areas in Thailand. Nomination of the Complex may also lend further support for the creation and cooperative management of transboundary protected areas, increasing the level of protection afforded to wildlife throughout Southeast Asia, long considered a global biodiversity hotspot.

4. Threats and Management Issues

This section discusses threats to the Complex, as well as present management issues (summarized in Table 1). Solutions and action plans will be presented in a later section.

4.1 Threats

Dong Phayayen - Khao Yai Forest Complex faces various threats including encroachment, illegal hunting and logging, harvesting of non-timber forest products (NTFPs), alteration of natural fire regimes, habitat degradation, and impacts stemming from government policies (e.g. land encroachment from the exploitation of goods for export), and from conflicts in neighboring counties. The pressures from population growth of people living around the Complex and from immigrants moving into the region from other areas of the country are also prominent. The "resources" of the Complex are, for many local inhabitants, the only resources available for exploitation. Like many national parks around the globe, the Complex represents an island surrounded by a sea of exploitation and development.

Threats to the ecosystem integrity of the Complex include: development pressures, environmental pressures, natural disasters, visitor and tourism pressures, and pressures from local inhabitants (within or adjacent to the Complex).

4.1.1 Development Pressures

Roads form one of the biggest threats to the Complex (Map 2). Though the impacts from building roads within the Complex have not been well documented, DNP staff have known for years the negative impacts associated with roads that fragment habitats and improve access to formerly isolated areas of the park. Some species, such as the white-handed gibbon (an IUCN Red Listed species), are particularly vulnerable to fragmentation of habitat. White-handed gibbons are arboreal species, relying on contiguous areas of forest to forage. The patches of habitat that are created by roads serve to isolate the gibbons into smaller populations that are more vulnerable to extinction.

Table 1. Summary of threats and management issues for the DPKY-FC.

Threats	Management Issues
Development Roads Impacts include: - habitat fragmentation - poaching and encroachment - wildlife mortality through vehicular collisions Infrastructure Impacts include: - loss of habitat - disturbance to wildlife **Environmental Pressures** Invasive alien species Impacts include: - competition between native and non-native species for limited resources (e.g., light, water, nutrients) Climate Change Possible impacts include: - changes in abiotic conditions (e.g., temperature, precipitation, etc.) - loss of species unable to adapt **Natural Disasters** Forest Fires Possible impacts include: - loss of habitat - loss of wildlife species - loss of park infrastructure **Tourism** Generation/Disposal of Wastes Impacts include: - wildlife habituation - water pollution Soil Compaction/Erosion Impacts include: - vegetation damage - increased surface water runoff **Pressures from surrounding communities** Poaching Impacts include: - loss of rare and/or endangered species Encroachment Impacts include: - loss and/or destruction of habitat	**Preservation of Ecosystem Integrity** Issues include: - conflicting objectives (e.g., balancing ecological and recreational values) - resource constraints - threats that originate outside park boundaries - lack of baseline information **Visitor and Tourism Issues** Issues include: - increasing numbers of tourists - visitor satisfaction **Stakeholder Participation** Issues include: - lack of public support - conflicts with stakeholder groups (particularly local communities) - boundary disputes **Research and Monitoring** Issues include: - inadequate research programme - inequitable distribution of research projects within Complex units - lack of funding, staff, time and expertise prevent development of effective monitoring programmes **Management of Complex Units** Issues include: - duplication of efforts - inefficient use of limited resources

Improved access to different areas of the park (created by roads) encourages people to move inside or alongside the boundaries of the park. Land encroachment is a serious threat to the park's integrity, as inhabitants rely heavily on the park's resources to meet their needs. Roads also facilitate illegal hunting and logging activities. The degree and distribution of illegal activities are routinely monitored by the staff of the protected area units. However, these illegal activities will not disappear easily if populations continue to grow and if local people continue to rely on resources from within the protected areas.

Motorized vehicles traveling along the roads also pose a threat to wildlife attempting to cross. Some animals (e.g., pig-tailed macaques) sit alongside the road, dangerously close to the edge. Animals crossing the road also pose a threat to human safety, as cars swerve to avoid collisions. Furthermore, the pollution emitted from motorized vehicles, particularly trucks that spew out diesel fuel, is likely having an impact on roadside vegetation, but the impacts are not well understood.

The infrastructure built to accommodate the increasing numbers of visitors has also had a negative impact on wildlife within the Complex. In Khao Yai National Park, for example, tourism facilities (washrooms, cafeterias, camping grounds, visitor centers, etc.) have been constructed in the middle of, or adjacent to, important wildlife habitat (e.g., foraging grounds, salt lick areas). The impacts of the loss of habitat and the disturbance of wildlife associated with concentrated visitor use in prime habitat is not well documented.

4.1.2 Environmental Pressures

Despite a lack of evidence, the negative impacts associated with environmental pressures that originate outside of park boundaries - invasive alien species, climate change, hydrological changes, etc, threaten the ecological integrity of the Complex.

4.1.3 Natural disasters

No natural disasters have been recorded for this Complex. Fires present a threat to the Complex, particularly in the dry, eastern sides of the Complex (i.e., Dong Yai and Ta Phraya), but approximately 99% of forest fires are human-caused. Fires are controlled by DNP staff from regional and provincial offices, as well as the forest fire control offices.

4.1.4 Visitor and Tourism Pressures

Impacts from visitors are considered a major threat to the Complex. Khao Yai National Park, for example, receives an average

of over 700,000 visitors each year. The close proximity of the Complex to many big cities, combined with the variety of recreational opportunities provided (e.g., camping, hiking, trekking, wildlife viewing, etc.) and the parks' exceptional aesthetic appeal, make for a highly sought-after attraction for a growing number of domestic and international tourists.

The growing number of tourists has created a number of management issues, including solid waste generation and disposal, sewage treatment and disposal, wildlife habituation (e.g., pig-tailed macaque regularly hang around camp sites looking for food), soil compaction and erosion on popular trails (where trails have not been hardened) and at campsites, and increasing demand for infrastructure (food services, visitor facilities, etc.). Recreational impacts from mass tourism may become significant threats in the future, if the recreational needs of tourists are not well understood or managed.

4.1.5 Pressures from Inhabitants within or Adjacent to the Complex

Land encroachment, wildlife poaching, illegal logging, and illegal collection of non-timber forest products by local inhabitants and illegal laborers from neighbouring countries (e.g., Cambodia), are creating serious problems for Complex staff. Aloe wood collection is the most serious problem in this Complex. Each year, approximately 2,500 kg of aloe wood is confiscated by park staff in Khao Yai National Park alone.

DNP staff have been working continuously to resolve the problems that have occurred as a result of encroachment within and around protected area unit boundaries. Many different strategies, such as *regional focus*, have been introduced. Khao Yai has been divided into seven administrative units; each region has been delegated authority and resources to patrol and suppress illegal activities. The results are positive in many regions, but the pressures from settlers who live adjacent to the Complex remain.

As widely understood in many tropical countries, impacts from inhabitants, whether within or adjacent to protected areas, can create serious long-term negative impacts to an area's ecological integrity, especially if the inhabitants are not living harmoniously with nature. With growing population levels and shrinking resource bases, it is becoming increasingly difficult for inhabitants to exploit resources in a sustainable manner.

4.2 Management Issues

4.2.1 Research and Monitoring

At the Dong Phayayen - Khao Yai Forest Complex, a majority of research projects are conducted at Khao Yai National Park, while few studies are conducted in other units within the Complex. The challenge for Complex staff is to distribute research projects more evenly throughout the Complex, apply research findings from studies conducted in the past (and, where feasible, apply studies conducted in other protected areas), and to initiate more research projects to address gaps in information.

Similar to conditions that prevail in other tropical countries, research, and application of research findings, is inadequate, severely compromising the ability of Complex superintendents and staff to meet park goals and objectives. A lack of qualified researchers (e.g., ecologists) and superintendents who are unable to devote more time to research (routine problems divert attention away from other responsibilities), all contribute to the problem. A crucial component of effective protected area management is access to information about:

- the types and locations of valuable habitats and their characteristics (i.e., species diversity, size of habitat, degree of naturalness, uniqueness, and representativeness, and degree of species dependence on them), both within and adjacent to park boundaries,
- the park's flora and fauna (i.e., species richness, status of populations, major threats, etc.),
- the types, locations, and amounts of human use (recreational, commercial, subsistence activities, etc), and their impacts on the biota and habitats of the Complex,
- information about park visitors (i.e., who they are, what their expectations are, trends in visitor use, etc.),
- how visitors and the infrastructure developed and maintained to service visitors impacts wildlife, and
- the present and potential threats to the Complex's resources from activities outside the boundaries (i.e., within the Zone of Influence).

Large gaps in information will continue to inhibit the ability of park managers to preserve the conservation values of the Complex, threatening the long-term ecological integrity of Complex units, as well as the units' attractiveness to visitors.

A lack of monitoring is another issue facing park managers in Thailand. At present, few monitoring projects are conducted in the Complex. Monitoring requires periodic collection of data, but a lack of staff, time, expertise, and funding prevent the development of

effective monitoring programs. Research deficiencies also inhibit the development of appropriate indicators, which are essential for the effective monitoring of human impacts on the park.

Despite these difficulties, an attempt has been made to set up monitoring projects in other areas (i.e., Western Complex), although little has been done in the Dong Phayayen - Khao Yai Forest Complex. The issue deserves greater attention. Monitoring is a vital component of protected area management; without a monitoring program, it is difficult to ascertain how park "resources" are impacted by internal and external pressures, whether or not management goals and objectives are being met, and where to direct management efforts given limited available resources. A monitoring program will need to be developed and implemented for the Complex, as it is an important component of adaptive management.

4.2.2 Preservation of Ecosystem Integrity

DNP staff, like other park management agencies around the globe, are charged with the formidable challenge of conserving a variety of park values that often conflict with one another. For example, park managers aim to protect ecological values (i.e., biological diversity, ecosystem processes, etc.), while also providing a range of recreational activities to satisfy the growing number of tourists who have come to expect the opportunity to participate in a variety of recreational opportunities and conveniences. The variety of other threats facing the Complex (road development, encroachment, poaching, environmental pressures, etc.), combined with resource constraints (particularly financial constraints) further complicate the development and execution of effective management strategies aimed at maintaining ecosystem integrity. Furthermore, the root causes of threats to the Complex may originate outside of park boundaries. Population growth, land use policies, fiscal policies, economic development projects, social changes, and even globalization have impacted the way natural resources are valued and utilized all over the country.

Effective management of the Complex is also hampered by a lack of baseline information, which is due, in large part, to a lack of trained personnel. No records exist to confirm the loss of biodiversity at the genetic, species, and habitat levels resulting from development projects, encroachment, or poaching, nor is the impact of these activities on ecosystem functions (i.e., predator/prey interactions, biogeochemical cycles, the hydrological cycle, etc.) known. The latest available information (see Appendix 1) reveals that many species listed as threatened under national and/or global legislation are in danger of extirpation. This should send an alarming message to all Complex stakeholders that serious remedial action must be taken immediately to prevent the further loss of biological diversity.

Ongoing protection of ecological integrity within the Complex is further constrained by the damage that has already been done. For example, the Complex contains fragmented habitats. In some cases, fragmented habitats contain populations that are too small to be considered viable. Wildlife populations isolated from one another cannot exchange genetic material, which, over the long-term, impairs the ability of offspring to adapt to changing habitat conditions. In other cases, habitats may be contiguous but poaching and other threats have reduced populations to such low numbers that the species fails to reproduce quickly enough to stabilize populations. Tigers and elephants provide a good example. Both species exist in dangerously low numbers within the Complex, despite tireless efforts on behalf of park staff to protect these animals from poachers. Poachers are encouraged to continue their pursuit of endangered animals due to the high price tag attached to animal parts (particularly elephant tusks), which are in great demand across the Asia-Pacific region.

Although the impacts associated with the major threats facing Dong Phayayen - Khao Yai Forest Complex may seem small when compared to environmental issues such as global warming, ozone layer depletion, air pollution, or the spread of invasive alien species, the threats arising from encroachment and poaching have the potential to seriously (and perhaps irreversibly) impact long-term evolutionary processes, with unknown consequences for humans.

4.2.3 Tourism Issues

Most protected areas within this Complex continue to experience rising numbers of tourists, particularly at Khao Yai National Park. The lure of a chance encounter with an elephant, pig-tailed macaque, or great hornbill attracts thousands of wildlife viewers from around the globe, as well as a large number of domestic tourists seeking an escape from the hectic pace of nearby cities. Although the expectations of Complex visitors are not well documented, based on research conducted in other national parks, it is reasonable to assume that recreational expectations differ between domestic and international tourists. This makes it increasingly difficult for managers to provide a range of recreational opportunities to satisfy all visitor preferences, while at the same time protecting the resource the tourists have paid to visit.

Crowding is an important element of visitor satisfaction, and in some tourist areas within the Complex, (e.g., wildlife viewing towers and waterfalls), social carrying capacities are often exceeded on weekends and long holidays. In the long-term, crowding may negatively affect visitors' recreational experiences, which may ultimately result in decreased support (financial and/or political) for the protected area. It is therefore important to develop management plans that aim to reduce perceptions of crowding or that

aim to increase social carrying capacities to accommodate growing tourism demand. But social carrying capacities must not be increased at the expense of ecological and/or physical carrying capacities. Unfortunately, management is hampered by a lack of data on all aspects of carrying capacity, making it difficult to achieve management goals and objectives.

In addition to concerns surrounding visitor satisfaction (and how to manage it), the potential ecological impacts arising from mass- (or eco-) tourism are receiving more attention. However, specific, detailed studies on the impacts of visitors recreating in the Complex have yet to be carried out. For example, the impacts of noise on wildlife adjacent to camping areas, or the impacts on vegetation arising from air pollution from cars traveling along the roads, is currently unknown.

The management issues associated with increasing tourism are not unique to the Complex; they are common to an overwhelming majority of parks around the globe. As a result, DNP staff will be able to share their experiences with other park agencies within and outside of Thailand. Similarly, Complex managers can learn from the mistakes of other national parks operating under similar conditions.

4.2.4 Stakeholder Participation

Stakeholder participation in natural resource management has been the focus of conversation (and perhaps debate) in both developed and developing countries. For Thailand, especially protected areas within Dong Phayayen - Khao Yai Forest Complex, stakeholder participation is not a new concept. For many years, the Complex staff have worked with local people and communities at all levels (i.e., the rich, the poor) in an effort to communicate park goals and to encourage locals' participation in the provision of services for tourists. In theory, by participating in and benefiting from tourism-related activities, local peoples can reduce or eliminate the need to rely on the park to meet subsistence and/or commercial needs.

However, because of the need to access a dwindling supply of resources for more and more people, along with the non-conforming behaviour of some, conflicts with various stakeholder groups remain hot, and as a result, much of the work of park management staff is viewed negatively in the eyes of the public. These circumstances (lack of cooperation from stakeholders and lack of public support) make it difficult for park staff to meet park objectives. Unless greater cooperation among the different stakeholders is achieved, park staff will face mounting pressures from local people living on the edge of the Complex. Fortunately, there are efforts underway to improve the participatory process in Thailand. The RTG has encouraged stakeholder participation in natural resources

conservation and use through the new Constitution. Under this provision, the DNP has been in the challenging position to develop a sound mechanism for stakeholder participation for effective management of its protected area system.

4.2.5 Management of Complex Units

Dong Phayayen - Khao Yai Forest Complex is composed of four national parks and one wildlife sanctuary. Protected area units are divided by physical (i.e, terrain) and administrative boundaries, but the units are managed mainly under administrative boundaries - each unit has a different superintendent with different management goals and objectives, and the wildlife sanctuary is managed differently from the national park units. Each Complex unit has its own distinct management plan (excepting Dong Yai WS and Ta Phraya NP), and manages its own resources (e.g., budget, staff, infrastructure, etc.). In some cases, this leads to inefficiencies. For example, in some areas, guard stations are located next to each other. Scarce resources could be better utilized with greater coordination between Complex units. If for example, one guard station was built to service the needs of an adjacent unit, park superintendents could free up funds and staff for other initiatives, or afford greater protection to other areas of the park.

Greater integration of management efforts or single reserve management would provide a number of benefits, including:

1. Cost savings. Separate management of each unit results in duplication of effort. An integrated management approach would conserve financial and human resources, by pooling scarce resources (i.e., staff, equipment, vehicles, etc.)
2. Information sharing. Exchange of information and experiences may lead to greater cost savings and more effective management of park units through the creation of one database.
3. Planning and managing in one direction. An integrated or cooperative management effort would result in a single set of goals and objectives to guide management of the Complex, which would help eliminate the pursuit of conflicting goals (i.e., units within the Complex may have opposing objectives or emphasize different goals, leading to conflict), reducing inefficiencies and leading to greater cost savings.
4. A greater emphasis on ecological boundaries. Wildlife do not recognize administrative or political boundaries. Therefore, effective influence over threats that originate from outside parks requires methods that protect wildlife along ecosystem rather than legal/political boundaries.

An integrated management plan for the Complex will aid in the development and execution of more effective and efficient strategies to cope with some of the threats and management issues discussed above.

5. Management Plan

5.1 Rationale and Purpose of the Plan

In recognition of the need to more effectively address the threats and issues as outlined above, a management plan for the Dong Phayayen - Khao Yai Forest Complex has been prepared. The management plan takes into consideration current socio-political circumstances, and relies on the use of contemporary information (i.e., recent scientific knowledge in conservation management, protected area management and planning, and recreation planning) to guide management objectives and plans for action.

The document is intended to provide unit managers (and other interested parties) with a clearly defined direction with respect to management of human use within the Complex. More specifically, the plan will help guide the management of issues related to habitat and wildlife protection and visitor use. The management plan outlines what needs to be done to solve current issues, while planning for future changes based on past trends. In recognition of the dynamic nature of socio-political conditions, the plan is sufficiently flexible to allow for change. Most importantly, the management plan reflects the commitment of the RTG to support its agencies in managing the Complex.

The management plan for the Dong Phayayen - Khao Yai Forest Complex differs from other plans used in Thailand, in a number of important ways. Specifically, the Complex management plan:

- provides a guideline to manage the Complex as one unit;
- is based on an *ecosystem-based management* approach to help address threats that originate outside of park boundaries;
- takes into consideration the need to manage human use beyond administrative boundaries, through an emphasis on bioregional planning;
- relies on *adaptive management* to learn from past experiences;
- applies conservation biology concepts such as representativeness, connectivity (i.e., corridors), coarse and fine filters, and focal species (keystone, umbrella, indicator, and/or flagship species) to conserve wildlife values;
- manages park ecological values at the landscape level to help ensure ecosystem integrity (e.g., protection of core

habitats for rare, endemic and endangered species, protection of watersheds, etc.);
- relies on more than one area of expertise to manage human impacts on wildlife and their habitats, such as conservation biology, ecology, and recreational planning (e.g., Recreational Opportunity Spectrum (ROS), Carrying Capacity (CC), Limits of Acceptable Change (LAC), etc.);
- uses *mosaic management*, which aims to manage an area that falls under different forms of ownership (state owned versus private) and/or legislation (e.g., different categories of protected areas such as national parks and wildlife sanctuaries, community or indigenous conservation areas);
- provides an action plan aimed at solving current problems in and around the Complex;
- uses past trends (e.g., visitor use) to project issues that may develop in the future; and
- provides direction for future research projects.

While the uniqueness of this management plan presents a number of challenges, the approach is expected to reap a number of benefits, including enhanced protection of the park's ecological values, more efficient utilization of limited resources, and enhanced visitor satisfaction.

5.2 Management Goals and Objectives

5.2.1 Management Goals

The principal goal of the Complex management plan is to maintain the natural resource values (viewscapes, species habitats, ecological processes) of the Complex, and to ensure that all uses are compatible with this aim. More specifically, management goals for the Dong Phayayen – Khao Yai Forest Complex include:

1. Preservation of all ecosystem representations (e.g., landforms, rare and endemic habitats and species, etc.);
2. Maintenance of geological, ecological, and evolutionary processes that generate and maintain biodiversity; and
3. Optimization of economic uses (i.e., products and services of tourism), without compromising natural values.

The Complex will be managed to conserve habitats and ecological processes in order to preserve the value of the area for tourism, research, and education, and to protect certain species and biotic communities.

5.2.2. Management Objectives

To accomplish these overarching goals, specific objectives for management of the Complex include:

1. Maintain minimum viable populations (MVPs) of focal species (e.g., key stone species, umbrella species, indicator species, rare and endemic species). For example, several mammal and bird species are on global/national lists of species threatened with extinction (Appendix 1a and 1b), and these species represent possible conservation targets.
2. Ensure persistence of ecosystem integrity through maintenance of ecosystem services (e.g., watershed protection, maintenance of complex inter- and intra-species relationships), and genetic, species, and habitat biodiversity.
3. Conduct biological, ecological, and social research projects aimed at gathering up-to-date baseline information.
4. Apply contemporary theories, concepts, frameworks, and methods across a variety of disciplines (e.g., conservation biology, ecology, geography, psychology) to strengthen protected area research and management within the Complex.
5. Develop a long-term monitoring system that is easy and economical to implement. Identify a set of environmental and social indicators to manage human use of the Complex.
6. Optimize economic opportunities through the provision of visitor services (e.g., guided tours, transportation, equipment rental) and products (e.g., souvenirs, accommodation, food), to help ensure adequate, ongoing funding for conservation. Ensure that the impacts from these economic opportunities do not severely compromise the ecological, recreational, and educational values of the Complex.
7. Improve the range of recreational opportunities (e.g., wildlife viewing, camping, hiking, trekking, swimming) and recreational experiences (e.g., opportunities for solitude). Ensure that the impacts from recreational opportunities / experiences do not severely compromise the ecological, recreational, and educational values of the Complex.
8. Manage visitor use through careful monitoring and control of visitor impacts on biological diversity and ecosystem processes, in order to preserve the long-term values of the Complex.
9. Create more opportunities for visitors to learn more about the Complex - the history and development of the Complex, the geological, ecological, biological, and aesthetic significance of the protected area units, and threats to ecosystem integrity.

10. Promote stakeholder participation at all levels of Complex management.
11. Provide opportunities for greater benefits sharing among local stakeholders.
12. Strengthen management capability.
13. Apply ecosystem-based management and adaptive management techniques to manage human use of the Complex.

These objectives are designed to address the threats and management issues as outlined in an earlier section. However, the ability of Complex managers to tackle the threats and issues facing protected area units (i.e., the ability of managers to meet these objectives) will ultimately depend upon the availability of adequate resources. A discussion of the management plan limitations and opportunities follows.

5.3 Management Plan Limitations and Opportunities

Effective management of protected areas around the globe, including the Dong Phayayen - Khao Yai Forest Complex, requires significant support from the wider public and all levels of government. Inadequate support makes it difficult for park managers to:

- support the levels of staff necessary to adequately police the park and/or to conduct essential social and scientific research,
- to provide effective education and interpretation programs to visitors,
- to purchase necessary equipment (site binoculars, computers, vehicles, radios, etc.),
- to train park staff in contemporary park management techniques.

The RTG has recently paid serious attention to protected area management, giving conservation top priority. Many agencies (e.g., Ministry of Natural Resources and Environment (MNRE), Department of National Parks, Wildlife and Plant Conservation Department (DNP)) have been set up to oversee protection of Thailand's natural resources, and laws related to natural resources (e.g., Wildlife Preservation Act) have been amended. Equally important, a new Constitution provides opportunity for the public and local people to participate in government business. This is a good sign, since success of this management plan will ultimately depend upon support from the public.

Even with public support, however, there are some major barriers to successful implementation of the Dong Phayayen - Khao Yai Forest Complex management plan. For example, a lack of up-to date, detailed ecological data makes it difficult for managers to

understand how developments (internal and external to the park) have affected, and continue to affect, ecosystem integrity. In the absence of ecological data, it is difficult to achieve many of the objectives that were outlined earlier. Although a lack of ecological (and social) data will continue to hinder management efforts, this management plan aims to address the issue by placing an emphasis on gathering and applying information, a task that should be made easier with support from the RTG.

Yet another constraint relates to the direction of management, which, to a large degree, depends on the superintendents of the protected area units. Units have been managed autonomously, with minimal effort to share information and/or resources. However, there is some indication that managers are beginning to collaborate. All five superintendents have started to work together as one unit, sharing staff, equipment, and conservation and recreation expertise. This is a positive step in the right direction, as it indicates a willingness to cooperate to realize park goals and objectives.

Despite signs of improvement, there is reason to be vigilant. As mentioned before, active support from the RTG and other stakeholders (NGOs, local communities, and the wider public) is key to success. Successful management of Complex units will also require a commitment from park managers to produce annual operational plans that set up projects that are in accordance with the action plans laid out in this document.

In summary, while there are several socio-political circumstances that place limitations on the implementation of this management plan, changing conditions (e.g., growing public support, signs of greater cooperation between park superintendents) are also creating new opportunities. The changing socio-political climate, which appears to be swinging in favour of greater support for conservation, will help park staff implement the *plan for action*, which are discussed in the next section.

6. Plan for Action

To meet the objectives as detailed above, a plan for action have been formulated based on existing scientific knowledge, current threats and management issues facing the Complex, and the commitment of the RTG to assist in management of the Complex. In addition, the plan for action has been designed to be flexible enough for Complex managers to modify certain activities based on their experience and on new data received during the implementation phase. The action plan is divided into 5 sections: research and monitoring, protection of ecological values, visitor planning, stakeholder participation, and management capability. (The action plan is summarized in Appendix 2.)

6.1 Research and Monitoring

Objectives:

1. Conduct biological, ecological, and social research projects aimed at gathering up-to-date baseline information.
2. Apply contemporary theories, concepts, frameworks, and methods across a variety of disciplines to strengthen protected area research and management within the Complex.
3. Develop a long-term monitoring system that is easy and economical to implement. Identify a set of environmental and social indicators to manage human use of the Complex.

Actions:

1. Undertake research projects to identify the following:
   - the types and locations of valuable habitats and their characteristics (i.e., species diversity, size of habitat, degree of naturalness, uniqueness, representativeness, degree of species dependence, etc.), both within and adjacent to park boundaries (priority given to the former),
   - the park's flora and fauna (i.e., species richness, status of populations, major threats, etc.),
   - the types, locations, and amounts of human use (recreational, commercial, subsistence activities, etc) and their impacts on the biota and habitats of the Complex,
   - the impacts of fire within the Complex (i.e, fire ecology, habitat destruction, impacts on wildlife, etc.),
   - the impacts of habitat fragmentation on wildlife populations,
   - the impacts of air pollution (i.e., pollution associated with vehicular traffic within the park) on roadside vegetation,
   - mortality levels of wildlife as a result of vehicular collisions, and the impacts on wildlife populations,
   - park visitor attributes (i.e., who they are, what their expectations are, trends in visitor use, etc.),
   - how visitors and the infrastructure developed and maintained to service visitors impacts wildlife,
   - the diversity and spread of alien species and the impacts on native species, and
   - the potential impacts of climate change on ecological processes and biodiversity (a long-term research project),
2. Spread research projects across the protected area units within the Complex, but assign priority to issues that demand immediate management attention.
3. Conduct research projects using methods that are widely accepted (i.e., the methods are repeatable and produce reliable results). Consult recent academic publications and/or academic researchers to design research methods.

4. Tap into research programmes conducted at other protected areas within the region and around the globe. The pressures that threaten the DPKY - FC are not unique; innovative ways to resolve these issues have been developed elsewhere.
5. Recruit the assistance of volunteers (e.g., Peace Corp Volunteers), academic researchers (professors, graduate students), NGOs (e.g., Wildlife Fund Thailand, WildAid), and local community groups to maximize the number of research projects that can be carried out with limited financial resources.
6. In coordination with local stakeholder groups, build a database that will help monitor changes in the socio-political environment within communities that surround the Complex, including changes in population dynamics (changes in birth rates, population densities, etc.), development projects, land use patterns, etc. This information will help park managers anticipate and manage future threats.
7. In coordination with local stakeholder groups, document traditional knowledge systems. This information may help managers better understand how human use can be managed to minimize long-term ecological impacts.
8. Develop and implement a monitoring system to determine when management action is required to minimize further negative impacts arising from developments (within and outside of park boundaries), too many visitors and / or inappropriate visitor use, etc. Identify appropriate ecological and social indicators to alert managers when impacts have exceeded acceptable limits. Evaluate the indicators every year to ensure they remain pertinent and adequate.
9. Develop a monitoring system to help prevent forest fires and/or to minimize the damage from fires. For example, monitor the accumulation of natural fuels.

6.2 Protection of Ecological Values

Objectives:

1. Maintain minimum viable populations (MVPs) of focal species (e.g., key stone species, umbrella species, indicator species, rare and endemic species).
2. Ensure persistence of ecosystem integrity through maintenance of ecosystem services, and genetic, species, and habitat biodiversity.

Actions:

1. Identify habitats that are sensitive to human disturbance (e.g., breeding grounds, rare or endangered habitats, habitats with rare or endangered species).
2. Identify species as conservation targets (i.e., rare, endangered, endemic species). Conduct research to estimate population size and MVP for each focal species, and identify specific threats to the ongoing survival of focal species.
3. Develop specific management plans to protect identified conservation targets. Develop monitoring programs (including a set of indicators) to track changes in the status of focal species / habitats.
4. Conduct research on the feasibility of reintroduction of extirpated species (e.g., freshwater crocodiles).
5. Conduct research to determine the feasibility of developing wildlife corridors between Complex units, to reduce the impacts of fragmentation. Tap into the extensive research that has been conducted in other protected areas on wildlife corridors to guide and supplement the research programme.
6. Investigate the feasibility of decommissioning roads (and restoring habitat) that dissect habit utilized by focal species.
7. To reduce the impacts of traffic on wildlife and habitats, examine the feasibility of introducing alternate means of access to Complex facilities. For example, visitors could be required to hike into camping sites, and/or local communities could provide a shuttle service to and from designated areas within the Complex. These tactics would also reduce the need for construction and maintenance of parking lots within the Complex.
8. Minimize negative impacts to habitats and wildlife caused by recreational activities and Complex facilities by conducting an environmental impact assessment for proposed developments (e.g., roads, trail development, accommodation, camping sites, visitor services, etc.), particularly when sensitive habitats and/or rare, endemic and endangered species may be at risk.
9. Apply research findings on the biophysical elements of the Complex to create a system of zones. The Complex includes a variety of habitats which may be more suited to one type of activity over another. Areas should be zoned so that: a) sensitive habitats are protected from damaging activities, b) intensive use is confined to sites that can sustain it, and c) incompatible activities are separated to avoid conflicts. The Complex should be zoned to enable the simultaneous preservation of critical sites and the continued enjoyment and sustainable economic use of appropriate areas by people.
10. Explore the feasibility of relocating ranger stations to help ensure efficient use of limited resources and to afford greater protection to wildlife. Where appropriate, establish new ranger stations to help reduce threats that arise from encroachment and poaching.

11. Dedicate additional resources (funding, time, number of trained personnel, etc.) to active patrolling of the park to help ensure compliance with park regulations and to assist in the collection of ecological data for input into the database. Equip patrol officers with sufficient defense and communications equipment, and ensure that all patrol officers receive training in the collection of basic ecological data.
12. Ban all non-native species (e.g., domestic animals, ornamental plants, etc.) from the Complex to protect wildlife.
13. To protect wildlife, enforce all park guidelines.
14. Educate visitors about the dangers (to humans and animals) associated with feeding wildlife.
15. Dispose all solid waste off-site.
16. Ensure that all garbage receptacles are wildlife-proof. Install additional garbage receptacles in high-traffic areas to help reduce litter.
17. Educate visitors about the impacts of solid waste generation. Encourage visitors to "pack-in" and "pack-out".
18. Install septic tanks at every visitor catering center. Empty septic tank contents outside Complex boundaries.
19. Where appropriate, harden nature trails to control soil erosion. Ensure that visitors set up tents only within designated camp sites to reduce the area vulnerable to soil compaction and erosion.
20. Survey high fire-hazard areas regularly to detect fires early. Fire patrols can be done on foot and/or by helicopter.
21. Equip fire suppression stations with adequate resources and equipment to fight fires where they occur.
22. In consultation with local stakeholders, develop a fire prevention (e.g., education programme) and treatment plan.
23. With the participation of local people living around the Complex, clearly demarcate unit boundaries to help dispel any confusions regarding park boundaries. Demarcation of boundaries may include the use of natural (e.g., planting native tree species along park perimeters) or artificial (e.g., signs) techniques.
24. Develop incentives to encourage conservation outside of Complex boundaries to protect remnant habitats, populations, and/or key representations. For examples, create opportunities for the private sector to support conservation projects through tax incentives or conservation easements.
25. Create a task force, in collaboration with stakeholder groups, to discuss the development of a buffer zone area. A buffer zone, similar to the concept of a Biosphere Reserve where multiple use zones are created around the park, could help address threats that originate outside of park boundaries. This will be a difficult negotiation, and may require retraction (as oppose to extension) of national park / wildlife sanctuary boundaries, to address the concerns and needs of local user

groups. This is a long-term project, requiring a serious commitment of resources from all sides.

6.3 Visitor Planning and Management

Objectives:

1. Optimize economic opportunities through the provision of visitor services and products to help ensure adequate, ongoing funding for conservation. Ensure that the impacts from these economic opportunities do not severely compromise the ecological, recreational, and educational values of the Complex.
2. Improve the range of recreational opportunities and recreational experiences. Ensure that the impacts from recreational opportunities / experiences do not severely compromise the ecological, recreational, and educational values of the Complex.
3. Manage visitor use through careful monitoring and control of visitor impacts on biological diversity and ecosystem processes, in order to preserve the long-term values of the Complex.
4. Create opportunities for visitors to learn more about the Complex - the history and development of the Complex, the geological, ecological, biological, and aesthetic significance of the protected area units, and threats to ecosystem integrity.

Actions:

1. Identify opportunities to expand visitor services in the short and long term. Conduct cost / benefit analyses (CBA) and/or environmental impact assessments (EIA) to determine whether or not the negative impacts are outweighed by the positive impacts (i.e., determine whether or not the long-term economic contributions to conservation outweigh the immediate negative impacts).
2. Conduct carrying capacity studies within each unit of the Complex to assess the social and ecological impacts of current use levels. Develop indicators to help monitor the impacts of changes in visitor levels and use.
3. Systematically apply recreation planning concepts to explore the possible expansion of recreational opportunities / experiences within the Complex while minimizing the negative ecological impacts. For example, concepts such as *Carrying Capacity* (physical, social, environmental carrying capacity) and *Limits of Acceptable Change* can be applied in conjunction with the concept of *Recreational Opportunity Spectrum* to develop visitor experiences that meet ecological, economic, and social objectives.
4. Develop a set of recreational guidelines that seek to maximize visitor enjoyment of the area, while protecting the ecological values of the park. Develop recreational zones to minimize

conflict between recreational users and to help minimize negative ecological impacts.

5. To reduce crowding at popular sites (e.g., waterfalls in KYNP), encourage visitors to explore other units within the Complex (e.g., other units within the Complex could be promoted through advertising, or Khao Yai NP could set limits on the number of overnight visitors).
6. Restrict visitor access to sensitive habitats through signs and policing. All restricted zones should be marked clearly on a map, with information about why the habitats have been closed to visitor use.
7. To ensure compliance with regulations, encourage greater support for the Complex, and to enhance the visitor experience, develop a comprehensive nature interpretation program, including:
    - guided nature hikes,
    - visitor interpretation centers with detailed information about the park's significance and threats to ecological integrity,
    - improved signage to educate visitors about important or vulnerable ecological and geological features, and
    - public presentations that afford visitors an opportunity to learn about special features of the Complex.

   Provide a variety of educational materials (e.g., books, pamphlets, brochures, videos) for sale. Encourage the participation of local stakeholder groups in the development and implementation of the interpretation program to extend benefits beyond park boundaries.
8. Develop a web site that enables visitors to learn about different aspects of the park (recreational opportunities, ecological and educational values, threats, etc.). The web site should be used as a communication tool, to educate visitors and to advise potential users of recreational guidelines and regulations.
9. To help manage visitor use, particularly during peak times (i.e., weekends, festivals), develop an advanced booking, on-line registration system for campers. When the camping sites have been booked in full, limit access to day use.

6.4 Stakeholder Participation

Objectives:

1. Promote stakeholder participation at all levels of Complex management.
2. Provide opportunities for greater benefits sharing among local stakeholders.

Actions:

1. To ensure that local people fully participate in protected area management and to encourage more equitable sharing of costs and benefits arising from protection of Complex resources, encourage the organization of a committee comprised of local people and park staff members who meet regularly (e.g., once a month) to discuss and resolve issues in a public forum. Formation of a committee will aid in the resolution of current issues and the prevention of future conflicts.
2. In collaboration with park staff and stakeholders, identify and establish standards and mechanisms for equitable sharing of both costs and benefits arising from recreational activities that take place in designated areas under the provision of laws and regulations of national park and wildlife sanctuary acts. For example, provide opportunities for stakeholder groups to participate directly in, and benefit from, the development and implementation of interpretation programs, hospitality services, and transportation services.

6.5 Management Capability Enhancement Plan

Objectives:

1. Strengthen management capability.
2. Apply ecosystem-based management and adaptive management techniques to manage human use of the Complex.

Actions:

1. Integrate management of the protected area units within the Complex. Protected areas within the Complex share many of the same threats and management issues; integrated management will allow for cost savings through sharing of expertise, equipment, and staff.
2. Establish a coordinating office among the five units (location of office to be decided by park unit superintendents) to link protection work and to exchange information. This office should be a meeting place for park managers to hold regular (e.g., monthly) and emergency meetings.
3. Create a new model of governance to strengthen the capacity of the institution overseeing the Complex. This new structure, function, and approach should be designed to manage all protected areas as one protected unit (Complex).
4. Establish co-management pilot projects with Complex staff and community stakeholders (local community members, NGOs, private businesses, etc.) to encourage participation in, and support for, conservation. Findings from this pilot project could be

applied to management of natural resources outside the Complex by indigenous, community, or private sectors.

5. Strengthen staff capability through additional training.
6. Apply adaptive management techniques, whereby managers "learn by doing" (i.e., managers learn from mistakes, and adjust management programmes appropriately).
7. Develop a forum for park unit staff to share information about park-related issues. The forum should be held on a regular basis (e.g., quarterly), and local stakeholders should be invited to attend and participate.
8. Hold a biannual or annual workshop / seminar, and invite staff from other parks within Thailand and abroad to attend. This will aid in the development of a network to share information about issues related to protected area management.
9. Seek academic support from local, regional, and international institutions.
10. To conserve scarce resources and promote greater support for conservation, park managers should employ the help of volunteers from academia, local NGOs, and other interested parties to:
    - develop interpretation programs,
    - set up a user-friendly website with educational materials,
    - develop and execute research programmes,
    - carry out monitoring programmes, and
    - liaison with local stakeholder groups.
11. Use research findings to guide management actions. This includes research specific to the characteristics and conditions of the Complex, as well as research that has been conducted in other protected areas within Thailand, Southeast Asia, and around the globe.
12. Build up a library of journal publications and technical reports for reference. Units should subscribe to "Parks", a monthly IUCN publication that reports on various protected area issues from around the globe. The "National Parks and Protected Areas International Bulletin" is another good source of information for park managers. All units within the Complex should become members of "TIES" (The International Ecotourism Society) to receive publications about conservation, facility design, etc. The library should be made accessible to all Complex staff.
13. Review management goals and objectives on a regular basis, and monitor how closely these goals / objectives are being met.
14. In recognition of the dynamic nature of socio-political conditions, review and update the management plan every five years. This should be done in consultation with other stakeholders, whose support is necessary for successful management of the Complex.

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Appendix 1a. Global and/or national mammal species of high conservation priority found within the DPKY-FC.

Scientific Name	Common Name	Thai Status	IUCN	CITES
Macaca nemestrina	pig-tailed macaque		VU	
Macaca arctoides	stump-tailed macaque	VU	VU	
Macaca fascicularis	crab-eating macaque		LR/NT	
Presbytis cristata	silvered langur		LR/NT	
Hylobates lar	white-handed gibbon	VU	LR/NT	App I
Hylobates pileatus	pileated gibbon	EN	VU	App I
Manis javanica	malayan pangolin		LR/NT	App II
Ratufa bicolor	black giant squirrel			App II
Belomys pearsoni	hairy-footed flying squirrel	VU		
Maxomys whiteheadi	whitehead's rat	VU		
Hystrix brachyura	malayan porcupine		VU	
Atherurus macrourus	brush-tailed porcupine		EN	
Cuon alpinus	asian wild dog	VU	VU	App II
Ursus thibetanus	asiatic black bear	VU	VU	App I
Helarctos malayanus	malayan sunbear	VU	DD	App I
Lutrogale perspicillata	smooth-coated otter	VU		
Viverra megaspila	large-spotted civet	VU	V	
Paradoxurus hermaphroditu	common palm civet		VU	
Arctictis binturong	binturong		VU	
Pardofelis marmorata	marbled cat	EN	DD	App I
Prionailurus bengalensis	leopard cat		EN	App II
Felis chaus	jungle cat	CR		
Catopuma temmincki	asian golden cat	EN	LR/VU	App I
Neofelis nebulosa	clouded leopard	VU	VU	App I
Panthera pardus	leopard	VU	LR	App I
Panthera tigris	tiger	VU	EN	App I
Elephas maximus	elephant	EN	EN	App I
Sus scrofa	common wild pig	CR	VU	
Bos javanicus	banteng	CR	VU	
Bos gaurus	gaur	VU	VU	App I
Naemorhedus sumatraensis	serow		VU	App I

Appendix 1b: List of globally and/or nationally threatened or near threatened bird species by protected area unit.

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
121	Siamese fireback *Lophura diardi*	R	X	X	X	X	
127	green peafowl *Pavo muticus*			1	LR	LR	
423	rufous-bellied woodpecker *Dendrocopos hyperythrus*	R		X			
416	white-bellied woodpecker *Dryocopus javensis*	R	Mc	X			
404	streak-throated woodpecker *Picus xanthopygaeus*	R		X	U		
406	black-headed woodpecker *Picus erythropygius*	R	U	X			
415	great slaty woodpecker *Mulleripicus pulverulentus*	R	X	X	X		
374	Oriental pied hornbill *Anthracoceros albirostris*	R	X	X	X	X	
376	great hornbill *Buceros bicornis*	R	X	1	X	3	
367	brown hornbill *Anorrhinus tickelli*	R	X	LR			
371	wreathed hornbill *Aceros undulates*	R	X	X	X		
304	coral-billed ground cuckoo *Carpococcyx renauldi*	R	X		X	3	
274	Alexandrine parakeet *Psittacula eupatria*	R					
276	blossom-headed parakeet *Psittacula roseata*	R	X	X	X		
318	spot-bellied eagle owl *Bubo nipalensis*	R	X		X		
329	Javan frogmouth *Batrachostomus javensis*	R	X				
265	pale-capped pigeon *Columba punicea*	N	X				
255	orange-breasted pigeon *Treron bicincta*	R	X		4		
251	pompadour pigeon *Treron pompadora*	R	X		X	3	
257	yellow-footed pigeon *Treron phoenicoptera*	R	U				
249	white-bellied pigeon *Treron sieboldii*	R	X				
259	green imperial pigeon *Ducula aenea*	R	X	X	X	X	

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
159	masked finfoot *Heliopais personata*	Vagrant	X				
160	pheasant-tailed jacana *Hydrophasianus chirurgus*	Vagrant		1			
163	grey-headed lapwing *Vanellus cinereus*	Vagrant	X				
72	Jerdon's baza *Aviceda jerdoni*	B	X	2	X		
70	black kite *Milvus migrans*	N	X				
71	brahminy kite *Haliastur indus*	Vagrant			X	3	
87	grey-headed fish eagle *Ichthyophaga ichthyaetus*	R	X				
83	rufous-winged buzzard *Butastur liventer*	R	Mc	X	X	X	
98	black eagle *Ictinaetus malayensis*	R	X	X	X		
91	mountain hawk eagle *Spizaetus nipalensis*	R	X	X		X	
109	white-rumped falcon *Polihierax insignis*	R		X			
6	Oriental darter *Anhinga melanogaster*	N	X				
28	Malayan night heron *Gorsachius melanolophus*	R	X		X		
30	Schrenck's BITTERN *Ixobrychus eurhythmus*	Vagrant	X				
42	spot-billed pelican *Pelecanus philippensis*	Vagrant	X	X		LR	
34	Asian openbill *Anastomus oscitans*	Vagrant	X			X	
36	black stork *Ciconia nigra*	Vagrant	X				
37	woolly-necked stork *Ciconia episcopus*	R				U3	
40	lesser adjutant *Leptoptilos javanicus*	Vagrant	X				
39	greater adjutant *Leptoptilos dubius*	Vagrant	X				
429	black-and-red broadbill *Cymbirhynchus macrorhynchos*	R					
558	silver oriole *Oriolus mellianus*	N	X				
496	brown-rumped minivet *Pericrocotus cantonensis*	N	X	X	X		
806	white-browed fantail *Rhipidura aureola*	R		X			
812	Japanese paradise-flycatcher *Terpsiphone atrocaudata*	Vagrant					

L&R	Species	Status	Khao Yai NP	Thap Lan NP	Pang Sida NP	Ta Phraya NP	Dong Yai WS
779	green-backed flycatcher *Ficedula elisae*	P	X				
835	golden-crested myna *Ampeliceps coronatus*	R	X	X	X	X	
836	hill myna *Gracula religiosa*	R	X	X	X	X	
603	limestone wren babbler *Napothera crispifrons*	R	X				
877	baya weaver *Ploceus philippinus*	R		2	X		
899	YELLOW-BREASTED BUNTING *Emberiza aureola*	Vagrant	X				

Notes:

1) *No confirmed data on bird population or abundance is available for Dong Yai Wildlife Sanctuary at the present time.*
2) *L&R species number is allotted in Lekagul and Round 1991.*
3) *X presence is confirmed by substantiated records.*
4) *All species on this list are either globally or nationally threatened or near-threatened*

Appendix 2. Summary of threats, management issues, objectives, and action plans for the DPKY-FC Complex.

Management Objectives	Threats and Management Issues Addressed	Action Plan
RESEARCH AND MONITORING 1. Conduct biological, ecological, and social research projects aimed at gathering up-to-date baseline information. 2.Apply contemporary theories, concepts, frameworks, and methods across a variety of disciplines to strengthen protected area research and management within the Complex. 3.Develop a long-term monitoring system that is easy and economical to implement. Identify a set of environmental and social indicators to manage human use of the Complex	THREATS - collection of baseline information will help Complex managers address threats arising from development pressures (roads, infrastructure), environmental pressures (spread of invasive alien species and climate change), natural disasters (fire), tourism (generation and disposal of waste and soil compaction / erosion), and pressures from surrounding communities (poaching and encroachment) MANAGEMENT ISSUES - resource constraints - lack of baseline information - inadequate research programme - inequitable distribution of research projects across Complex units - lack of funding, staff, time and expertise prevent development of effective monitoring programmes	1. Undertake research projects to fill in information gaps. 2. Spread research projects across units; assign priority to issues that demand immediate management attention. 3. Conduct research projects using methods that are widely accepted. Consult recent academic publications and/or academic researchers to design research methods. 4. Tap into research programmes conducted at other protected areas. 5. Recruit assistance from volunteers, academics, NGOs, and local community groups to maximize the number of research projects that can be conducted. 6. Build a database to help monitor changes in the socio-political environment within communities that surround the Complex. 7. Document traditional knowledge systems. 8. Develop and implement a monitoring system to determine when management action is required to minimize further negative impacts. Identify ecological and social indicators to alert managers when impacts have exceeded acceptable limits. Evaluate indicators annually. 9. Develop a monitoring system to help prevent forest fires and/or to minimize the damage from fires.

Management Objectives	Threats and Management Issues Addressed	Action Plan
PROTECTION OF ECOLOGICAL VALUES 1. Maintain minimum viable populations (MVPs) of focal species (e.g., key stone species, umbrella species, indicator species, rare and endemic species). 2. Ensure persistence of ecosystem integrity through maintenance of ecosystem services, and genetic, species, and habitat biodiversity.	THREATS - development pressures (roads, infrastructure) - environmental pressures (spread of invasive alien species, climate change) - natural disasters (fire), - tourism (generation and disposal of waste and soil compaction and erosion) - pressures from surrounding communities (poaching and encroachment) MANAGEMENT ISSUES - preservation of ecosystem integrity (lack of baseline information) - visitor and tourism issues (increasing numbers of tourists) - stakeholder participation (conflicts with stakeholder groups, boundary disputes, lack of public support)	1. Identify sensitive habitats. 2. Identify species as conservation targets. Conduct research to estimate population size and MVP for focal species; identify threats to the ongoing survival of focal species. 3. Develop management plans to protect conservation targets. Develop monitoring programs to track changes in the status of focal species / habitats. 4. Conduct research on the feasibility of reintroduction of extirpated species. 5. Conduct research to determine the feasibility of developing wildlife corridors between Complex units. 6. Investigate the feasibility of decommissioning roads. 7. Examine the feasibility of introducing alternate means of access to Complex facilities. 8. Conduct an EIA for all proposed developments. 9. Apply research findings to create a system of zones. 10. Explore the feasibility of relocating ranger stations. Establish new stations where appropriate. 11. Dedicate additional resources to park patrol. 12. Ban all non-native species from the Complex. 13. To protect wildlife, enforce all park guidelines. 14. Educate visitors about the dangers of feeding wildlife. 13. Dispose all solid waste off-site. 14. Ensure that all garbage receptacles are wildlife-proof. Install additional garbage receptacles in high-traffic areas. 15. Educate visitors about the impacts of solid waste generation. 16. Install septic tanks; empty contents outside Complex boundaries. 17. Where appropriate, harden nature trails to control soil erosion. Ensure that visitors set up tents only within designated campsites.

Management Objectives	Threats and Management Issues Addressed	Action Plan
PROTECTION OF ECOLOGICAL VALUES, continued		18. Survey high fire-hazard areas regularly. 19. Equip fire suppression stations with adequate resources and equipment to fight fires. 20. Develop a fire prevention and treatment plan. 21. Demarcate unit boundaries. 22. Develop incentives to encourage conservation outside of Complex boundaries. 23. Create a task force to discuss the development of a buffer zone area.
VISITOR PLANNING AND MANAGEMENT 1. Optimize economic opportunities through provision of visitor services /products. Ensure that impacts do not severely compromise the ecological, recreational, and educational values of the Complex. 2. Improve the range of recreational opportunities and experiences. Ensure that any impacts do not severely compromise the ecological, recreational, and educational values of the Complex. 3. Manage visitor use through careful monitoring and control of visitor impacts. 4. Create more opportunities for visitors to learn about the Complex.	THREATS - development of tourism infrastructure (loss of habitat, wildlife disturbance) - increasing numbers of tourists (waste generation and disposal, soil compaction and erosion) MANAGEMENT ISSUES - increasing numbers of tourists - visitor satisfaction - inadequate research programme	1. Identify opportunities to expand visitor services. Conduct CBA and/or EIA. 2. Conduct carrying capacity studies to assess social and ecological impacts of current use levels. Develop indicators to help monitor changes in visitor levels and use. 3. Apply recreation planning concepts to explore the possible expansion of recreational opportunities / experiences while minimizing ecological impacts. 4. Develop a set of recreational guidelines that seek to maximize visitor enjoyment of the area, while protecting the ecological values of the park. Develop recreational zones. 5. Spread visitor use throughout units of the Complex. 6. Restrict visitor access to sensitive habitats. Map all restricted zones. 7. Develop a comprehensive nature interpretation program. 8. Develop a web site that enables visitors to learn about different aspects of the park. 9. Develop an advanced booking, on-line registration system to help manage visitor use. Limit access to day use when the camping sites have been booked in full.

Management Objectives	Threats and Management Issues Addressed	Action Plan
STAKEHOLDER PARTICIPATION 1. Promote stakeholder participation at all levels of Complex management. 2. Provide opportunities for greater benefits sharing among local stakeholders.	THREATS - pressures from surrounding communities (poaching, encroachment) MANAGEMENT ISSUES - preservation of ecosystem integrity - stakeholder participation (lack of public support, conflicts, boundary disputes)	1. Organize a committee comprised of local people and park staff members who meet regularly to discuss and resolve issues in a public forum. 2. In collaboration with park staff and stakeholders, identify and establish standards and mechanisms for equitable sharing of both costs and benefits arising from recreational activities that take place within the Complex.
MANAGEMENT CAPABILITY ENHANCEMENT PLAN 1. Strengthen management capability. 2. Apply ecosystem based management and adaptive management techniques to manage human use of the Complex	THREATS - management integration will help Complex managers address threats arising from development pressures (roads, infrastructure), environmental pressures (spread of invasive alien species and climate change), natural disasters (fire), tourism (generation and disposal of waste and soil compaction / erosion), and pressures from surrounding communities (poaching and encroachment)	1. Integrate management of the protected area units within the Complex. 2. Create a new model of governance to strengthen the capacity of the institution overseeing the Complex. 2. Establish a coordinating office among the five units to link protection work and to exchange information. This office should be a meeting place for park managers to hold regular (e.g., monthly) and emergency meetings. 3. Establish co-management pilot projects with Complex staff and community stakeholders to encourage participation in, and support for, conservation. 4. Strengthen staff capability through additional training. 5. Apply adaptive management techniques, whereby managers "learn by doing". 6. Develop a forum for park unit staff to share information about park-related issues. 7. Hold a biannual or annual workshop/ seminar; invite staff from other parks to attend. 8. Seek academic support from local, regional, and international institutions.

Management Objectives	Threats and Management Issues Addressed	Action Plan
MANAGEMENT CAPABILITY ENHANCEMENT PLAN, continued	MANAGEMENT ISSUES - duplication of efforts - lack of resources and inefficient use of limited resources - inadequate research programme (lack of baseline information)	9. Employ the help of volunteers from academia, local NGOs, and other interested parties to: develop interpretation programs, develop a website, develop and execute research programmes, carry out monitoring programmes, and liaison with local stakeholder groups. 10. Use research findings to guide management actions 11. Build up a library of journal publications and technical reports for reference. Subscribe to "Parks" (IUCN publication), the "National Parks and Protected Areas International Bulletin", and "TIES" (The International Ecotourism Society) to receive publications. 12. Review management goals and objectives on a regular basis, and monitor how closely these goals/ objectives are being met. 13. Review and update the management plan every five years, in consultation with other stakeholders.

Annex

World Heritage Evaluation : Dong Phayayen-Khao Yai Forest Complex – DNP's Activities

Table 1 Population of Important Species in DPKY-FC

Table 2 Number of Species in DPKY-FC

Table 3 Comparative analysis

Table 4 Mitigation Plan to Reduce Impacts From Road in Dong Phayayen-Khao Yai Forest Complex

Table 5 Committee / Meeting Concerning National Park in DPKY-FC

Table 6 Number of Outreach Programme of DPKY-FC in 2004

Table 7 Training Programme for DPKY-Fc DPKY-FC Personnel 2004

CD 1 = Other Information about DPKY-FC

CD 2 = Maps of DPKY-FC

World Heritage Evaluation: Dong Phayayen - Khao Yai Forest Complex

Questions and Issues	Clarification/Additional Information	Remarks
A. Nomination Document **2. <u>Justification for Inscription</u>** ***a. Statement of Significance - Biodiversity Values*** With reference to Criteria II and IV, the nomination particularly focuses on the values of the complex for wildlife conservation, including globally threatened and endangered species such as tiger, elephant, crocodile, etc. However, *neither the nomination document nor the 1997 management plan provides population estimates of key species* (except for elephant, and the gaur and banteng estimates that date to 1995). *These will be useful, especially if trends over time are* available, *to give an indication of whether or not the complex is succeeding in its conservation objectives and if species populations are viable - that is, will the complex maintain and enhance these values?* The problem is that the nomination uses phrases like: "the DPKY-FC <u>is thought to contain</u> some of the largest remaining protected populations of many species..." (p. 6).	- The department has a significant amount of information to indicate that the complex is succeeding in its conservation objectives, especially in the maintenance of viable populations. The information include annual reports on: o Routine patrols o Helicopter inspections o Wildlife conservation reports o Visitor statistics and tourism data o NGO participation in protected area management activities. - See appendix 1 for estimated populations of key species.	Table 1,2
b. Comparative Analysis This section of WH nominations is extremely important, but the DPKY-FC document does not provide a comparison with other protected areas within the biogeographical region and sub-regions. Specific comparisons are only made within Thailand, and the general statement that "the habitats within this part of the ecoregion contain assemblages that are as complete as are currently known to exist anywhere in the Indochina bio-region" (p.13). Also, the comparative points made on p. 14 are substantially taken from the 1997 management plan-much has changed in the region over the past 14 years. The nomination would therefore needs a more detailed comparative analysis with protected areas with similar ecosystems in neighboring countries (Cambodia, Laos, Myanmar).	If the site is designated as the World Heritage site, it will be the 4th largest World Heritage Site in South/East Asia after Tropical Rainforest Heritage of Sumatra, Gunung Lorentz NP, and Thung Yai – Huai Kha Khaeng Wildlife Sanctuary.	Table 3

Questions and Issues	Clarification/Additional Information	Remarks
c. Integrity (1) Roads The roads that bisect the DPKY-FC (from the information supplied) are a major concern since, as the nomination acknowledges and the 1997 management plan discusses in detail (p. 23), they reduce the viability of the area's role in supporting the movement of wildlife populations. The nomination document and the 1997 management plan both refer to the need for wildlife corridors and underpasses along these major roads, and the management plan makes other specific recommendations (p. 31). *Has any design and feasibility work been carried out for these proposals?* *Have any other options/management plan recommendations been considered/implemented to reduce or limit the access along these roads?*	(1) Roads There is an existing proposal for a feasibility study to be undertaken within all relevant areas in the DPKY-FC. It is estimated that about 20 million Baht will be required to fully implement an effective wildlife corridor process, including possible underpasses. There has been significant collaboration with other organizations such as the Highways Department, local administration, and provincial offices. The mitigation plan to reduce impacts from roads in DPKY-FC is attached in Annex 3.	Table 4
(2) Boundary Alignments (and land/resource use incursions) Many of the boundaries are complex, long and/or narrow, which usually increases management difficulty - especially in relation to controlling incursions into protected areas. The 1997 management plan discussed this issue and recommended that some boundaries be rationalized. Table 11 on pp. 50-51 also notes that these is a major issue in Thap Lan NP, with possibly 480 km^2 taken up by agriculture and settlements. *Has any action been taken on this issue and, if so, what has been done or is planned?*	(2) Boundary Alignments The DPKY-FC has 80 ranger stations located in various parts of the complex, and the department is confident that, with further capacity development and support, the site can be managed effectively. Encroachment, which is recognized as a significant management issue, particularly in Thaplan NP, has been actively addressed. For example, some 480 km^2 of agricultural land has been surveyed under the Cabinet Resolution, dated 30 of June 1998. This far reaching resolution was promulgated to call a halt to encroachment and commence a period of negotiation with local communities and settlements. Provisions in the resolution include options for people to move from the NP or to continue living in specified areas under agreed conditions. For the long term solution, the readjustment of the boundary has been conducted. Adjacent areas will be added into Thaplan NP, and some areas (i.e., 480 km^2 of agricultural land) will be de-gazetted under the Cabinet Decree.	
Question and Issues	DNP's Activities	Remarks

Questions and Issues	Clarification/Additional Information	Remarks
3. Description On pp. 40-41 there are references to Sakaerat Biosphere Reserve. This is not referred to elsewhere in the nomination document. *Can more information be provided on the BR and its relationship to the WH nomination*	Sakaerat Biosphere Reserve is contiguous with Thaplan NP and many similar management functions, including research and conservation education, and interpretation, are complementary to Thaplan NP.	BR data in CD
d. Present state of conservation On p. 47 it states: "currently there are no reliable systems for evaluating and reporting on management effectiveness within the DNP and a simple and flexible system, which can be scaled up or down to suit a broad range of management contexts and needs, will be necessary to effectively manage the DPKY-FC as a cohesive unit." This is a key issue with regard to managing a WH Site. *What action will be taken to address evaluation of management effectiveness in DPKY-FC?*	DPKY-FC is made-up of 5 units, and each area has the resources and infrastructure to control most routine management issues. DNP will endeavor to find more effective management through the proposed DPKY-FC management project which has been in place since 2002. The conceptual management plan for the complex has already been formulated, and based on this plan, the complex wide management plan is scheduled to be completed by 2006. It is expected that this document will both guide the overall management of the complex as well as establish effective monitoring systems.	Table 5
e. Policies and Programmes re presentation and promotion *What action is being taken to develop "definitive policies and programmes that relate to the presentation and promotion of the proposed site" (p. 47)?*	To present and promote DPKY-FC, the superintendents have been working in consultation with community and provincial committees. Many programs, such as education, protection, and tourist destinations, have been established and implemented. Khao Yai NP, for example, is well-known to tourists for its natural attractiveness. Khao Yai NP has nearly one million visitors per year. Another example is the pilot project to reintroduce crocodiles to Pang Sida NP. Recently DoNP promoted DPKY-FC at the exhibition at the 3rd IUCN WCC 2004 in Bangkok.	

Questions and Issues	Clarification/Additional Information	Remarks
4. Management ***c. Protective Measures and Means of Implementation*** On p. 49 it states that "present levels of coordination within the complex are not optimal, but all superintendents are making serious efforts to improve coordination". The 1997 management plan also comments on this (p. 26). Given the large size of the DPKY-FC and its composite nature (different protected areas with individual management structures) coordinated approaches are essential. *What action is being taken to improve planning and management coordination?* *On a related matter, referring to Figure 1 p. 53, how do the various 'offices' (national parks, wildlife conservation, regional office, watershed conservation and management) interact to ensure coordination and effective management of the DPKY-FC?*	To strengthen management effectiveness, the Ministry of Natural Resources and Environment (MoNRE) has taken the issue of wildlife trafficking and protection seriously by establishing a Nature Protection Training Center at Khao Yai National Park in October 2004. To improve planning and management coordination, a coordinating office among the five protected units (location of office to be decided by park unit superintendents) will be established to link protection work and to exchange information. This office will be a meeting place for park managers to hold regular (e.g., monthly) and emergency meetings, as well as evaluating management effectiveness.	
f. Agreed Plans *What is the current status of Khao Yai Conservation Project?* *Are there other projects in and around DPKY-FC carried out by NGOs, etc?* On p. 56 the issue of 'illegal immigrants from Cambodia' is discussed, but transboundary management issues are not really addressed in the nomination. *What is action is being taken to address these issues?* p. 57 refers to Community Outreach and Awareness Training. This is obviously very important for the whole DPKY-FC. *What action is being taken to extend this outreach to local communities?*	The KhaoYai Conservation Project is an on-going intervention that currently operates under the day-to-day supervision of the KNP Park Superintendent. This program, which includes significant community outreach efforts, has been used as a model for other PAs in Thailand. The department implements, often with support from NGOs and the conservation community, and donors, a number of other training programmes for staff including superintendents, deputy rangers, and workers. For more information about outreach programmes in and around DPKY-FC carried out by NGOs, communities, or other governmental organizations, see Annex 8.	Table 6

Questions and Issues	Clarification/Additional Information	Remarks
k. Staffing Levels The 1997 management plan (p. 25) states that the DPKY-FC appears "to be understaffed in order to undertake many of the more non-traditional activities, such as villager liaison, public relations and upgrading of interpretative opportunities". *Has this situation improved and what is the breakdown of professional staff skills/assignments to deal with such issues?*	The department has worked closely with other ASEAN countries to improve and build management capacity skills. As mentioned in the previous section, the Nature Protection Training Center at Khao Yai National Park will be able to accommodate the staff of DPKY-FC for Human Resources Development. The center will be the meeting place for park managers, not only from Thailand but also from other countries, to exchange experiences in protected area management, in joint management and ecotourism management of protected areas, and in people participation in protected area management. This cooperation already took place at the ASEAN Heritage Park workshop held in September 2004.	Table 7
5. Factors Affecting the Property ***a. Development Pressures*** *What is being done to integrate the DPKY-FC into a regional development planning process to address the issues identified on p. 65: resorts, estates, tourism, logging, etc?* ***c. Natural Disasters and Preparedness*** *What about fires and the impact of drought on the system?*	The direction of management depends to a large degree on the superintendents of the protected area units, and the five superintendents have already started to work together as one unit, sharing staff, equipment, and conservation and recreation expertise. These superintendents have also worked closely with community and provincial committees to integrate the DPKY- *FC* into a regional development planning process. This is a positive step as it indicates a willingness to cooperate in plans to realize park goals and objectives. Since the NP Acts does not allow any activities besides protection research, and ecotourism, all activities have to be permitted by the MoNRE; therefore, no serious disasters (i.e., forest fires) have occurred in DPKY-FC.	

Questions and Issues	Clarification/Additional Information	Remarks
6. Monitoring Table 19, p. 67, presents a proposed monitoring matrix. *Since wildlife hunting is a major concern in DPKY-FC, affecting key proposed WH values, why is the monitoring only to be undertaken twice a year?*	MoNRE has taken wildlife hunting as a major concern in DPKY-FC by establishing the Nature Protection Training Center Khao Yai National Park in October 2004. The DoNP has set up monitoring programmes, and now the staff of DPKY-FC has regularly taken actions to monitor wildlife trafficking.	
B. Questions and Issues Arising from the 1997 Management Plan p. 23 refers to "several dam proposals that would inundate areas within the parks. One such dam is currently under construction in Pang Sida NP, others have been proposed for Khao Yai and Thap Lan National Parks. Unfortunately, by definition, the inundation…inevitably floods out lowland forests, the richest and also one of the scarcest habitats…" *What is the status of dam proposals for the DPKY-FC?* *Was the dam in Pang Sida NP completed and, if so, what were the impacts?* pp. 27-37 of the plan present a range of recommended management programmes. *Given that the plan was prepared in 1997, what aspects of the recommendations have been implemented?*	Pang Sida NP has 3 small reservoirs located outside the park boundary. No impacts have been found. These reservoirs function as buffer zones and water resources for wildlife and villagers.	
C. Comment by Independent Reviewers. (1) Tiger populations and effective management	DoNP, through the cooperation between National Park Office and Wildlife Conservation Office, has set up a programme to conduct research on key wildlife species in the complex. The program will be started in 2005 and finished by 2007.	-

Questions and Issues	Clarification/Additional Information	Remarks
(2) Collaboration among DPKY-FC and related organization and community	To ensure that local people fully participate in protected area management and to encourage more equitable sharing of costs and benefits arising from protection of Complex resources, DoNP has issued an executive order to protected areas all over the country to set up a protected area committee comprised of local people and park staff members who meet regularly (e.g., once a month) to discuss and resolve issues in a public forum. Formation of a committee will aid in the resolution of issues and the prevention of future conflicts. In collaboration with park staff and stakeholders, the DPKY-FC has started the pilot program to identify and establish mechanisms for equitable sharing of both costs and benefits arising from recreational activities that take place in designated areas under the provision of laws and regulations of national park and wildlife sanctuary acts. For example, by providing opportunities for stakeholder groups to participate directly in, and benefit from, the development and implementation of interpretation programs, hospitality services, and transportation services.	
(3) Impact from quarrying karts / limestone	That area is quite far from the DPKY-FC (30 kms.). The Thai government has for long time taken the issue of impacts from mining seriously. Since April 2004, the prime minister ordered related ministries to take care of pollutions that would occur in concession areas.	
(4) Comparison to Thung Yai - Huai Kha Khaeng	DPKY-FC is the largest and most comprehensive representations of Thailand's biodiversity. Though DPKY-FC is a bit smaller than Thung Yai- Huai Kha Khaeng, it will still add a large part to the global ecosystems. This area also contains the most significant, last habitat, of lowland evergreen forest. If Thung Yai- Huai Kha Khaeng is considered as a western complex, DPKY- FC could be an eastern complex. Both areas would be the corridors and buffers for the Southeast ASIA ecoregion.	

Table 1 Population of important Species in DPKY-FC

No	Species	Number of Population					total	Source
		Kho Yai	Thaplan	Pong Sida	Ta Phraya	Dong Yai		
1	*Elephas maximums* (Elephant)	180 (400)	40	18	20	70 (100)	328	Survey / encountered by park Staff , NGOs, Tourists, Academy.
2	*Bos aurus* (Gaur)	106 (300)	20	50	30	30	236	
3	*Bos javanicus* (Bunteng)	*	5	4	20	10	39	* No data
4	*Panthera tigris* (Tiger)	10 (25)	3	5	2	2	22	. (x) estimate
5	*Panthera pardus* (Leopard)	*	*	15	1	2	18	population.
6	*Ursus thibetanus* (Asialic black bear)	60 (110)	30 (50)	70	*	*	160	
7	*Helarctos malayanus* (Malayan sun bear)	60 (110)	30 (50)	70	*	*	160	
8	*Hylobates lar* (White handed gibbon)	500 (750)	*	18	*	*	518	
9	*Hylobates pileatus* (Pileated gibbon)	20 (35)	*	*	*	*	20	
10	*Cervus unicolor* (Sambar deer)	2800 (5900)	*	*	*	*	2800	
11	*Naemorhedus* sumatraensis (serow)	50 (75)	10	2	5	5 (10)	72	
12	*Crocodylus siamensis* (Crocodile)	2	*	2	*	*	4	
13	*Macaca nemestrina* (pig-tailed macaque)	1500 (2600)	*	*	*	*	1500	
14	*Lutrogale perspicillata* (smooth-coated otter)	4 (25)	*	*	*	*	4	

Table 2 Number of Species in DPKY-FC

No	Wildlife	Number of Species					Source
		Kho Yai	Thaplan	Pong Sida	Ta Phraya	Dong Yai	
1	Mammals	71	76	81	42	26	Survey & Research From Management Plan * = No data
2	Birds	358	284	238	200	163	
3	Reptiles	48	48	19	43	18	
4	Amphibians	23	17	16	23	*	
5	Fishes	*	31	19	23	31	
6	Butterfly	206	*	290	94	99	

Table 4 Mitigation Plan to Reduce Impacts from Roads in Dong Phayayen – Khao Yai Forest Complex.

ROAD	SHORT TERM	LONG TERM
1. Pakchong-Noen Horm (Road No 3077)	- Install signs to remind drivers where there are crossing spots for wildlife. - Set up speed limits. - Identify a sensitive habitat and build up road bumps to reduce speed. - Set up time limits for access to the park (i.e., opening and closing time of park entrances, no passing after 6:00 pm). - Set up checking points to control pollutions (i.e., air and noise pollutions). - Set up checking points to control alcohol consumptions. - Limit numbers of cars during particular seasons (i.e., rainy season). - Set limit for weight of the car. - Limit car uses (i.e., for tourist use only) and ban truck or business transportation in some seasons (e.g., rainy season, or high season for tourists visits). - Collect data on mortality levels of wildlife as a result of vehicular collisions, and the impacts on wildlife populations. - Educate tourists and visitors about road impacts. - Conduct ecological impact assessment to develop mitigation plan to minimize negative impacts on sensitive habitat, rare, endemic, or endangered species. - Recruit assistance from volunteers, such as NGOs or local community, to publicize impacts from driving over speed limit in the park. This includes volunteers to work with park staff in sensitive spots during long weekends or high season.	- Develop and implement a monitoring system to minimize impacts from roads. - Set up database and conduct a long-term research project to collect data on mortality levels of wildlife as a result of vehicular collisions, and analyze the impacts on wildlife populations. - Conduct a long-term ecological research project on potential impacts of the road to ecological processes and biodiversity. - Investigate the feasibility of restoring habitats that are important to key species. - To reduce the impacts of traffic on wildlife and habitats, especially in long weekends or high seasons, introduce alternate means of access to the national park, i.e., providing a shuttle service to and from a designated area. - Cooperate with local communities or other governmental organizations in how road are developed and maintained near the park to minimize the impacts from road uses. - Do not allow expansion of the road.

2. Pang Sida- Thab Larn (Road No.3462)	Closed.	Closed.
3. Kabin Buri-Wang Nomkheaw (Road No.304)	- Set up speed limits. - Set up time limits for access to the park. - Set up checking points to control pollutions (i.e., air and noise pollutions). - Set up checking points to control alcohol consumptions. - Set limit for weight of the car. - Collect data on mortality levels of wildlife as a result of vehicular collisions, and the impacts on wildlife populations.	- Set up database and conduct a long-term research project to collect data on mortality levels of wildlife as a result of vehicular collisions, and analyze the impacts on wildlife populations. - Investigate the feasibility of restoring habitats that are important to key species. - Conduct research to determine the feasibility of developing wildlife corridors to reduce the impacts of fragmentation (i.e., Km 27-29 as a corridor and Km 42-48 a culvert). - To reduce the impacts on mortality levels of wildlife as a result of vehicular collisions, conduct a research to determine the feasibility of building fences at the sensitive spots along the park boundary. - Do not allow to expand the road.
4. Ta Phraya- Noen Dindeang (Road No.348)	- Limit numbers of cars during particular seasons. - Set up time limits for access to the park. - Set limit for weight of the car. - Set up checking points to control pollutions (i.e., air and noise pollutions).	Conduct research to determine the feasibility of developing wildlife corridors or culvert).

Table 5 Committee / Meeting Concerning National Park in DPKY-FC

No.	Committee / Meeting	Participant From Park	Frequency	Remark
1	Local village committee meeting	Chief of ranger station	Monthly	
2	Tambol administration organization meeting	Chief of ranger station , deputy superintendent	Monthly	
3	Provincial forest resources protection committee	Superintendent	Monthly	
4	District forest resources protection committee	Deputy Superintendent	4 time / year	
5	Provincial government agencies meeting	Superintendent / Deputy	Monthly	
6	Dong yai management consultant committee	Superintendent / Deputy	2 time / year	Sub – district level
7	Khao yai management consultant committee	Deputy / Ranger	2 time / year	Sub – district level
8	National park office meeting	Superintendent	4 time / year	

Table 6 Number of Outreach Programme of DPKY-FC in 2004

No	Outreach programme	Number of Activities					Participated organization	Remarks
		Kho Yai	Thaplan	Pong Sida	Ta Phraya	Dong Yai		
1	Nature education camp	15	7	10	3	8	School , NGOs Conservation groups	Reported by Park Manager
2	Nature education school	8	5	12	3	8	School , NGOs	
3	Public Relation meeting	40	20	12	10	10	Leader , villagers	
4	Media / radio	-	-	50	-	-	Citizen in Srakaew province	
5	Rehabilitation programme	2	2	-	2	3	School , village NGOs , Government agencies	
6	Clean our National Park	5	2	3	2	2	School , villages NGOs , Government agencies	
7	Salt lic programme	8	4	3	3	3	School , NGOs	
8	Prescribed burning	1	-	1	-	-	NGOs , villages	
9	Exhibition	10	5	6	3	3	District , Province	

NGOs working in the area of DPKY-FC :

1. Preserve Khao Yai National Park foundation
2. SeubNakasatian foundation
3. WildAid
4. WWFT
5. WCS

Table 7 Training Programme for DPKY-Fc DPKY-FC Personnel 2004

No.	Training Programme	Participant				Time
		Superintendent	Deputy	Ranger	Worker	
1	Reservation of NP. Accommodation by Internet	/	/	/	/	5-24 Feb
2	Tourist Service in Protected Areas	-	-	-	/	23-29 Feb
3	Car Maintenance	-	-	-	/	8-18 Mar
4	Ecotourism Guide	-	-	-	/	30- Mar - 5 Apr
5	Rehabilitation Orchids in Forest	-	/	/	-	7 Apr
6	Protected Areas Plantation	-	-	-	/	16-22 Feb
7	Development of National Park Participatory Management	-	/	/	/	7 Apr
8	Increasing Effective Patrolling	-	-	/	/	10-19 May
9	Water Acidity Security	-	-	/	/	13-17 Jun
10	Nature Interpretation	-	/	/	/	19-25 Jul
11	Trend of Private Tourist Service Development	-	-	-	/	22-25 Sep

Table 1 Mitigation Plan to Reduce Impacts from Roads in Dong Phayayen – Khao Yai Forest Complex.

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4. Ta Phraya- Noen Dindeang (Road No.348)	- Limit numbers of cars during particular seasons. - Set up time limits for access to the park. - Set limit for weight of the car. - Set up checking points to control pollutions (i.e., air and noise pollutions).	Conduct research to determine the feasibility of developing wildlife corridors or culvert).

No. 0910.2/ 3671

National Park, Wildlife and Plant Conservation Department
61 Phaholyothin Road,
Chatuchak, Bangkok 10900
Thailand
Tel.+ 662-561-4292-3 Ext. 746
Fax. 662-579-5964

1 March B.E. 2548 (2005)

Dear Dr.Francesco Bandarin,

Dong Phayayen – Khao Yai Forest Complex (Thailand): nominated for inclusion on the World Heritage List

Reference is made to Mr. David Sheppard's letter dated 10 January 2005 requesting confirmation from the Government of Thailand concerning 3 issues: Dong Phayayen – Khao Yai Forest Complex (DPKY-FC) boundaries, strengthening ecological integrity, and strengthening management integrity.

We would like to provide the following information regarding these issues:

DPKY-FC Boundaries

National Park, Wildlife and Plant Conservation Department (DoNP) confirms that there will be changes to the boundaries in the near future, but requests that the World Heritage Committee considers the original nomination area of national park and wildlife sanctuary lands as the DPKY-FC World Heritage nomination.

The boundary adjustments (Attachment), part of the immediate plan for the DPKY-FC, are as follows:

1) 43, 729.63 ha. of inhabited and degraded park land to the north and northwest of Thap Lan National Park will be excluded from the complex.

2) 17, 627 ha. of National Forest Reserve land to the north of Thap Lan National Park will be added to the complex. This piece of forest has been added to the complex because it contains high conservation values and improves the viability of wildlife habitats in the DPKY-FC.

The adjustments are currently in process, which requires land inspections and surveys, and will be finalized in 2007. The area immediately inside the adjusted boundary at Thap Lan National Park is under careful surveillance to ensure no further encroachment or degradation from inhabitants. Buffer zones along this new and vulnerable section of the boundary will be established.

Strengthening Ecological Integrity

In May 2003, the DPKY-FC Management Project released information about its assessment of the impact of highways on species diversity in Khao Yai and Thap Lan National Parks. The assessment concluded that a wildlife corridor along the highway was necessary to uphold local biodiversity values, after which the Management Project undertook preliminary studies into appropriate locations and design possibilities for wildlife corridors.

On 19 August 2004, a Ministerial Committee of the Government of Thailand approved a 20 million baht budgetary allocation (to be made in 2006) for a Mountain Biodiversity Programme [CoP 7] for feasibility studies into wildlife corridors across highways that transect the DPKY-FC. A feasibility study will begin in 2006, which will require 2 years, after which construction is estimated to take 5 years, giving a completion date in 2013.

DoNP is currently drawing up a Terms of Reference for the feasibility study, which includes a commitment to assess the ecological suitability of various corridor construction methods, to minimize environmental impact. It is also standard procedure that projects funded by the government go through a rigorous Environmental Impact Assessment process.

The proposed corridors will be built on Highway 304 between Khao Yai and Thap Lan National Parks and on Highway 348 in Tha Praya National Park. At this point, it appears that the corridors will be in the form of a wildlife underpass (i.e. an elevated road for vehicles).

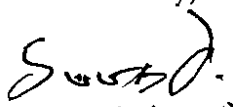
Strengthening Management Integrity

DoNP acknowledges the importance of managing the DPKY-FC as a single protected area, and there are steps being taken to ensure that there is an integrated management approach.

In 2003 DoNP established a Management Project to administer the DKPY-FC. The Project is involved in various works throughout the complex, but currently has just 5 full-time staff and does not have sufficient funds and manpower to prepare a management plan. Instead, DoNP has made arrangements for the plan to be prepared by a private company, with a contract signed on 3rd June 2004. A Forest Complex manager, who will work closely with the superintendents of the individual protected areas, will be appointed when the management plan is completed in 2006.

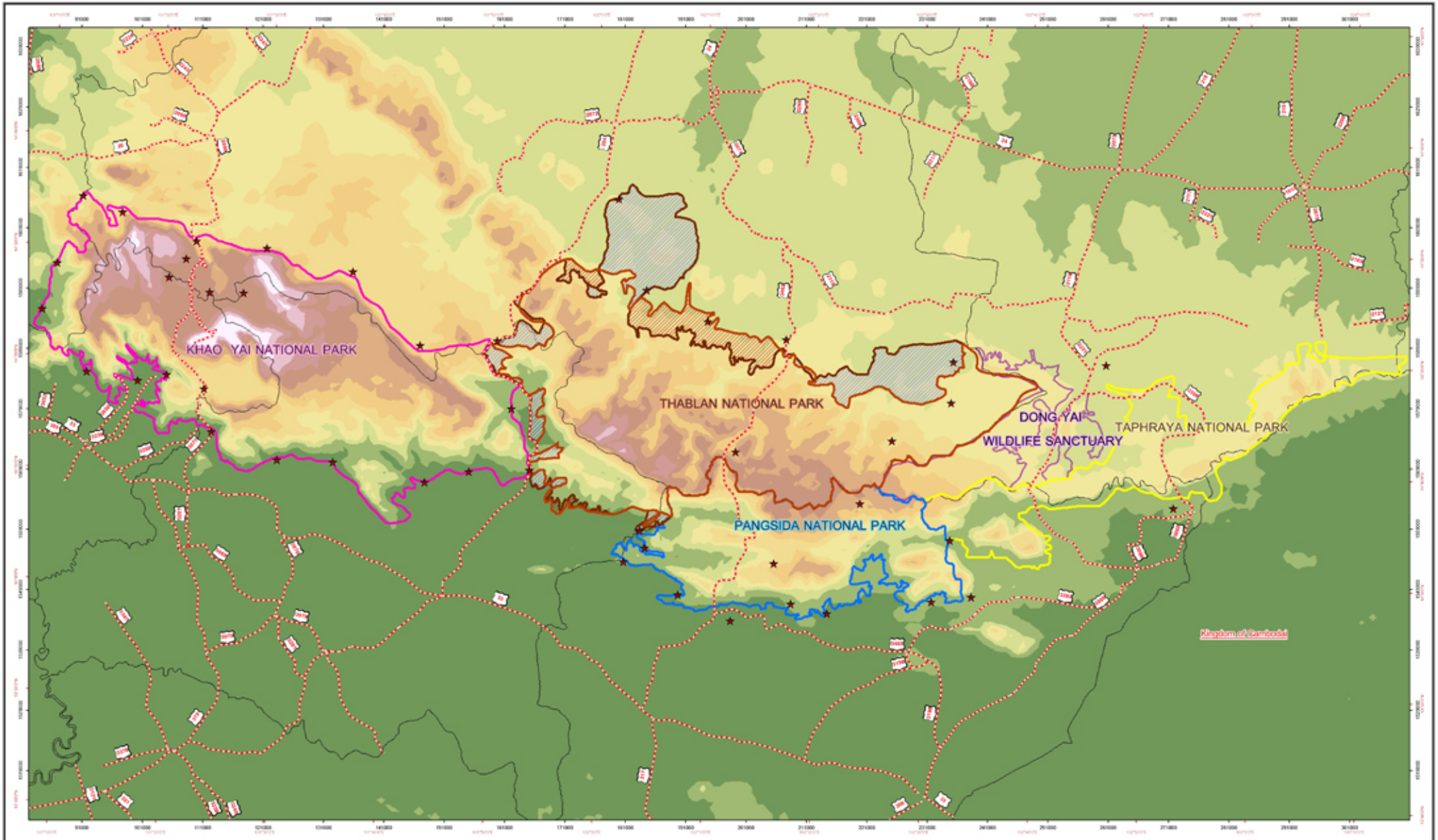
We hope that this is sufficient supplementary information for the World Heritage Centre. Please do not hesitate to contact us if you have any queries.

Yours sincerely,

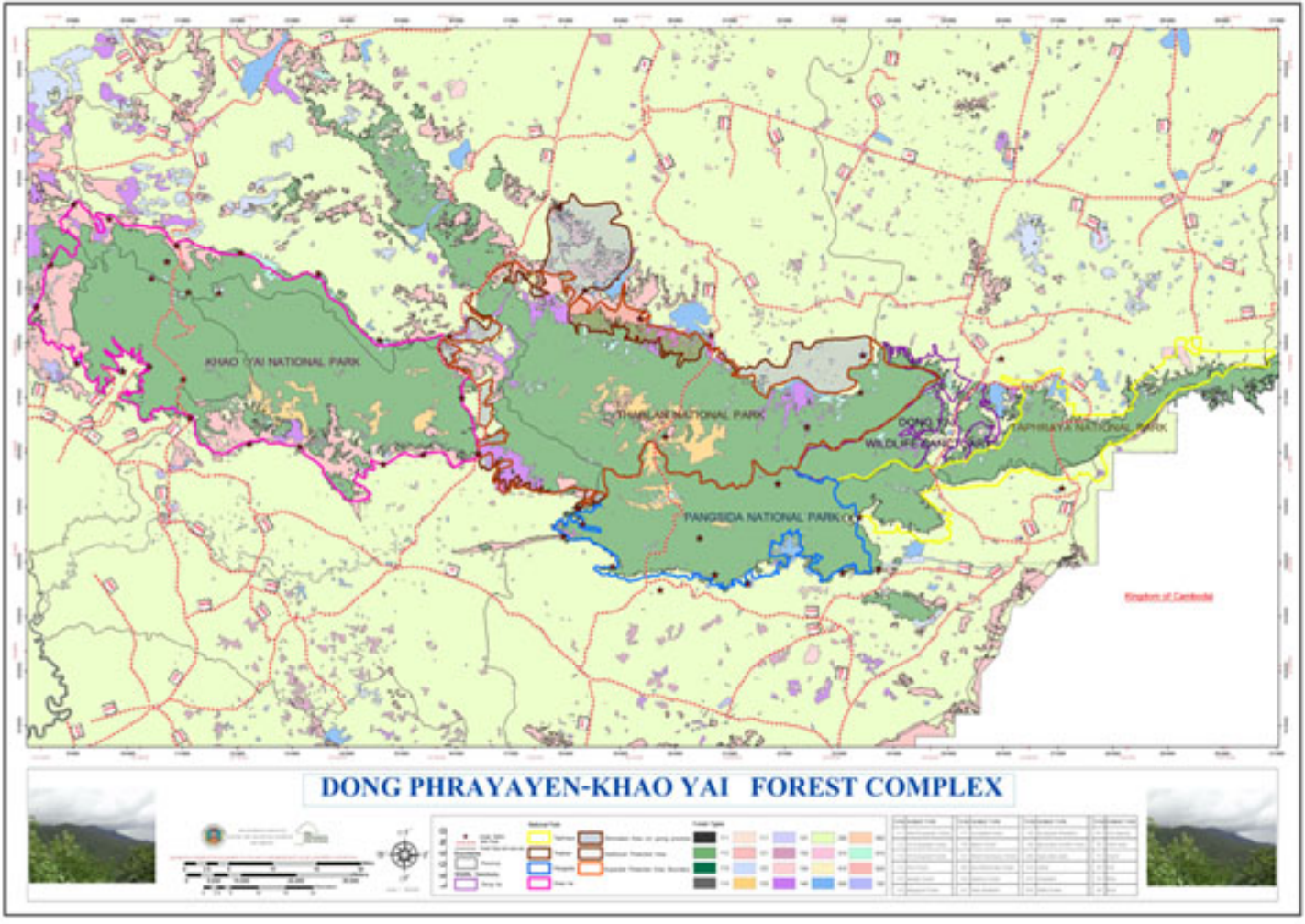


(Mr.Suvat Singhapant)
Director General
National Park, Wildlife and Plant
Conservation Department

Director, the World Heritage Centre UNESCO
Att: Georgina Peard, Project Officer- World Heritage
7, place de Fontenoy
75352 Paris 07 SP
France



DONG PHRAYAYEN-KHAO YAI FOREST COMPLEX



DONG PHRAYAYEN-KHAO YAI FOREST COMPLEX

ASIA / PACIFIC

DONG PHAYAYEN-KHAO YAI FOREST COMPLEX

THAILAND

WORLD HERITAGE NOMINATION – IUCN TECHNICAL EVALUATION

DONG PHAYAYEN-KHAO YAI FOREST COMPLEX (THAILAND) ID N° 590 Rev

Background Note:
In 1991 the Government of Thailand nominated Khao Yai National Park (NP) to the World Heritage (WH) List. The nomination was deferred by the 15th Session of the WH Bureau and the government was requested to:

a) "provide a better assessment of the Park's international significance;
b) elaborate the site's potential links with adjacent parks with a view to increasing the size of the nominated area; and
c) clarify their intention with regard to the construction of dams within the Park boundaries."

Since 1991 the State Party has included Khao Yai NP within a complex with three other national parks and a wildlife sanctuary, with one of the national parks and the wildlife sanctuary established as recently as 1996, to form the Dong Phayayen-Khao Forest Complex (DPKY-FC). This nomination of the DPKY-FC is therefore a response to the deferral of 1991.

1. DOCUMENTATION

i) Date nomination received by IUCN: April 2004

ii) Dates on which any additional information was officially requested from and provided by the State Party: IUCN requested supplementary information on the 6 November 2004, after the field mission, and 10 January 2005, after the IUCN WH Panel. State Party responses were received on 30 November 2004 and 11 March 2005 respectively.

iii) IUCN/WCMC Data Sheet: 60 references in the nomination document.

iv) Additional Literature Consulted: Department National Parks, Wildlife and Plant Conservation (2004) **GIS Database and its Applications for Ecosystem Management - WEFCOM Ecosystem Management Project**; C. Magin and S. Chape (2004) **Review of the World Heritage Network: Biogeography, Habitats and Biodiversity**; S. Chettamart (2003) **Ecotourism Resources and Management in Thailand**; J. Parr (2003) **A Guide to the Large Mammals of Thailand** (Sarakadee Press, Bangkok); A. Lynam (2003) **A National Tiger Action Plan for the Union of Myanmar;** J. MacKinnon (1997) **Protected Area Systems Review of the Indo-Malayan Realm.**

v) Consultations: 7 external reviewers. Superintendents and staff of Khao Yai, Thap Lan, Pang Sida and Ta Phraya National Parks, and Dong Yai Wildlife Sanctuary; 2 consultation meetings were held: with the Department of National Parks, Wildlife and Plant Conservation, and the Office of Natural Resources and Environmental Policy and Planning in Bangkok, and with local stakeholders at Pang Sida NP; and superintendent and staff of Huai Kha Khaeng Wildlife Sanctuary WH Site.

vi) Field Visit: Stuart Chape, 19-28 October 2004.

vii) Date of IUCN approval of this report: April 2005

2. MAIN FEATURES AND SUMMARY OF NATURAL VALUES

The Dong Phayayen-Khao Yai Forest Complex (DPKY) lies in an east-west alignment along and below the Korat Plateau, the southern edge of which is formed by the Phanom Dongrek escarpment. This places the complex inside the Udvardy (1975) Thailandian Monsoon Forest biogeographic province, bordering the Indochinese Rainforest biogeographic province; modified by MacKinnon (1997) to the Central Indochina and Cardamom Mountains biogeographic units, respectively. The complex also lies at the edge of WWF Global 200 Ecoregion 35 (Tropical and Subtropical Moist Broadleaf Forest) and Ecoregion 54 (Indochina Dry Forests). The Cardamom Mountains biogeographic unit also corresponds to a Conservation Internatonal biogeographic hotspot.

The complex comprises five almost contiguous protected areas spanning 230km between Ta Phraya NP on the Cambodian border in the east, and Khao Yai NP at the west end of the complex. Khao Yai is the only mountainous section, with an elevational range between 100-1351m. It is rugged with a steep south-facing scarp, at places 500m high, which dips back gently to the north, and slopes gradually down over the southeast half of the site. About 7,500ha lies above 1000m. The north side is drained by several tributaries into the Mun River, a tributary of the Mekong River. The southern side is drained via numerous scenic waterfalls and gorges by four main fast-flowing streams into the Prachinburi River.

Thap Lan NP to its east has an elevational range of 100-992m with much of its area lying between 300-500m and draining mainly north to the Mun river. Pang Sida NP lies to the south of Thap Lan NP across a watershed ridge, sloping south. It lies between 70-849m with part of the broad Phanom Dongrak escarpment at its western end. The Ta Phraya NP (120-562m) extends to the east, with north-draining uplands between 280-300m, which fall in a 200m scarp to the lowland valley of the Lam Sathorn River to the east. Lying between the last three areas and connecting them all is the low hilly Dong Yai Sanctuary (230-685m) which has a small outlier to its east adjacent to Ta Phraya NP. The total area of the complex, excluding any buffer areas outside of protected area boundaries, is 615,500ha. The details are included in Table 1.

Table 1: The details of the protected areas included in the nominated serial property

Protected Area Name	Year Est.	Area (ha)	IUCN PA Management Category	Other Existing Designation
Khao Yai NP	1962	216,800	II	ASEAN Heritage Park
Thap Lan NP	1981	223,600	II	
Pang Sida NP	1982	84,400	II	
Ta Phraya NP	1996	58,400	Unassigned	
Dong Yai WS	1996	31,300	Unassigned	

The rugged western half of Khao Yai NP lies on Permo-Triassic igneous volcanic rocks. To the south and east this is replaced by Jurassic calcareous and micaceous siltstones and sandstones. In the northwest part of Khao Yai there are small areas of limestone karst with steep cliffs, gorges, columns and caves. All of Thap Lan, as far as upland Ta Phraya, forms the rim of the quartz-rich sandstone Korat Plateau, the edge of which is the Phanom Dongrek range and escarpment. Formation of the Phanom Dongrek escarpment is attributed to crustal uptilting.

Annual rainfall over the complex ranges from 3000mm in the west to under 1000mm in the east, mainly during the southwest monsoon between May and October. Higher elevations and south-facing slopes, in common with the rest of Thailand's lower central plains, receive more rain. Khao Yai NP is the wettest area, averaging 2270mm per annum. There is a long dry season between November to April when moist evergreen forests retain their humidity but which favours the growth of dry open forest towards the east.

The complex has a well defined topographic, climatic and vegetation east-west gradient. It contains all major habitat types of eastern Thailand and at least 2500 plant species are recorded (16 endemic) of the 20,000-25,000 species estimated for Thailand (MacKinnon 1997). Within the area three main types of vegetation are dominant: evergreen forests (73.8% of all five reserves), mixed dipterocarp/deciduous forest (5.3%) and deforested scrub, grassland and secondary growth (18%). The first two categories, with karst and riverine ecosystems, comprise the most significant habitats. The evergreen forests are of three types: dry (28.7%), moist evergreen above 600m (25.8%) and hill and lower montane rainforests (19.3%). They provide a wide range of ecosystems and habitats. The dipterocarp/deciduous mixed forests provide a similarly wide range but in drier fire-prone areas with sandy soils. As well as mixed forests the drier areas include dry dipterocarp forest and grassland. The small area of karst in the northwest of Khao Yai NP has distinctive microhabitats. Riverine ecosystems wind through other forest types, with distinct features and limited habitats such as cascades, waterfalls and deep pools.

More than 80% of Khao Yai NP is covered in evergreen or semi-evergreen forest, much of it tall, good quality primary forest. Moist and dry evergreen forests also occur in the other protected areas of the complex: Thap Lan 59%, Pang Sida 86.5%, Ta Phraya 72.5%, and Dong Yai 70.6%. A greater proportion (32%) of Thap Lan has been degraded, mostly through loss of dry dipterocarp forest by clearing for agriculture and tree plantations in the northern and northwestern sections. However, it also has about 700ha of the fan-leafed corypha or *lan* palm, on the leaves of which Buddhist sermons were originally inscribed. Pang Sida has wide south-facing hill-slope habitats. There are also extensive areas of bamboo forest. In Ta Phraya 25% and in Dong-Yai almost 20% of the land is grassland or scrub. The protected areas in the DPKY complex were logged to a varying extent prior to the declaration of the 1989 logging ban by the Thailand Government, with secondary regrowth forest succession evident in many areas. Nevertheless, there are significant core areas of primary forest in all protected areas of the complex, as evidenced in a low altitude overflight during the evaluation mission.

The complex contains more than 800 fauna species, and protects some of the largest remaining populations in the region of many important wildlife species. A total of 112 species of mammals are known from the four parks: in Khao Yai - 72 species, Thap Lan - 76, Pang Sida - 85 and Ta Phraya - 21. Complete data are not yet available for Dong Yai but the wildlife sanctuary is known to contain important large mammal species. Globally threatened mammals found in the complex include the

Asian Elephant (EN), Tiger (EN), Leopard Cat (EN), Clouded Leopard (VU), Marbled Cat (VU), Asian Golden Cat (VU), Pigtailed Macaque (VU), Stump-tailed Macaque (VU), Pileated Gibbon (VU), Asiatic Black Bear (VU), Malayan Sun Bear (VU), Asiatic Wild Dog (VU), Large Spotted Civet (VU), Malayan Porcupine (VU), Wild Pig (VU), Serow (VU), Banteng (EN) and Gaur (VU). The karst area has endemic species of reptiles and bats (63 reptile species are recorded in Khao Yai). Important riverine species include the Smooth-coated Otter (VU) and the endangered Siamese Crocodile (CR), rediscovered in Pang Sida NP in 1992. The Department of National Parks, Wildlife and Plant Conservation (DNPWPC) is currently implementing a scientifically controlled crocodile re-introduction programme in Pang Sida NP in collaboration with Mahidol and Kasetsart Universities. Khao Yai NP is scientifically important at a global scale, as it is the only known location where White-handed and Pileated Gibbon species have overlapping ranges and interbreed.

Other notable species found in the complex include: Long-tailed Macaque, Silvered Langur, White-handed Gibbon, Slow Loris, Malayan Pangolin, Black Giant Squirrel, Hairy-footed Flying Squirrel, Whitehead's Rat, Brush-tailed Porcupine, Palm Civet, Binturong, Marbled Cat, Jungle Cat and Leopard. There are also unconfirmed reports of Wild Water Buffalo (EN). Recent surveys of herpetofauna indicate more than 200 species of reptiles and amphibians, with nine endemic species.

A total of 392 species of birds have been recorded within the DPKY-FC: Khao Yai - 358 species, Thap Lan - 284, Pang Sida - 238 and Ta Phraya - 200. The complex provides resident habitat for three globally threatened bird species: Pale-capped Pigeon (VU) and Silver Oriole (VU) (evergreen forest), Green Peafowl (VU) (dipterocarp/ deciduous forest) and Masked Finfoot (VU) (riverine habitat). In addition, 53 species considered nationally threatened or near threatened occur including four species of hornbill. Some 12.5% of birds are vagrant or passage migrants, including the Spot-billed Pelican (VU) and Greater Adjutant (CR).

3. COMPARISONS WITH OTHER AREAS

Thailand has 82 terrestrial national parks and 55 wildlife sanctuaries. Of these, 17 protected area complexes have been identified as important for large mammal conservation (Parr 2003), including DPKY-FC, which at 6,155 km², is the second largest forest complex in Thailand and the fourth largest in the region. The largest complex in Thailand is the Western Forest Complex (WEFCOM), comprised of 17 protected areas covering 18,730 km² and located in the Indochinese Rainforest biogeographic province biogeographic unit. The Huai Kha Khaeng-Thung Yai (HKK-TY) Wildlife Sanctuaries WH property forms the core of this huge area, and presents a logical point of comparison with the DPKY-FC nomination. A comparison with HKK-TY was central to the evaluation of the 1991 Khao Yai nomination. A field visit to HKK Wildlife Sanctuaries and extensive overflight of both HKK and TY was carried out following the evaluation of the DPKY complex nomination.

With the addition of Thap Lan, Pang Sida and Ta Phraya NPs, and the Dong Yai Wildlife Sanctuary, the concern of the 1991 Khao Yai evaluation regarding the size of the area has to a large extent been addressed - provided that effective wildlife corridors are constructed to ensure connectivity. The DPKY-FC is known to protect representative populations of most of the large mammal species of Thailand and has an intact carnivore community (reviewer comment). The overall species count (relative to HKK-TY and other complexes) has increased significantly from the nomination of Khao Yai in 1991. The largest contiguous area within the complex (Thap Lan, Pang Sida, Dong Yai and Ta Phraya) covers almost 3,500 km². However, apart from Khao Yai, all areas show impacts from logging (prior to the Government of Thailand 1989 logging ban), and other anthropogenic impacts. Nevertheless, even HKK-TY has had historic and ongoing anthropogenic impacts in some areas as a result of past human habitation and clearing of vegetation. Overall, DPKY presents a complex mosaic of all vegetation/habitat types remaining in northeast Thailand, including rainforest habitats; reflecting not only successional processes but also resulting from landform and soil diversity, and the east-west climatic gradient that characterises the complex. DPKY-FC Khao Yai NP contains a significant area of hill evergreen forest (39% of total KY NP area) above 600m altitude. Table 2 compares the DPKY-FC to other relevant WH properties and protected areas in the Indo-Malayan Realm.

The comparative examples given below are a mix of protected area remnant 'islands' in modified landscapes and those that are part of larger natural landscapes. The WEFCOM is the most outstanding example of the latter, not only a huge area in its own right but also (currently) functionally linked to large natural ecosystems in Myanmar. The smaller Kaeng Krachan complex also has ecological linkages with Myanmar. The Laos example is within the larger Annamite Mountains forested ecosystems on both sides of the Laos-Vietnam border, including linkages to Phong Nha-Ke Bang WH property. The DPKY-FC falls into the former category, and is the last substantial remnant habitat in northeastern Thailand capable of sustaining viable populations of large fauna. In terms of fauna biodiversity values, the DPKY complex compares favourably with both existing WH properties and other protected areas in the region. In particular, its suite of mammal species includes populations of the globally endangered tiger and elephant. Actual numbers of tiger are currently unknown but all protected areas report sightings/tracks, although it appears unclear whether or not tigers remain in Khao Yai NP. The elephant population in the complex is estimated to be about 300 animals.

Properties in other countries in the region, including Laos, Cambodia and Myanmar have greater apparent habitat integrity but also greater problems with regard to poaching and wildlife trade, and major management capacity issues. (There is, nevertheless, great potential in these countries). For example, a recent survey report by the Wildlife Conservation Society (Lynam 2003) on the status of tigers in Myanmar concluded that "the tiger in Myanmar has suffered a range collapse and is in an advanced state of decline towards extinction". The survey compared the status of tigers in Thailand, noting that conservation in that country was more successful as a result of protected area establishment and management, even though "both countries had similar richness and abundance of [other] large mammals".

Table 2: Comparison of the nominated property to other WH properties and protected areas in the Indo-Malayan Realm

PA/PA Complex	Area (rounded km²)	Mammals	Birds	Reptiles & Amphibians	Biogeographic Province	Human Impact
DPKY	**6,155**	**112**	**392**	**200**	**Thailandian Monsoon Forest**	**Old logging, agriculture, poaching, roads**
Thung Yai-Huai Kha Khaeng WHS, Thailand	6,222	120	400	139	Indochinese Rainforest	Some habitation, agriculture
Phong Nha-Ke Bang WHS, Vietnam	858	113	302	81	Indochinese Rainforest	Roads, poaching, cultivation
Kaziranga NP WHS, India	378	35 (*Indian Rhinoceros)	300	?	Burma Monsoon Forest	Poaching, incursions
Manas NP WHS, India	520	55	450	53	Burma Monsoon Forest	Poaching, incursions, separatist conflict
Sinharaja Forest Reserve WHS, Sri Lanka	87	38	147	60	Ceylonese Rainforest	Old logging, poaching, incursions
Tropical Rainforest Heritage of Sumatra WHS	26,000	180	450	?	Sumatra	Illegal logging, agriculture, settlements and roads
Western Forest Complex (including TY-HKK WHS)	18,730	150	490	130	Indochinese Rainforest	Poaching, refugees agriculture, proposed road development
Kaeng Krachan Forest Complex	4,373	57	400	?	Indochinese Rainforest	Poaching, incursions
Nakai-Nam Theun National Protected Area, Laos	3,445	Important representation of major species found in Indochina, including CR, EN and VU mammal species and 400 bird species			Thailandian Monsoon Forest/ Indochinese Rainforest	High level of poaching for wildlife trade, incursions
Cardamom Mtns, Cambodia	14,500 (several scattered PAs)	+100	450	?	Indochinese Rainforest	High level of poaching, wildlife trade, logging

In relation to Criterion (iv), on a comparative basis the DPKY-FC is clearly of global significance with regard to wildlife conservation. It also contains important core areas of relatively unmodified habitat representative of globally important tropical forest ecosystems. The DPKY-FC is located within the Udvardy Thailandian Monsoon Forest biogeographical province and contains elements of the WWF Cardamom Mountains Rainforest Ecoregion, which currently do not have a WH property (Magin and Chape 2004). However, in relation to Criteria (i), (ii) and (iii), the DPKY-FC does not have features that meet or surpass values in other areas at international scales. Nominated under Criterion (i), the escarpment feature is similar to a number of locations and also extends beyond the nominated area as a regional feature. With regard to Criterion (ii), while the area contains valuable habitats and ecosystems, and plays a key role in local, national and regional hydrological and ecological processes, these do not constitute global values. By comparison, Thung Yai-Huai Kha Khaeng WH property, especially within the larger WEFCOM, protects huge contiguous areas of tropical forest ecosystems. The protected areas in Laos along the Annamite Range protect a much larger proportion of the catchment inflow of the Mekong Basin. Similarly, with regard to Criterion (iii), while the DPKY-FC does contain landscapes and species that represent a "significant aesthetic experience", many of which are accessible in Khao Yai NP, the scale of such experiences is met or exceeded in other WH properties and protected areas.

4. INTEGRITY

4.1. Legal Status

The protected areas are the property of the Government of Thailand, with the four national parks declared under the National Parks Act of 1961 and the Dong Yai Wildlife Sanctuary declared under the Wild Animals Reservation

Protection Act 1960 (amended 1992). The Department of National Parks, Wildlife and Plant Conservation (DNPWPC), through the Office of National Parks (ONP) in the Division of Plant Conservation and Protection and the Office of Wildlife Conservation (OWC) within the Division of Laws, administer both national parks and wildlife sanctuaries respectively. Both national park and wildlife laws provide sufficient legal protection but each has distinct management objectives or primary emphases that have required operational clarification by the managing agencies. The National Parks Act states that a national park is established to "preserve its natural state for the benefit of public education and enjoyment", placing a strong emphasis on human use rather than conservation. Therefore guiding principles have been established for national parks that refer to preserving and maintaining "ecosystem integrity, biodiversity and scenic beauty" (Chettamart 2003). The OWC has also developed objectives that refer to providing "opportunities for the public to learn and enjoy the areas". Nevertheless, the fundamental differences in the objectives of the supporting legislation, as well as the division of administrative responsibilities between two agencies within the DNPWPC emphasise the importance of collaborative management approaches and harmonised objectives. In the case of WH properties the State Party could consider development of specific national WH legislation to ensure a more coherent and integrated approach to manage of WH properties.

The existing legislation has been criticised for precluding "involvement of local communities in protected area management issues" and that "the National Parks Division and the Wildlife Conservation Division place heavy emphasis on law enforcement, in line with the legal framework" (WWF Thailand website). Discussions with park staff and stakeholders during the evaluation mission suggested that this approach is changing. A recent collaborative initiative in Khao-Yai NP, the Khao Yai Conservation Project involving a range of stakeholders, provides a good example that could be replicated in other parts of the complex.

4.2 Management

All the protected areas in the DPKY-FC have full-time resident staff, including superintendents for each area. There are 80 ranger stations located around and in the complex. Basic management capacity at non-professional levels is adequate by international standards and good by regional levels. This is particularly the case relative to the neighbouring high biodiversity countries of Laos and Cambodia. However, the level of professional (tertiary trained) staffing needs strengthening in all of the protected areas in the complex, especially in Thap Lan NP the largest protected area, but also in Ta Phraya NP with its cross-border issues – which also needs strengthening of its ranger staff for the same reason, although police also patrol the border area. The nomination document lists staffing levels as noted in Table 3.

Table 3: Staffing levels in the nominated property

Category	Khao Yai	Thap Lan	Pang Sida	Ta Phraya	Dong Yai	Total
Professional	9	5	6	3	3	26
Permanent employees	68	18	21	7	8	122
Seasonal employees	305	211	135	49	56	756
Total	**305**	**211**	**135**	**59**	**67**	**904**

The evaluation mission supported the view of the nomination document that "present levels of coordination within the complex are not optimal". Geographically contiguous areas are are administratively separated, each with a superintendent-in-charge. The rationale for establishing the administratively and legislatively separate, but in part ecologically contiguous, Dong Yai WS was also not apparent during the field evaluation. It creates perceptual and managerial boundaries, when in fact the whole area needs to be managed as a cohesive unit. This would be greatly assisted through a 'whole-of-complex' management approach (as in the WEFCOM Ecosystem Management Project) directed by a 'chief superintendent' responsible for overall management coordination and budget allocation, with an appropriate level of seniority and professional expertise. The supplementary information provided by the State Party in March 2005 states that a forest complex Manager will be appointed in 2006 after the completion of a new management plan (see below).

Three of the five protected areas have operational management plans. Plans for the most recently established areas, Ta Phraya NP and Dong Yai WS, are scheduled to be prepared in 2004. As well as the individual operational plans, a strategic management plan for the entire complex was prepared by the Office of Environmental Planning and Policy and Kasetsart University in 1997. This plan was updated by the Office of National Parks and Kasetsart University in 2004. It is essential that the plan move from strategic intent to coordinated action as soon as possible. However, in its supplementary information the State Party has indicated that a further management plan for the whole complex will be prepared by a private company, contracted in June 2004. The relationship to the existing plan is not clear, nor the rationale in appointing the complex manager after the new plan has been completed. It would be helpful if the complex manager participated in development of the new plan.

While budgets for Thap Lan and Pang Sida remained fairly constant between 1998-2003, they increased for Khao Yai NP and declined for Ta Phraya NP and Dong Yai WS (both received 11% of the funds provided to Khao Yai in 2003). Khao Yai NP is the primary visitor attraction in the complex, not surprising given its proximity to the national capital, role as Thailand's first national park, its place in the national psyche as a symbol of nature conservation, and promotion as a tourist centre. The park received more than half a million visitors in 2003 and has well established visitor facilities that require high maintenance levels and therefore the need for significant funding is understood. In contrast, Ta Phraya NP received only 280 visitors in 2003, down from a peak of 2,720 in 1999. The reasons for this significant decline are not entirely clear but the border area is less accessible, there are fewer facilities and security issues. However, it is evident that there is a substantial disparity in financial resourcing across the complex, reflected in lower levels of staffing and equipment in the eastern protected areas, that needs to be corrected.

4.3 Boundaries

The boundaries of the DPKY-FC follow contour lines and were originally drawn around remaining areas of forest and natural habitat, in common with many of the world's protected areas. This has resulted in a complicated boundary, especially on the northern side of Thap Lan NP and almost the entire area of Ta Phraya NP. Ta Phraya also has a high boundary to area ratio, protecting the remaining linear stretch of forest along the Thai-Cambodian border, increasing management difficulty. In some areas significant incursion and agricultural conversion has occurred, especially in the north and northwest part of Thap Lan NP. There is no clear external buffer zone delineation, with other land uses bordering directly onto the protected areas. The exception is part of the northern boundary of Thap Lan NP, which borders with the Sakaraet Biosphere Reserve, administered by the Ministry of Science and Technology. There is a need to rationalise the complex boundaries and this has been recognised by the Government. In its supplementary information the State Party has committed to boundary adjustment by 2007, with the exclusion of 437.73km² of inhabited and degraded land and the addition of 176.27km² of National Forest Reserve to Thap Lan. The successful reafforestation at Khao Pheng Ma, on the northeast border of Khao Yai, undertaken by WWF Thailand is an excellent example of what can be achieved to re-establish natural forest, and this approach should be replicated in buffer zones.

4.4 Human Impact

As the last major area of extensive forest in northeastern Thailand, surrounded by almost completely converted landscapes, human pressures are significant and diverse:

Roads
Major roads divide the complex between Khao Yai NP and Thap Lan NP (Road 304), and separate Dong Yai WS and Ta Phraya NP (Road 348) and currently limit the effectiveness of the complex for ecosystem scale conservation and wildlife protection. Road 304 presents a particular problem because it is a busy highway that separates Khao Yai and Thap Lan. Nevertheless, the Government recognises the problem and has undertaken to develop wildlife corridors at two points along Road 304 and one on Road 348 where natural vegetation and topography offer opportunities to do so. The Government has budgeted 20 million Thai Baht (approximately US$500,000) to undertake a feasibility study for development of these corridors (State Party supplementary information November 2004). However, in the supplementary information provided in March 2005, the State Party advised that the feasibility study would commence in 2006, take 2 years, followed by a construction period of 5 years, with completion in 2013. IUCN is concerned, however, that this 8 year time frame currently proposed by the State Party to complete the design and construction of the corridors will compromise the values of the complex. IUCN considers that the viability of the complex retaining outstanding universal value is highly dependent on re-establishing and maintaining connectivity between different ecological components of the complex currently compromised by the roads. Ecologically effective wildlife corridors will be an essential part of the strategy to ensure connectivity within the complex but the process to construct these corridors must be expedited.

Although the State Party's supplementary advice states that the ecological suitability of various construction methods will be assessed, it also indicates that "at this point, it appears that the corridors will be in the form of a wildlife underpass". It is important that all options are considered. Underpasses are unlikely to encourage movement between protected areas of larger mammals and the State Party should evaluate the construction of "green or ecological bridges" over the roads. Such bridges have been used successfully in a number of countries (e.g. Banff National Park in Canada).

Two other north-south roads (Road 3462 in Pang Sida-Thap Lan and Road 3308 in Ta Phraya) have already been closed to public through-traffic, with Road 3462 used only for tourist entry into Pang Sida NP.

Incursions, Conversion and Separation
The DPKY-FC is located in an economically poorer part of Thailand and significant areas on the northern and northwestern periphery of Thap Lan NP have been taken over in past years and converted to agriculture. A number of villages are still located in the northeastern section of Thap Lan. As noted above, action needs to be taken to rationalise boundaries and establish effective buffer zones in collaboration with local communities. Pang Sida NP has a number of community groups that actively support the park and this needs to be replicated in all areas.

Between Khao Yai NP and Thap Lan NP there is a significant area of developed agricultural land separating the two national parks either side of Road 304. This area needs to be carefully managed as a buffer zone in conjunction with construction of wildlife corridors to the north and the south of this area. Planning controls need to be applied to the types of development permitted in this area.

Tourism
Of the four national parks in the complex, Khao Yai receives the most pressure from tourism. At peak times the carrying capacity of the park is exceeded, placing intense pressure on management and facilities. Ongoing concerns relate to use of the main north-south park road, in particular the impact on wildlife and the significant number of road kills. Speed bumps were recently installed and have had some effect. However, other strategies will need to be considered to bring people into the park, and setting limits on the numbers of people allowed entry. Some tourist activities occur in other parts of the complex, especially in Pang Sida NP, and a whole-of-complex tourism strategy needs to be developed and implemented to deal with increasing pressures and opportunities.

Poaching
Although park staff report a drop in illegal hunting and poaching activities as a result of increased patrolling activities, this remains an issue (as it is in all protected areas in the region, including TY-HKK WH property). As well as wildlife poaching, the high value wood *Aquilaria crassna*, used to produce incense for Middle East markets, is also illegally taken from the park. Cambodian small-scale loggers are known to occasionally cross the border into Ta Phraya NP to take timber. Additional resources are required to ensure that park staff can adequately deal with these threats, including additional staff trained in community participatory management processes.

4.5 Other Threats

The eastern protected areas, Dong Yai and Ta Phraya, contain unexploded ordinance, including land mines in Ta Phraya NP, as a result of the 1970s-1980s conflicts in Cambodia and insurgent activities in Thailand. These areas need to be thoroughly surveyed and cleared in places where management staff require access, and to provide for safe future public access.

5. ADDITIONAL COMMENTS

The Government of Thailand is to be commended for its efforts to conserve the country's natural heritage, especially through the designation of large areas and complexes, and its recent allocation of funding to develop a national protected areas system plan. This important initiative should ensure that all important habitats are not only effectively conserved but also linked to a range of management objectives that ensure community participation.

The IUCN evaluation mission also visited Thung Yai-Hua Kha Khaeng (TY-HKK) WH property in order to compare the current nomination with the existing property. It was observed that there appeared to be no active promotion of the WH status of TY-HKK at the property entrance. As a result of an extension to the original boundary, the WH inscription marker now lies 9 km inside the property. The State Party should consider a more active and visual promotion of the WH status of TY-HKK at the property entrance to increase local and visitor awareness of the WH values.

6. APPLICATION OF CRITERIA/STATEMENT OF SIGNIFICANCE

The Dong Phayayen-Khao Yai Forest Complex has been nominated under all four natural criteria.

Criterion (i): Earth's history and geological features
The Phanom Dongrek escarpment is a significant geomorphological feature of the DPKY-FC, especially within Ta Phraya NP along the Thailand-Cambodia border. However, although an important regional landscape feature it is not of outstanding universal value. IUCN does not consider that the nominated property meets this criterion.

Criterion (ii): Ecological processes
While acknowledging the key role that the DPKY-FC plays in local, national and regional hydrological and ecological processes there are other larger, more globally important properties that contribute to these values in the wider region. IUCN does not consider that the nominated property meets this criterion.

Criterion (iii): Superlative natural phenomena or natural beauty and aesthetic importance
The DPKY-FC contains landscapes of national and regional importance. It also contains species of international importance with high aesthetic value, many of which are visible in Khao Yai NP. However, the scale of the landscape aesthetic experience is met or exceeded in other WH properties and protected areas, including TY-HKK WH property, and the aesthetic interaction with wildlife, in terms of global experiences, is also exceeded in other properties. IUCN does not consider that the nominated property meets this criterion.

Criterion (iv): Biodiversity and threatened species
The DPKY-FC contains more than 800 fauna species, including 112 species of mammals, 392 species of birds and 200 reptiles and amphibians. It is internationally important for the conservation of globally threatened and endangered mammal, bird and reptile species that are recognised as being of outstanding universal value. This includes 1 critically endangered, 4 endangered and 19 vulnerable species. The complex contains the last substantial area of globally important tropical forest ecosystems of the Thailandian Monsoon Forest biogeographic province in northeast Thailand, which in turn can provide a viable area for the long-term survival of these globally important species. The unique overlap of the range of two species of gibbon, including the vulnerable Pileated Gibbon, further adds to the global value of the complex. IUCN considers that the nominated property meets this criterion.

7. DRAFT DECISION

IUCN recommends that the Committee adopt the following draft decision:

The World Heritage Committee,

1. Having examined Document ***WHC-05/29.COM/8B***

2. *Inscribes the Dong Phayayen-Khao Yai Forest Complex, Thailand, on the World Heritage List on the basis of natural criterion (iv).*

   ***Criterion (iv):** The DPKY-FC contains more than 800 fauna species, including 112 species of mammals, 392 species of birds and 200 reptiles and amphibians. It is internationally important for the conservation of globally threatened and endangered mammal, bird and reptile species that are recognised as being of outstanding universal value. This includes 1 critically endangered, 4 endangered and 19 vulnerable species. The area contains the last substantial area of globally important tropical forest ecosystems of the Thailandian Monsoon Forest biogeographic province in northeast Thailand, which in turn can provide a viable area for the long-term survival of these globally important species. The unique overlap of the range of two species of gibbon, including the vulnerable Pileated Gibbon, further adds to the global value of the complex.*

3. *Requests the State Party to carry out a design study for the construction of ecologically effective wildlife corridors to functionally link the western and eastern sectors of the complex, and to report on its findings; as well as an implementation time table, to the 31st session of the World Heritage Committee in 2007;*

4. *Further recommends that the State Party:*

   i) *expedite the implementation of the Dong Phayayen-Khao Yai Forest Complex management planning and appoint a manager responsible for the entire PA complex*

   ii) *provide increased resources for management across the complex;*

   iii) *undertake comprehensive and ongoing wildlife status monitoring;*

   iv) *implement measures to control the speed of traffic on the major roads that bisect the complex, especially before ecological corridors are constructed;*

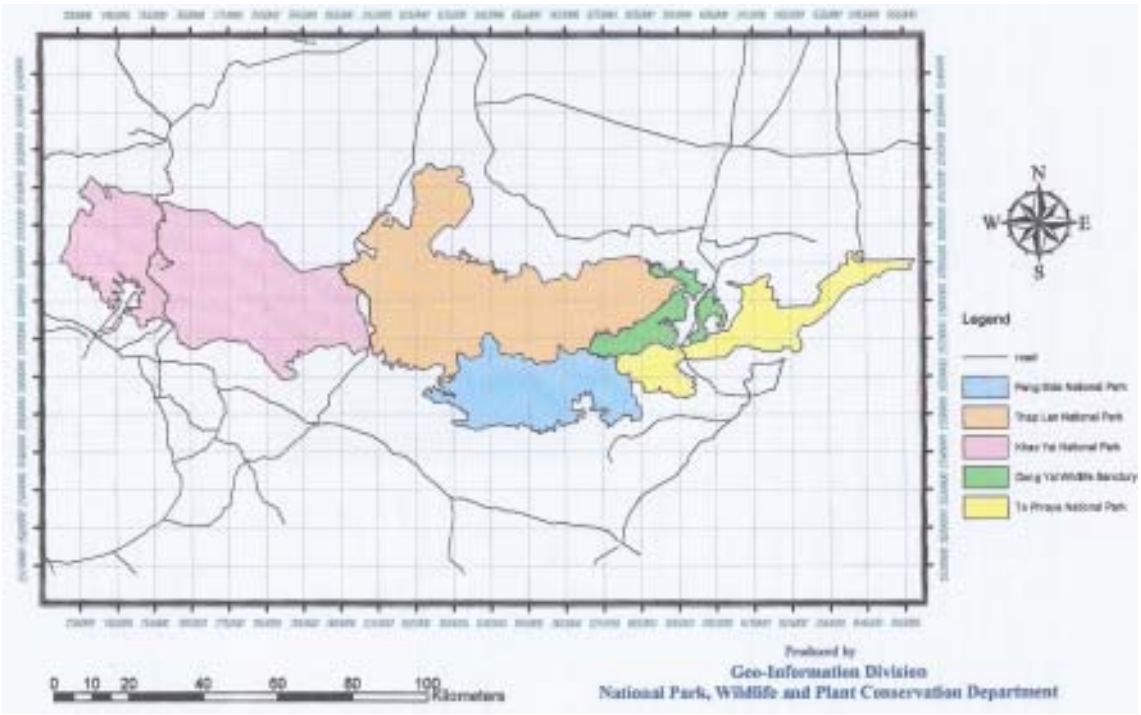
   v) *ensure that the World Heritage status of the complex is actively promoted to further encourage public cooperation in the conservation of the complex; and*

   vi) *explore transboundary protected area cooperation with the Government of Cambodia with regard to Banteay Chmor Protected Landscape, as well as other transborder resource management issues that affect the DYKY-FC.*

5. *Commends the State Party for its establishment of protected area complexes to maximize conservation opportunities.*

Map 1: General location of nominated property

Map 2: Boundaries of nominated property



ASIE / PACIFIQUE

COMPLEXE FORESTIER DE DONG PHAYAYEN-KHAO YAI

THAILANDE

CANDIDATURE AU PATRIMOINE MONDIAL - ÉVALUATION TECHNIQUE DE L'UICN

COMPLEXE FORESTIER DE DONG PHAYAYEN-KHAO YAI (THAÏLANDE) ID N° 590 Rev

Note explicative :
En 1991, le gouvernement de la Thaïlande a proposé l'inscription du Parc national de Khao Yai sur la Liste du patrimoine mondial. La proposition a été différée par la 15e session du Bureau du patrimoine mondial et le gouvernement de la Thaïlande a été prié :

a) « de fournir une meilleure évaluation de l'importance internationale du parc ;

b) d'étudier les liens potentiels du site avec les parcs voisins dans le but d'augmenter les dimensions du bien proposé ; et

c) de préciser son intention concernant la construction de barrages dans les limites du parc. »

Depuis 1991, l'État partie a intégré le Parc national de Khao Yai à un complexe, avec trois autres parcs nationaux et un sanctuaire de faune sauvage – l'un des parcs nationaux et le sanctuaire de faune sauvage ont été établis en 1996 – pour former le Complexe forestier de Dong Phayayen-Khao Yai. La proposition concernant le Complexe forestier de Dong Phayayen-Khao Yai est donc une réponse à la proposition différée en 1991.

1. DOCUMENTATION

i) Date de réception de la proposition par l'UICN : avril 2004

ii) Dates auxquelles des informations complémentaires ont été demandées officiellement puis fournies par l'État partie : l'UICN a demandé des informations complémentaires le 6 novembre 2004, après sa mission d'évaluation et le 10 janvier 2005, après la réunion du Groupe d'experts du patrimoine mondial de l'UICN. L'UICN a reçu les réponses de l'État partie le 30 novembre 2004 et le 11 mars 2005, respectivement.

iii) Fiches techniques UICN/WCMC : 60 références dans le dossier de la proposition.

iv) Littérature consultée : Department National Parks, Wildlife and Plant Conservation (2004) **GIS Database and its Applications for Ecosystem Management - WEFCOM Ecosystem Management Project**; C. Magin and S. Chape (2004) **Review of the World Heritage Network: Biogeography, Habitats and Biodiversity**; S. Chettamart (2003) **Ecotourism Resources and Management in Thailand**; J. Parr (2003) **A Guide to the Large Mammals of Thailand** (Sarakadee Press, Bangkok); A. Lynam (2003) **A National Tiger Action Plan for the Union of Myanmar;** J. MacKinnon (1997) **Protected Area Systems Review of the Indo-Malayan Realm.**

v) Consultations: 7 évaluateurs indépendants. Superintendants et personnel des parcs nationaux de Khao Yai, Thap Lan, Pang Sida et Ta Phraya, ainsi que du Sanctuaire de faune sauvage de Dong Yai ; deux réunions de consultation ont eu lieu : avec le Département des parcs nationaux et de la conservation des animaux et plantes sauvages et le Bureau des ressources naturelles et de la politique de l'environnement à Bangkok, et avec les acteurs locaux au Parc national de Pang Sida ; et Superintendant et personnel du Bien du patrimoine mondial du Sanctuaire de faune sauvage de Huai Kha Khaeng.

vi) Visite du bien proposé : Stuart Chape, 19 au 28 octobre 2004

vii) Date d'approbation de ce rapport par l'UICN : avril 2005.

2. PRINCIPALES CARACTÉRISTIQUES ET RÉSUMÉ DES VALEURS NATURELLES

Le Complexe forestier de Dong Phayayen-Khao Yai (DPKY) se trouve dans un alignement est-ouest, le long et au-dessous du plateau de Korat, dont l'extrémité sud est formée par l'escarpement de Phanom Dongrek. Le complexe est donc situé à l'intérieur de la province biogéographique de forêt de mousson thaïlandienne décrite par Udvardy (1975), en bordure de la province biogéographique de la forêt ombrophile indochinoise ; qui ont été modifiées par MacKinnon (1997) pour devenir les unités biogéographiques de l'Indochine centrale et des monts Cardamom, respectivement. Le complexe se trouve aussi en bordure de l'Écorégion 35 des 200 écorégions mondiales du WWF (forêt caducifoliée tropicale et subtropicale humide) et de l'Écorégion 54 (forêts sèches d'Indochine). L'unité biogéographique des monts Cardamom correspond aussi à un centre biogéographique défini par Conservation International.

Le complexe comprend cinq aires protégées quasi contiguës qui s'étendent sur 230 km entre le Parc national de Ta Phraya à la frontière cambodgienne, à l'est et le Parc national de Khao Yai à l'extrémité occidentale du complexe. Khao Yai est le seul secteur montagneux avec une élévation située entre 100 et 1351 m. Le terrain est accidenté avec un escarpement abrupt orienté vers le sud qui, par endroits s'élève à 500 m de hauteur, puis plonge doucement vers le nord et descend en pente douce sur la partie sud-est du site. Environ 7500 ha sont situés au-dessus de 1000 m. Le versant nord est drainé par plusieurs rivières qui se jettent dans la rivière Mun, affluent du Mékong. Le versant sud est drainé, via plusieurs cascades et gorges spectaculaires, par quatre cours d'eau principaux au cours rapide qui se jettent dans le fleuve Prachinburi. Le Parc national de Thap Lan, à l'est, a une altitude de 100 à 992 m, mais la majeure partie de la superficie est située entre 300 et 500 m et le drainage se fait essentiellement vers le nord et la rivière Mun. Le Parc national de Pang Sida se trouve au sud du Parc national de Thap Lan, de l'autre côté d'une crête de partage des eaux dont la pente est orientée vers le sud. Il est situé entre 70 et 849 m et une partie du large escarpement Phanom Dongrak se trouve à son extrémité ouest. Le Parc national de Ta Phraya (120-562 m) s'étend à l'est, présentant des plateaux drainés vers le nord entre 280 et 300 m qui tombent en un escarpement de 200 m jusqu'à la vallée basse de la rivière Lam Sathorn, à l'est. Entre les trois dernières aires, et les reliant les unes aux autres, se trouve le Sanctuaire de Dong Yai aux collines basses (230-685 m) qui présente une petite enclave à l'est, adjacente au Parc national de Ta Phraya. La superficie totale du complexe, à l'exclusion des zones tampons qui se trouvent à l'extérieur des limites des aires protégées, est de 615 500 ha. Les détails sont présentés au tableau 1.

Tableau 1 : Détails concernant les aires protégées figurant dans ce bien sériel proposé

Nom de l'aire protégée	Année établiss.	Superficie (ha)	Catégorie de gestion des aires protégées de l'UICN	Autre désignation
PN Khao Yai	1962	216 800	II	Parc du patrimoine de l'ANASE
PN Thap Lan	1981	223 600	II	
PN Pang Sida	1982	84 400	II	
PN Ta Phraya	1996	58 400	Non assignée	
SF Dong Yai	1996	31 300	Non assignée	

La partie orientale accidentée du Parc national Khao Yai repose sur des roches volcaniques ignées permo-triasiques. Au sud et à l'est, elles font place à des siltites et à des grès calcaires et micacés du Jurassique. Dans la partie nord-ouest de Khao Yai, on trouve de petits secteurs de karst calcaire avec des falaises abruptes, des gorges, des colonnes et des grottes. Tout Thap Lan, jusqu'à Ta Phraya en amont, forme la bordure du plateau de Korat, gréseux et riche en quartz, lui-même bordé par la chaîne et l'escarpement de Phanom Dongrek. La formation de l'escarpement de Phanom Dongrek est attribuée à un basculement crustal.

Sur le complexe, les précipitations annuelles vont de 3000 mm à l'ouest à moins de 1000 mm à l'est; il pleut surtout durant la mousson du sud-ouest entre mai et octobre. Les zones d'élévation et les pentes orientées vers le sud, comme le reste des plaines centrales basses de la Thaïlande, reçoivent davantage de pluies. Le Parc national de Khao Yai est la zone la plus humide : il reçoit en moyenne 2270 mm de pluie par an. De novembre à avril, il y a une longue saison sèche durant laquelle les forêts sempervirentes humides retiennent leur humidité, mais qui favorise la croissance des forêts sèches claires à l'est.

Le complexe a un gradient topographique, climatique et de végétation est-ouest bien défini. Il contient tous les types d'habitats principaux de l'est de la Thaïlande et on y a décrit au moins 2500 espèces de plantes (dont 16 endémiques) sur les 20 000 à 25 000 espèces estimées pour toute la Thaïlande (MacKinnon, 1997). Dans la région, il y a trois types de végétation principaux dominants : les forêts sempervirentes (73,8% des cinq réserves), la forêt mixte diptérocarpe/décidue (5,3%) et les broussailles des zones déboisées, les prairies et la végétation secondaire (18%). Les deux premières catégories, avec les écosystèmes karstiques et riverains, comprennent les habitats les plus importants. Les forêts sempervirentes sont de trois types : forêts sèches (28,7%), forêts sempervirentes humides au-dessus de 600 m (25,8%) et forêts ombrophiles de colline et de basse altitude (19,3%). On y trouve une vaste gamme d'écosystèmes et d'habitats. Dans les forêts mixtes diptérocarpes/décidues il y a aussi une large gamme semblable d'écosystèmes et d'habitats, mais dans des zones plus sèches et sensibles au feu qui ont des sols sableux. Comme les forêts mixtes, les zones plus sèches comprennent des forêts sèches diptérocarpes et des prairies. La petite zone de karst, au nord-ouest du Parc national de Khao Yai, possède des micro-habitats distincts. Les écosystèmes riverains serpentent à travers les autres types de forêts, avec des caractéristiques particulières et des habitats limités tels que des cascades, des chutes d'eau et des bassins profonds.

Le Parc national de Khao Yai est couvert, à plus de 80%, de forêts sempervirentes ou semi-sempervirentes, pour la plupart des forêts primaires de haute futaie et de bonne qualité. Il y a aussi des forêts sempervirentes humides et sèches dans les autres aires protégées du complexe : Thap Lan 59%, Pang Sida 86,5%, Ta Phraya 72,5% et Dong Yai 70,6%. Une proportion plus grande (32%) de Thap Lan est dégradée, ayant surtout perdu sa forêt sèche de diptérocarpes par le défrichement pour l'agriculture et les plantations dans les secteurs nord et nord-ouest. Cependant, Thap Lan comprend aussi environ 700 ha de coryphas aux feuilles en éventail ou palmier *lan*, sur les feuilles desquels étaient écrits les sermons bouddhistes à l'origine. Pang Sida contient de vastes habitats de collines et de pentes orientées vers le sud. On y trouve également des zones importantes de forêts de bambou. Les prairies ou les broussailles couvrent 25% de la superficie de Ta Phraya, et près de 20% de celle de Dong-Yai. Les aires protégées du Complexe forestier de DPKY ont été exploitées dans une plus ou moins grande mesure avant la proclamation de l'interdiction d'exploitation, en 1989, par le gouvernement de la Thaïlande, et la repousse secondaire de la succession forestière est évidente dans de nombreuses zones. Néanmoins, comme on a pu l'observer lors d'un survol à basse altitude durant la mission d'évaluation, il y a d'importantes zones centrales de forêts primaires dans toutes les aires protégées du complexe.

Le complexe contient plus de 800 espèces animales et protège certaines des plus grandes populations restantes, dans la région, de nombreuses espèces de faune sauvage importantes. Au total, 112 espèces de mammifères ont été dénombrées dans les quatre parcs : Khao Yai - 72 espèces, Thap Lan - 76, Pang Sida - 85 et Ta Phraya - 21. Des données complètes ne sont pas encore disponibles pour Dong Yai, mais on sait que le Sanctuaire de faune sauvage contient d'importantes espèces de grands mammifères. Parmi les mammifères menacés au plan mondial que l'on trouve dans le complexe, il y a l'éléphant d'Asie (EN) le tigre (EN), le chat léopard (EN), la panthère nébuleuse (VU), le chat marbré (VU), le chat doré d'Asie (VU), le macaque à queue de cochon (VU), le macaque brun (VU), le gibbon *Hylobates pileatus* (VU), l'ours noir d'Asie (VU), l'ours malais (VU), le cuon d'Asie (VU), la grande civette (VU), le porc-épic malais (VU), le sanglier (VU), le serow (VU), le banteng (EN) et le gaur (VU). La zone karstique contient des espèces endémiques de reptiles et de chauves-souris (63 espèces de reptiles sont décrites à Khao Yai). D'importantes espèces fluviales telles que la loutre d'Asie (VU) et le crocodile du Siam en danger (CR), ont été redécouvertes en 1992 dans le Parc national de Pang Sida. Le Département des parcs nationaux, de la conservation de la faune sauvage et des plantes est en train d'appliquer un programme de réintroduction scientifiquement contrôlé du crocodile dans le Parc national de Pang Sida, en collaboration avec les universités de Mahidol et Kasetsart. Le Parc national de Khao Yai est important du point de vue scientifique à l'échelon mondial, et c'est le seul endroit connu où l'aire de répartition du gibbon à mains blanches et du gibbon *Hylobates pileatus* se chevauchent et où il y a croisement entre les deux espèces.

Parmi les autres espèces remarquables que l'on trouve dans le complexe, il y a : le macaque de Buffon, le budeng, le gibbon à mains blanches, le loris lent, le pangolin javanais, l'écureuil géant de Malaisie, *Belomys pearsonii*, le rat de Whitehead, l'athérure à longue queue, la civette palmiste, le binturong, le chat marbré, le chat de la jungle et le léopard. Il y a aussi des observations non confirmées de buffles d'eau sauvages (EN). Des études récentes de l'herpétofaune indiquent la présence de plus de 200 espèces de reptiles et d'amphibiens dont neuf espèces endémiques.

Au total, 392 espèces d'oiseaux ont été décrites dans le Complexe forestier de DPKY : Khao Yai - 358 espèces, Thap Lan - 284, Pang Sida - 238 et Ta Phraya - 200. Le complexe sert d'habitat à quatre espèces d'oiseaux résidentes et menacées au plan mondial : le pigeon marron (VU) et le loriot argenté (VU) (forêt sempervirente), le paon spicifère (VU) (forêt diptérocarpe/décidue) et le grébifoulque d'Asie (VU) (habitat riverain). En outre, 53 espèces considérées comme menacées au plan national ou quasi menacées sont présentes, dont quatre espèces de calaos. Environ 12,5% des oiseaux sont occasionnels ou sont des migrateurs de passage, notamment le pélican à bec tacheté (VU) et le marabout argala (CR).

3. COMPARAISON AVEC D'AUTRES SITES

La Thaïlande possède 82 parcs nationaux terrestres et 55 sanctuaires de faune. Parmi eux, 17 complexes d'aires protégées ont été identifiés comme importants pour la conservation des grands mammifères (Parr, 2003), y compris le Complexe forestier de DPKY qui, avec 6155 km², est le deuxième complexe forestier de Thaïlande par la taille et le quatrième de toute la région. Le plus grand complexe de Thaïlande est celui des forêts occidentales (COMFO), formé de 17 aires protégées couvrant 18 730 km², qui se trouve dans la province biogéographique des forêts ombrophiles indochinoises. Le Bien du patrimoine mondial de Huai Kha Khaeng-Thung Yai (HKK-TY) forme le cœur de cette immense région et offre un point logique de comparaison avec le bien proposé. Une comparaison avec HKK-TY occupait une place importante dans l'évaluation, en 1991, de la proposition de Khao Yai. Une visite des sanctuaires de faune sauvage de HKK et un survol prolongé de HKK et de TY ont eu lieu après l'évaluation de la proposition concernant le complexe DPKY.

Avec l'ajout des Parcs nationaux Thap Lan, Pang Sida et Ta Phraya et du Sanctuaire de faune sauvage de Dong Yai, la préoccupation mentionnée dans l'évaluation de Khao Yai, en 1991, concernant les dimensions du site a, dans une large mesure, été traitée – à condition que des corridors efficaces soient construits pour la faune sauvage afin de garantir la connectivité. On sait que le Complexe forestier de DPKY protège des populations représentatives de la plupart des grandes espèces de mammifères de Thaïlande et une communauté intacte de carnivores (commentaire d'un évaluateur). Le compte global des espèces (par rapport à HKK-TY et à d'autres complexes) a augmenté de manière significative par rapport à la proposition de Khao Yai en 1991. La plus

grande zone contiguë au sein du complexe (Thap Lan, Pang Sida, Dong Yai et Ta Phraya) couvre près de 3500 km². Toutefois, hormis Khao Yai, toutes les autres zones présentent des impacts de l'exploitation forestière (qui prédatent l'interdiction d'exploitation imposée par le gouvernement de la Thaïlande en 1989), et d'autres impacts anthropiques. Néanmoins, même le HKK-TY a subi des impacts anthropiques historiques et en cours dans certaines régions par suite de l'occupation humaine et du défrichement de la végétation. Globalement, le Complexe forestier de DPKY est une mosaïque complexe de tous les types de végétation/habitats restant dans le nord-est de la Thaïlande, y compris les habitats de forêt ombrophile, reflétant non seulement des processus de succession mais aussi des processus qui résultent de la diversité du relief et des sols et du gradient climatique est-ouest qui caractérise le complexe. Le Complexe forestier de DPKY contient une zone importante de forêt sempervirente de collines (39% du total du Parc national Khao Yai) au-dessus de 600 m d'altitude. Le tableau 2 compare le Complexe forestier de DPKY à d'autres biens du patrimoine mondial et aires protégées du domaine indo-malais.

Tableau 2: Comparaison du bien proposé avec d'autres biens du patrimoine mondial et aires protégées du domaine indo-malais

AP/Complexe AP	Superficie (arrondie km²)	Mammifères	Oiseaux	Reptiles et amphibiens	Province biogéographique	Impacts anthropiques
DPKY	**6155**	**112**	**392**	**200**	**Forêt de mousson thaïlandienne**	**Ancienne exploitation du bois, agriculture, braconnage, routes**
Bien du patrimoine mondial Thung Yai-Huai Kha Khaeng, Thaïlande	6222	120	400	139	Forêt ombrophile indochinoise	Quelques habitations, agriculture
Bien du patrimoine mondial Phong Nha-Ke Bang, Viet Nam	858	113	302	81	Forêt ombrophile indochinoise	Routes, braconnage, agriculture
Bien du patrimoine mondial et Parc national Kaziranga, Inde	378	35 (*rhinocéros de l'Inde)	300	?	Forêt de mousson birmane	Braconnage, incursions
Bien du patrimoine mondial et Parc national Manas, Inde	520	55	450	53	Forêt de mousson birmane	Braconnage, incursions, conflit séparatiste
Bien du patrimoine mondial et Réserve forestière de Sinharaja, Sri Lanka	87	38	147	60	Forêt ombrophile ceylanaise	Ancienne exploitation du bois, braconnage, incursions
Bien du patrimoine mondial des forêts ombrophiles tropicales du patrimoine de Sumatra	26 000	180	450	?	Sumatra	Exploitation illicite du bois, agriculture, établissements et routes
Complexe des forêts occidentales (y compris Bien du patrimoine mondial TY-HKK), Thaïlande	18 730	150	490	130	Forêt ombrophile indochinoise	Braconnage, réfugiés, agriculture, projet de construction de routes
Complexe forestier de Kaeng Krachan	4373	57	400	?	Forêt ombrophile indochinoise	Braconnage, incursions
Aire protégée nationale de Nakai-Nam Theun, Laos	3445	Importante représentation des principales espèces trouvées en Indochine, y compris des espèces de mammifères classées CR, EN et VU et 400 espèces d'oiseaux			Forêt de mousson thaïlandienne/forêt ombrophile indochinoise	Niveau élevé du braconnage pour le commerce des espèces sauvages, incursions
Monts Cardamom, Cambodge	14 500 (plusieurs AP dispersées)	+100	450	?	Forêt ombrophile indochinoise	Niveau élevé du braconnage, commerce de la faune sauvage, exploitation du bois

Les exemples comparatifs donnés ci-dessus constituent un mélange d'« îlots » d'aires protégées perdurant dans des paysages modifiés et dans des paysages naturels de plus grande taille. Le COMFO est l'exemple le plus exceptionnel de cette dernière catégorie car il n'est pas seulement une vaste région à lui seul, mais aussi (actuellement) relié sur le plan fonctionnel à de grands écosystèmes naturels du Myanmar. Le complexe de Kaeng Krachan, plus petit, a également des liens écologiques avec le Myanmar. L'exemple laotien se trouve dans les très grands écosystèmes boisés des montagnes Annamites, de part et d'autre de la frontière entre le Viet Nam et le Laos, et a des liens avec le Bien du patrimoine mondial de Phong Nha-Ke Bang. Le Complexe forestier de DPKY entre dans la première catégorie et c'est le dernier habitat substantiel restant dans le nord-est de la Thaïlande qui puisse entretenir des populations viables de grands animaux. Du point de vue de la biodiversité de la faune, le bien proposé se compare favorablement, à la fois avec les biens du patrimoine mondial existants et avec les autres aires protégées de la région. En particulier, son ensemble de mammifères comprend des populations de tigres et d'éléphants menacées au plan mondial. Le nombre réel des tigres n'est pas connu, mais, dans toutes les aires protégées, on signale des observations/ traces. On ne sait pas avec certitude s'il reste ou non des tigres dans le Parc national de Khao Yai. La population d'éléphants du complexe est estimée à environ 300 animaux.

Dans les autres pays de la région, notamment le Laos, le Cambodge et le Myanmar, les biens semblent posséder une plus grande intégrité apparente de l'habitat, mais ils sont aussi confrontés à de plus graves problèmes de braconnage et de commerce des espèces sauvages ainsi que de capacité de gestion. (Il y a cependant un potentiel important dans ces pays.) Un rapport d'étude récent, publié par la Wildlife Conservation Society (Lynam, 2003) sur l'état des tigres au Myanmar, conclut : « au Myanmar, le tigre a souffert de l'érosion de son aire de répartition et se trouve dans un état avancé de déclin, en voie d'extinction ». L'étude comparait l'état des tigres en Thaïlande, notant que la conservation dans ce dernier pays était plus réussie grâce à la création et à la gestion d'aires protégées même si « les deux pays ont une richesse et une abondance semblables pour les [autres] grands mammifères ».

En ce qui concerne le critère (iv), par comparaison, le DPKY est clairement d'importance mondiale pour la conservation de la faune sauvage. Il contient aussi d'importantes zones centrales d'habitats relativement non modifiés, représentatifs des écosystèmes forestiers tropicaux importants au plan mondial. Le Complexe forestier de DPKY se trouve dans la province biogéographique de la forêt de mousson thaïlandienne définie par Udvardy et contient des éléments de l'Écorégion de forêt ombrophile des monts Cardamom du WWF, où il n'y a actuellement pas de bien du patrimoine mondial (Magin et Chape, 2004). Toutefois, en ce qui concerne les critères (i), (ii) et (iii), le Complexe forestier de DPKY n'a pas de caractéristiques comparables ou surpassant les valeurs des autres régions, au niveau international. Proposé au titre du critère (i), l'escarpement est semblable à celui de différents lieux et s'étend au-delà de la zone proposée devenant une caractéristique régionale. En ce qui concerne le critère (ii), si la zone contient des habitats et des écosystèmes importants, et joue un rôle clé dans les processus hydrologiques et écologiques locaux, nationaux et régionaux, ce ne sont pas là des valeurs universelles. Par comparaison, le Bien du patrimoine mondial de Thung Yai-Huai Kha Khaeng, en particulier au sein de l'ensemble de la COMFO, protège de vastes zones contiguës d'écosystèmes de forêt tropicale. Les aires protégées du Laos, le long de la chaîne des Annamites, protègent une beaucoup plus grande proportion du bassin du Mékong. De même, en ce qui concerne le critère (iii), le Complexe forestier de DPKY contient, certes, des paysages et des espèces qui représentent une « expérience esthétique importante », beaucoup étant accessibles dans le Parc national de Khao Yai, mais l'échelle de cette expérience est égalée ou surpassée dans d'autres biens du patrimoine mondial et aires protégées.

4. INTÉGRITÉ

4.1 Statut juridique

Les aires protégées sont la propriété du gouvernement de la Thaïlande et quatre parcs nationaux ont été créés au titre de la Loi sur les parcs nationaux de 1961. Le Sanctuaire de faune sauvage de Dong Yai a été créé au titre de la Loi de protection des réserves d'animaux sauvages de 1960 (amendée en 1992). Le Département des parcs nationaux, de la conservation de la faune et des plantes (DPNCFP), par l'intermédiaire de l'Office des parcs nationaux au sein de la Division de la conservation et de la protection des plantes, et de l'Office de la conservation de la faune sauvage au sein de la Division des lois, administre les parcs nationaux et les sanctuaires de faune sauvage. Les lois sur les parcs nationaux et sur la faune sauvage assurent une protection légale suffisante, mais chaque élément a des objectifs de gestion distincts ou des objectifs principaux qui ont dû être explicités dans le plan opérationnel par les organes de gestion. La Loi sur les parcs nationaux déclare qu'un parc national est établi pour « préserver son état naturel dans l'intérêt de l'éducation et de la jouissance du public », mettant un accent important sur l'utilisation par l'homme plutôt que sur la conservation. En conséquence, des principes directeurs ont été établis pour les parcs nationaux qui font référence à la protection et au maintien « de l'intégrité de l'écosystème, de la biodiversité et de la beauté des paysages » (Chettamart, 2003). L'Office de conservation de la faune sauvage a également établi des objectifs qui visent à fournir « au public des possibilités d'apprendre et de profiter des aires protégées ». Néanmoins, les différences fondamentales dans les objectifs de la législation d'appui, ainsi que la répartition des tâches administratives entre deux agences au sein du DPNCFP soulignent l'importance des approches de gestion en collaboration et des objectifs harmonisés. L'État partie pourrait envisager d'élaborer une législation nationale spécifique sur le patrimoine mondial afin de garantir une approche plus cohérente et plus intégrée de la gestion des biens du patrimoine mondial.

La législation en vigueur a été critiquée parce qu'elle empêcherait « la participation des communautés locales aux questions de gestion des aires protégées » et pour le fait que « la Division des parcs nationaux et la Division de la conservation de la faune sauvage mettent beaucoup l'accent sur l'application de la loi, conformément au cadre juridique » (site Web du WWF-Thaïlande). Des discussions avec le personnel des parcs et les différents acteurs, durant la mission d'évaluation, laissent à penser que cette approche est en train de changer. Une initiative récente en collaboration, dans le Parc national de Khao Yai, le « projet de conservation de Khao Yai », fait intervenir toute une gamme d'acteurs et fournit un bon exemple qui pourrait être suivi dans d'autres secteurs du complexe.

4.2 Gestion

Toutes les aires protégées du Complexe forestier de DPKY disposent d'un personnel résident à plein temps, y compris de surintendants pour chaque site. Il y a 80 stations de gardes dispersées autour et à l'intérieur du complexe. Les capacités de gestion de base, au niveau non professionnel, sont suffisantes selon les normes internationales et bonnes selon les normes régionales. C'est tout particulièrement le cas si l'on compare avec les pays voisins riches en biodiversité que sont le Laos et le Cambodge. Toutefois, le niveau du personnel professionnel (formation tertiaire) doit être renforcé dans toutes les aires protégées du complexe et en particulier dans le Parc national de Thap Lan qui est l'aire protégée la plus grande, mais aussi dans le Parc national de Ta Phraya qui a des problèmes transfrontières et qui a besoin d'un renforcement de son personnel de garde pour les mêmes raisons, même si la police patrouille dans la zone frontalière. Le dossier de la proposition indique le niveau de personnel comme mentionné au tableau 3.

Tableau 3 : Niveaux de personnel dans le bien proposé

Catégorie	Khao Yai	Thap Lan	Pang Sida	Ta Phraya	Dong Yai	Total
Professionnel	9	5	6	3	3	26
Employés permanents	68	18	21	7	8	122
Employés saisonniers	305	211	135	49	56	756
Total	**305**	**211**	**135**	**59**	**67**	**904**

La mission d'évaluation confirme l'affirmation du dossier de la proposition selon laquelle « le niveau de coordination actuel au sein du complexe n'est pas optimal ». Des zones contiguës sur le plan géographique sont séparées du point de vue administratif, chacune ayant son propre surintendant. La raison pour laquelle le Sanctuaire de faune sauvage de Dong Yai a été établi sous forme séparée du point de vue administratif et législatif, alors qu'il est en partie écologiquement contigu, n'est pas non plus apparue clairement durant l'évaluation du site. Cela crée des limites en matière de gestion alors qu'en fait l'ensemble de la région doit être géré comme une unité cohérente. Avec une approche de gestion à l'échelle du complexe, cette unité cohérente serait atteinte (comme dans le projet de gestion de l'écosystème COMFO), sous la direction d'un « surintendant chef » responsable de la coordination globale de la gestion et de l'attribution du budget qui aurait un niveau approprié de compétence professionnelle et d'ancienneté. L'information complémentaire fournie par l'État partie en mars 2005 indique qu'un administrateur du complexe forestier sera nommé en 2006 lorsque le nouveau plan de gestion sera terminé (voir ci-dessous).

Trois des cinq aires protégées ont des plans de gestion opérationnels. Les plans pour les sites établis le plus récemment, le Parc national de Ta Phraya et le Sanctuaire de faune sauvage de Dong Yai, devaient être préparés en 2004. Tout comme les plans opérationnels individuels, un plan de gestion stratégique pour l'ensemble du complexe a été préparé par l'Office de planification et de politique environnementales et l'université de Kasetsart en 1997. Ce plan a été mis à jour par l'Office des parcs nationaux et l'université de Kasetsart en 2004. Il est essentiel que le plan passe d'une intention stratégique à une action coordonnée le plus vite possible. Toutefois, dans ses informations, l'État partie indiquait qu'un autre plan de gestion pour l'ensemble du complexe serait préparé par une entreprise privée engagée pour ce faire en juin 2004. Les relations avec le plan existant ne sont pas claires ni la justification de la nomination d'un administrateur du complexe après que le nouveau plan aura été terminé. Il serait utile que l'administrateur du complexe participe à l'élaboration du nouveau plan.

Les budgets de Thap Lan et de Pang Sida sont restés relativement constants entre 1998 et 2003, celui du Parc national de Khao Yai a augmenté et ceux du Parc national de Ta Phraya et du Sanctuaire de faune de Dong Yai ont diminué (tous deux recevaient 11% des fonds attribués à Khao Yai en 2003). Le Parc national de Khao Yai est la principale attraction du complexe pour les touristes, en raison de sa proximité à la capitale nationale, de son rôle en tant que premier parc national de Thaïlande et de sa place dans l'imaginaire national en tant que symbole de la conservation de la nature, ainsi que de la promotion qui en est faite en tant que centre touristique. Le parc a reçu plus de 500 000 visiteurs en 2003 et dispose de locaux de bonne qualité pour les visiteurs qui nécessitent un niveau élevé d'entretien, ce qui

explique le besoin important de ressources financières. En revanche, le Parc national de Ta Phraya n'a reçu que 280 visiteurs en 2003 après avoir atteint un pic de 2720 en 1999. Les raisons de ce déclin marqué ne sont pas entièrement claires mais la zone frontalière est moins accessible, il y a moins d'infrastructures d'accueil et il y a des problèmes de sécurité. Toutefois, il est évident qu'il y a une disparité importante dans les ressources financières allouées au complexe et que celles-ci se reflètent dans le nombre moindre d'employés et l'équipement inférieur, dans les aires protégées orientales, ce qui doit être corrigé.

4.3 Limites

Les limites du Complexe forestier de DPKY suivent les courbes de niveau et ont été tracées à l'origine autour des dernières zones de forêt et d'habitat naturel, comme beaucoup d'aires protégées du monde. Il en est résulté des limites compliquées, en particulier du côté nord du Parc national de Thap Lan et pour presque toute la zone du Parc national de Ta Phraya. Ta Phraya a aussi un rapport très élevé entre ses limites et sa superficie et protège les dernières parcelles linéaires de forêt le long de la frontière entre le Cambodge et la Thaïlande, ce qui accroît la difficulté de gestion. Dans certaines zones, on note des incursions importantes et un empiétement de l'agriculture, en particulier dans les zones nord et nord-ouest du Parc national de Thap Lan. Il n'y a pas de délimitation claire d'une zone tampon extérieure de sorte que d'autres utilisations des terres jouxtent directement les aires protégées. L'exception est la partie des limites nord du Parc national de Thap Lan qui longe la Réserve de biosphère de Sakaraet administrée par le ministère des Sciences et de la Technologie. Il importe de rationaliser les limites complexes et le gouvernement le reconnaît. Dans ses informations complémentaires, l'État partie s'est engagé à ajuster les limites avant 2007, à exclure 437,73 km² de terres habitées et dégradées et ajouter les 176,27 km² de la Réserve forestière nationale de Thap Lan. Le reboisement réussi de Khao Pheng Ma, sur les limites nord-est de Khao Yai, entrepris par le WWF-Thaïlande est un excellent exemple de ce que l'on peut réaliser du point de vue du rétablissement de forêts naturelles et cette approche devrait être reproduite dans les zones tampons.

4.4 Impacts anthropiques

Comme il s'agit de la dernière grande zone de forêts étendues dans le nord-est de la Thaïlande, et que celles-ci sont entourées de paysages presque entièrement transformés, les pressions humaines sont importantes et diverses :

Les routes
Des routes principales divisent le complexe entre le Parc national de Khao Yai et le Parc national de Thap Lan (route 304), séparent le Sanctuaire de faune sauvage de Dong Yai du Parc national de Ta Phraya (route 348) et limitent actuellement l'efficacité du complexe pour la conservation et la protection des espèces sauvages à l'échelle de l'écosystème. La route 304 pose un problème particulier car il s'agit d'une grande route très encombrée qui sépare Khao Yai de Thap Lan. Néanmoins, le gouvernement reconnaît le problème et a entrepris de construire des corridors pour la faune en deux points le long de la route 304 et un point sur la route 348 où la végétation naturelle et la topographie offrent la possibilité de le faire. Le gouvernement a prévu 20 millions de baht (environ USD 500 000) pour une étude de faisabilité de ces corridors (information complémentaire de l'État partie, novembre 2004). Toutefois, dans les informations complémentaires fournies en mars 2005, l'État partie annonce que l'étude de faisabilité commencera en 2006, prendra deux ans et sera suivie par une période de construction de cinq ans pour se terminer en 2013. L'UICN craint cependant que ce délai de huit ans proposé par l'État partie pour terminer la conception et la construction des corridors ne compromette les valeurs du complexe. L'UICN considère que la viabilité du complexe et sa possibilité de maintenir une valeur universelle exceptionnelle dépendent étroitement du rétablissement et du maintien, entre les différents éléments écologiques du complexe, de la connectivité compromise actuellement par les routes. Des corridors écologiques efficaces pour les espèces sauvages seront une part essentielle de la stratégie qui garantira la connectivité au sein du complexe, mais le processus de construction des corridors doit être accéléré.

Bien que, dans ses informations complémentaires, l'État partie indique que la valeur écologique des différentes méthodes de construction sera évaluée, il ajoute que « pour le moment, il semble que les corridors se feront sous la forme de passages souterrains pour la faune sauvage ». Il importe que toutes les options soient prises en compte. Il est peu probable que des passages souterrains encouragent le mouvement des grands mammifères entre aires protégées, et l'État partie devrait évaluer la construction de « passerelles vertes ou écologiques » par-dessus les routes. De telles passerelles ont été construites avec succès dans plusieurs pays (par exemple dans le Parc national de Banff, au Canada).

Deux autres routes nord-sud (route 3462 dans Pang Sida-Thap Lan et route 3308 dans Ta Phraya) ont déjà été fermées au trafic public et la route 3462 ne sert plus qu'à l'entrée des touristes dans le Parc national de Pang Sida.

Incursions, transformation et séparation
Le Complexe forestier de DPKY est situé dans la région la plus pauvre de la Thaïlande sur le plan économique et de grandes zones de la périphérie nord et nord-ouest du Parc national de Thap Lan ont été accaparées depuis quelques années et converties à l'agriculture. Plusieurs villages sont encore situés dans le secteur nord-est de Thap Lan. Comme mentionné plus haut, des mesures devront être prises pour rationaliser les limites et établir des zones tampons efficaces en collaboration avec les communautés locales. Le Parc national de Pang Sida compte plusieurs groupes communautaires qui soutiennent activement le parc et il serait bon de reproduire cette situation dans tous les sites.

Entre le Parc national de Khao Yai et le Parc national de Thap Lan, il y a une zone importante de terres agricoles qui sépare les deux parcs nationaux de part et d'autre de la route 304. Cette zone doit être soigneusement gérée en tant que zone tampon, en conjonction avec la construction de corridors pour la faune au nord et au

sud de la zone. Il convient d'appliquer des contrôles de planification pour les types de développement autorisés dans la zone.

Tourisme
Sur les quatre parcs nationaux du complexe, Khao Yai est celui qui subit le plus de pressions du tourisme. Aux moments de pointe, la capacité de charge du parc est dépassée, ce qui exerce des pressions intenses sur la gestion et l'aménagement. Les inquiétudes permanentes ont trait à l'utilisation de la principale route du parc de direction nord-sud, et en particulier à son impact sur la faune sauvage et au nombre important d'animaux tués sur la route. Des ralentisseurs ont récemment été installés et ont eu quelque effet. Toutefois, il faudra envisager d'autres stratégies pour amener les touristes dans le parc et fixer des limites au nombre de personnes autorisées à entrer. Il y a quelques activités touristiques dans d'autres parties du complexe, en particulier dans le Parc national de Pang Sida, et une stratégie pour le tourisme à l'échelle du complexe doit être élaborée et appliquée afin de résoudre le problème des pressions qui augmentent et de saisir toutes les possibilités.

Braconnage
Bien que le personnel du parc signale une baisse de la chasse illicite et des activités de braconnage grâce aux patrouilles plus fréquentes, le braconnage reste un problème (comme pour toutes les aires protégées de la région, y compris le Bien du patrimoine mondial TY-HKK). Outre le braconnage de la faune sauvage, la grande valeur du bois *Aquilaria crassna* qui sert à produire de l'encens pour les marchés du Moyen-Orient, fait que cette espèce est aussi braconnée dans le parc. On sait que des bûcherons cambodgiens traversent occasionnellement la frontière pour pénétrer dans le Parc national de Ta Phraya et s'approprier le bois. Des ressources supplémentaires sont nécessaires pour faire en sorte que le personnel du parc puisse traiter toutes ces menaces de manière adéquate, notamment du personnel supplémentaire formé au processus de gestion communautaire participatif.

4.5 Autres menaces

Dans les aires protégées orientales, Dong Yai et Ta Phraya, il y a des munitions non explosées, y compris des mines dans le Parc national de Ta Phraya, qui datent des conflits de 1970-1980 au Cambodge et d'activités d'insurrection en Thaïlande. Ces zones doivent être inspectées de manière approfondie et nettoyées partout où le personnel de gestion a besoin d'accéder, ainsi que pour fournir un accès au public en toute sécurité.

5. AUTRES COMMENTAIRES

Le gouvernement de la Thaïlande doit être félicité pour les efforts qu'il déploie afin de conserver le patrimoine naturel du pays, notamment en classant de vastes régions et complexes et pour avoir récemment attribué des fonds à l'élaboration d'un plan de réseau des aires protégées nationales. Cette initiative importante devrait garantir que tous les habitats importants ne sont pas seulement conservés efficacement, mais aussi associés à une gamme d'objectifs de gestion garantissant la participation communautaire.

La mission d'évaluation de l'UICN a aussi visité le Bien du patrimoine mondial de Thung Yai-Hua Kha Khaeng (TY-HKK) afin de comparer la proposition actuelle et le bien existant. Elle a observé qu'il ne semblait pas y avoir de promotion active du statut de patrimoine mondial à l'entrée de TY-HKK. Par suite de l'extension des limites d'origine, la pancarte signalant l'appartenance au patrimoine mondial se trouve désormais à 9 km à l'intérieur du bien. L'État partie devrait envisager une promotion plus active et plus visuelle du statut de bien du patrimoine mondial de TY-HKK, à l'entrée du bien, afin de mieux sensibiliser la population locale et les visiteurs aux valeurs du patrimoine mondial.

6. APPLICATION DES CRITÈRES DU PATRIMOINE MONDIAL/IMPORTANCE

Le Complexe forestier de Dong Phayayen-Khao Yai est proposé au titre des quatre critères naturels.

Critère (i) : histoire de la terre et processus géologiques

L'escarpement de Phanom Dongrek est une caractéristique géomorphologique importante du Complexe forestier de DPKY, en particulier dans le Parc national de Ta Phraya, le long de la frontière entre la Thaïlande et le Cambodge. Toutefois, bien qu'il s'agisse d'une caractéristique paysagère régionale importante, elle n'est pas de valeur universelle exceptionnelle. L'UICN considère que le bien proposé ne remplit pas ce critère.

Critère (ii) : processus écologiques

Tout en reconnaissant le rôle clé que joue le Complexe forestier de DPKY pour les processus hydrologiques et écologiques locaux, nationaux et régionaux, il y a d'autres biens plus grands et plus importants au plan mondial qui apportent ces valeurs à la région dans son ensemble. L'UICN considère que le bien proposé ne remplit pas ce critère.

Critère (iii) : phénomène naturel ou beauté et importance esthétique exceptionnelles

Le Complexe forestier de DPKY contient des paysages d'importance nationale et régionale. Il contient aussi des espèces d'importance internationale qui ont une grande valeur esthétique et dont beaucoup sont visibles dans le Parc national de Khao Yai. Toutefois, l'échelle de l'expérience esthétique apportée par le paysage est égalée ou dépassée par d'autres biens du patrimoine mondial et aires protégées, y compris le Bien du patrimoine mondial TY-HKK, et l'interaction esthétique avec la faune sauvage, du point de vue des expériences mondiales, est également dépassée par d'autres biens. L'UICN considère que le bien proposé ne remplit pas ce critère.

Critère (iv) : biodiversité et espèces menacées

Le Complexe forestier de DPKY compte plus de 800 espèces de la faune, dont 112 espèces de mammifères, 392 espèces d'oiseaux et 200 reptiles et amphibiens. Il

est d'importance internationale pour la conservation de mammifères, d'oiseaux et de reptiles en danger et menacés au plan mondial qui sont reconnus comme d'importance universelle exceptionnelle. Cela comprend une espèce en danger critique d'extinction, quatre espèces en danger et 19 espèces vulnérables. Le complexe contient la dernière grande région d'importance mondiale d'écosystèmes de forêt tropicale de la province biogéographique de la forêt de mousson thaïlandienne dans le nord-est de la Thaïlande qui peut offrir une zone viable pour la survie d'espèces importantes au plan mondial telles que le tigre, l'éléphant, le chat-léopard et le banteng. Le chevauchement unique des aires de répartition de deux espèces de gibbons (dont *Hylobates pileatus* vulnérable) ajoute à la valeur générale du complexe. Le complexe ne joue pas seulement un rôle important pour la conservation des espèces résidentes, mais aussi pour les espèces migratrices telles que le pélican à bec tacheté en danger et le marabout argala en danger critique d'extinction. L'UICN considère que le bien proposé remplit ce critère.

7. PROJET DE DÉCISION

L'UICN recommande au Comité du patrimoine mondial d'adopter le projet de décision suivant :

Le Comité du patrimoine mondial,

1. *Ayant examiné le document* ***WHC-05/29.COM/8B,***

2. *Inscrit le Complexe forestier de Dong Phayayen-Khao Yai, Thaïlande, sur la Liste du patrimoine mondial, au titre du critère (iv).*

   Critère (iv) : *Le Complexe forestier de DPKY compte plus de 800 espèces de la faune, dont 112 espèces de mammifères, 392 espèces d'oiseaux et 200 reptiles et amphibiens. Il est d'importance internationale pour la conservation de mammifères, d'oiseaux et de reptiles en danger et menacés au plan mondial qui sont reconnus comme d'importance universelle exceptionnelle. Cela comprend une espèce en danger critique d'extinction, quatre espèces en danger et 19 espèces vulnérables. Le complexe contient la dernière grande région d'importance mondiale d'écosystèmes de forêt tropicale de la province biogéographique de la forêt de mousson thaïlandienne dans le nord-est de la Thaïlande qui peut offrir une zone viable pour la survie d'espèces importantes au plan mondial telles que le tigre, l'éléphant, le chat-léopard et le banteng. Le chevauchement unique des aires de répartition de deux espèces de gibbons (dont Hylobates pileatus vulnérable) ajoute à la valeur générale du complexe. Le complexe ne joue pas seulement un rôle important pour la conservation des espèces résidentes, mais aussi pour les espèces migratrices telles que le pélican à bec tacheté en danger et le marabout argala en danger critique d'extinction.*

3. Demande à l'État partie de réaliser une étude conceptuelle de la construction de corridors écologiquement efficaces pour la faune sauvage qui puissent assurer un lien fonctionnel entre les secteurs est et ouest du complexe, et de faire rapport sur ses conclusions, ainsi que sur un calendrier d'application, à la 31e session du Comité du patrimoine mondial, en 2007.

4. *Recommande en outre à l'État partie :*

   i) d'accélérer la mise en place du plan de gestion du Complexe forestier de Dong Phayayen-Khao Yai et de nommer un administrateur responsable du complexe d'aires protégées entier ;

   ii) de fournir des ressources accrues pour la gestion de l'ensemble du complexe ;

   iii) d'entreprendre un suivi complet et permanent de l'état de la faune sauvage ;

   iv) d'appliquer des mesures afin de contrôler la vitesse des automobiles sur les principales routes qui découpent le complexe, en particulier avant la construction des corridors écologiques ;

   v) de garantir la promotion active du statut de patrimoine mondial du complexe pour encourager la coopération du public à la conservation du complexe ; et

   vi) d'explorer la coopération en matière d'aires protégées transfrontières avec le gouvernement du Cambodge en ce qui concerne le paysage protégé de Banteay Chmor, ainsi que d'autres questions de gestion des ressources transfrontières qui affectent le Complexe forestier de DPKY.

5. *Félicite l'État partie pour avoir établi des complexes d'aires protégées afin de profiter au maximum des possibilités de conservation.*

Carte 1: Localisation du bien proposé

Carte 2: Limites du bien proposé