



World Heritage Sites

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DONG PHAYAYEN-KHAO YAI FOREST COMPLEX THAILAND

This complex of five protected forests in southern east Thailand forms a continuous topographic, climatic and vegetation gradient along some 200 km of hilly escarpment. It contains all the major rainforest habitat types of eastern Thailand and some of the region's largest remaining populations of many tropical forest species which are under pressure elsewhere.

COUNTRY
Thailand

NAME
Dong Phayayen-KhaoYai Forest Complex

NATURAL WORLD HERITAGE SERIAL SITE
2005: Inscribed on the World Heritage list under Natural Criterion x.

STATEMENT OF OUTSTANDING UNIVERSAL VALUE [pending]
The UNESCO World Heritage Committee issued the following statement at the time of inscription:

Justification for Inscription
Criterion (x): 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 Thaiandian 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.

IUCN MANAGEMENT CATEGORY
Khao Yai National Park: II National Park
Thap Lan National Park: II National Park
Pang Sida National Park: II National Park
Ta Phraya National Park: II National Park

BIOGEOGRAPHICAL PROVINCE
Thaiandian Monsoon Forest (4.10.4)

GEOGRAPHICAL LOCATION
In south central Thailand 160 km northeast of Bangkok, 15 km north of Prachin Buri town. Extends to the Cambodian border: 14° 00' to 14°33'S and 101° 05' to 103°14'E.

DATES AND HISTORY OF ESTABLISHMENT

- 1962: Khao Yai National Park established under the National Parks Act B.E.2504 of 1961;
- 1981 Thap Lan National Park established under Act B.E.2504;
- 1982: Pang Sida National Park established under Act B.E.2504;
- 1984: Khao Yai National Park declared an ASEAN Heritage Park;
- 1996: Ta Phraya National Park established under Act B.E.2504;
- 1996: Dong Yai Wildlife Sanctuary established under the Wild Animals Reservation B.E.2503 of 1960 (amended 1992).
- 2005: Khao Yai designated an ASEAN Heritage Park.

LAND TENURE

State, in the provinces of Saraburi, Nakhon Nayok, Nakhon Rachisima, Prachinburi, Srakaew and Burirum. Administered by the Office of National Parks, Wildlife and Plant Conservation (ONP) and the Office of Wildlife Conservation (OWC) in the Division of Plant Conservation & Protection, under the Division of Laws.

AREA

Total area:	615,500 ha
Khao Yai National Park (& ASEAN Heritage Park)	216,800 ha
Thap Lan National Park	223, 600 ha
Pang Sida National Park	84,400 ha
Ta Phraya National Park	59,400 ha
Dong Yai Wildlife Sanctuary	31,300 ha

ALTITUDE

100m to 1,351m (Khao Rom summit, Khao Yai).

PHYSICAL FEATURES

The Dong Phrayayen-Khao Yai Forest Complex comprises four almost contiguous protected areas running east-west some 230 km to the Cambodian border. They are located along and below the Korat Plateau, the southern edge of which is formed by the almost unbroken Phanom Dongrek escarpment. KhaoYai National Park at the west end of the complex is the only mountainous section, with an elevational range between 100 and 1,351 metres. It is rugged land with a steep south-facing scarp, at places 500m high, which dips back gently to the north, and slopes gradually down over the south-east half of the site. Some 7,500 ha lies above 1,000m. The north side is drained by several tributaries into the Nam 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 National Park to its east has an elevational range of 100 to 992m with much of its area lying between 300 and 500m and drains mainly north to the Nam Mun river. Pang Sida National Park lies to its south across a watershed ridge, sloping south. It lies between 70 and 849m with part of the broad Phanom Dongrak escarpment at its western end. The Ta Phraya National Park (120-562m) extends out to the east in two physiographic units: north-draining uplands largely between 280 and 300m, which fall in a 200m scarp to the lowland valley of the Lam Sathorn river to the east. Nestled 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.

Geologically the formation of the escarpment is attributed to long past crustal uplift. The rugged western half of Khao Yai National Park 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 is the rim of the quartz-rich sandstone Korat Plateau edged

by the Phanom Dongrek range and escarpment. This is broadest in the west, covering large areas of the three western parks but narrows and steepens in the east. Lowlands south of and below the Phanom Dongrak scarp are composed of quaternary colluvial deposits of rocks, sandy gravels and clays.

CLIMATE

The annual rainfall over the Complex falls from 2,270mm in Khao Yai Park in the west to under 1,000mm in the east, mainly during the southwest monsoon between May and October. Higher elevations and south-facing slopes receive more rain. The north slopes are on the edge of Thailand's drier north-east. The area has an average annual temperature of 23°C. There is a long dry season between November to April when the moist evergreen forests retain their humidity but which favours the growth of dry open forest towards the east and on northern slopes.

VEGETATION

The Complex is in the biogeographical Thaiindian Monsoon Forest on the border of the Indochinese Rainforest region and is a Conservation International Hotspot). No other protected area within this region has so well defined an east-west climatic and vegetation gradient. This could prove an informative datum during the current period of climatic change. It contains the seven major rainforest habitat types of eastern Thailand and at least 2,500 plant species are recorded, 16 being endemic (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%), tropical rainforest 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 occur in drier fire-prone areas with sandy soils. The drier areas include dry dipterocarp forest and grassland as well as mixed forests. The small area of karst in the north-west has distinctive microhabitats for small animals. Riverine ecosystems wind through the other forests with distinct features and limited habitats such as cascades, waterfalls and deep pools.

84% of Khao Yai is covered in evergreen or semi-evergreen forest, much of it tall good quality primary forest though there are some logged lowland areas. The park contains over 2,000 plant species including the valuable incense and medicinal aloewood or *Aquilaria crassna* (*mai krisana*). Moist and dry evergreen forests also occur in the other protected areas: 59% of Thap Lan, 86.5% of Pang Sida, 72.45% of Ta Phraya and 70.6% of Dong-Yai. Compared with the other parks, a high proportion (32%) of Thap Lan has been degraded, mostly by loss of dry dipterocarp forest by clearing for agriculture and tree plantations. It also has some 700 hectares of the fan-leaved corypha or talipot palm *Corypha umbraculifera*, on the leaves of which Buddhist texts were originally inscribed. Notable trees include *Adina cordifolia*, *Azelia xylocarpa*, *Anogeisus cuminata*, *Lagerstroemia calyculata*, *Pterocarpus macrocarpus* and *Pterocymbium javanicum*. 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.

FAUNA

The Complex contains more than 800 species of fauna and protects some of the largest remaining populations in the region of many tropical forest species which are coming under pressure elsewhere, Its size should ensure their continued protection. A total of 112 mammal species is known from the four Parks: in Khao Yai Park - 72 species, Thap Lan - 76, Pang Sida - 85 and Ta Phraya - 21. Complete data are not yet known for Dong-Yai Sanctuary but it is known to contain important large mammals. 22 species are globally threatened. In the evergreen forests these include the Asian elephant *Elephas maximus* (EN: ±300 individuals), Indochinese tiger *Panthera tigris corbetti* (EN); southern pigtailed macaque *Macaca nemestrina* (VU), stump-tailed macaque *Macaca arctoides* (VU), pileated gibbon *Hylobates pileatus* (EN), Himalayan black bear *Ursus thibetanus* (VU), Malayan sun bear *Helarctos malayanus* (VU), Asiatic wild dog *Cuon alpinus* (EN) and large spotted civet *Viverra megaspila* (VU). In

the dipterocarp / deciduous forest, globally threatened species include tiger and banteng *Bos javanicus* (EN: 10 animals); stump-tailed macaque, Malayan porcupine *Hystrix brachyura* (VU), clouded leopard *Neofelis nebulosa* (VU), marbled cat *Pardofelis marmorata* (VU), Sumatran serow *Capricornis sumatraensis* (VU) and southern gaur *Bos gaurus laosensis* (VU: 150 animals). The karst shelters microhabitats which favor endemic species of reptiles and bats. 200 species of reptiles and amphibians are known to exist in the Park, 63 reptile species are recorded in Khao Yai alone. Riverine species differ distinctly from those of the surrounding forests. The smooth-coated otter *Lutrogale perspicillata* (VU) is found there and the endangered relict Siamese crocodile *Crocodylus siamensis* (CR), rediscovered in Pang Sida Park in 1992.

Other notable species found in the four parks are: crab-eating macaque *Macaca fascicularis*, silvery lutung *Trachypithecus cristatus*, lar gibbon *Hylobates lar* (EN), greater slow loris *Nycticebus coucang* (VU), Sunda pangolin *Manis javanica* (EN), black giant squirrel *Ratufa bicolor*, hairy-footed flying squirrel *Belomys pearsoni*, Whitehead's spiny rat *Maxomys whiteheadi* (VU), Asiatic brushtailed porcupine *Atherurus macrourus*, palm civet *Paradoxurus hermaphroditus*, binturong *Arctictus binturong* (VU), Bengal leopard cat *Prionailurus bengalensis*, jungle cat *Felis chaus*, leopard *Panthera pardus* and wild pig *Sus scrofa*. There are also unconfirmed reports of Indian water buffalo *Bubalis arnee* (EN) in that park. If the very rare kouprey or grey ox *Bos sauvali* (CR) were to be rediscovered on the Cambodian border in the Dongrak mountains which are a continuation of the Phanom Dongrak range, the Complex would provide suitable habitat for its reintroduction.

A total of 392 species of birds has been recorded in the parks: in Khao Yai Park, 358 species, Thap Lan 284, Pang Sida 238 and Ta Phraya 200 species. Nearly two-thirds of the total are breeding species. Some 12.5% are vagrant or passage migrants including the spot-billed pelican *Pelicanus philippensis* (VU) and the greater adjutant *Leptoptilos dubius* (EN). Pale-capped pigeon *Columba punicea* (VU) in the evergreen forest, green peafowl *Pavo muticus* (EN) and silver oriole *Oriolus mellianus* (VU) in the dipterocarp/deciduous forest and masked finfoot *Heliopais personata* (EN) from the riverside are resident. 53 species are considered nationally threatened or near threatened, including four species of hornbill, Siamese fireback pheasant *Lophura diardi*, the rare silver pheasant *L. nycthemera* and the mountain imperial pigeon *Ducula badia*.

CONSERVATION VALUE

The Complex is internationally important for the conservation of globally threatened and endangered mammals, birds and reptiles in the last substantial area of the globally important tropical forest ecosystems of the Thai Monsoon Forest. This provides viable habitats for the long-term survival of endangered species such as tiger, elephant, leopard cat, banteng, greater adjutant and the migratory spotbilled pelican. No other protected area within the biogeographical region has so long and well marked a continuous topographic, climatic and vegetation gradient. It contains all the major rainforest habitat types of eastern Thailand and some of the region's largest remaining populations of many tropical forest species which are coming under pressure elsewhere. The Complex lies within a Conservation International-designated Conservation Hotspot, is a WWF Global 200 Eco-region and Khao Yai is an ASEAN Heritage Park.

CULTURAL HERITAGE

No record is provided of the traditional cultures associated with these areas.

LOCAL HUMAN POPULATION

There is little record of the people living within the parks, except for Khao Yai and Thap Lan. Khao Yai has villages within the Park itself and heavy settlement pressure from 104 villages along its borders. In 1991 some 195 families held disputed tenure certificates to land in Kaeng Khoi district in western Khao Yai, and the national Tourism Authority, the Highway Department, the Royal Thai Airforce, the Police and the national Electricity Generating Authority all hold land within the park. In Thap Lan Park settlements and agricultural land cover some 48,000 hectares (21.5% of its area). People living there

legally are currently allowed to stay; those living illegally are moved to alternative holdings. The Thai government plans to adjust the boundaries of Thap Lan to address this issue.

VISITORS AND VISITOR FACILITIES

In 2002 visitation to all four parks totalled 784,370 visitors, 580,400 (74%) going to Khao Yai which has symbolic importance being the oldest national park and has the best maintained visitor facilities. By 2006 tourist visits totalled 1.4 million. Khao Yai is only two hours drive from the Bangkok metropolitan area and it is possible to see there a wide range of animals as well as the rivers and waterfalls. In each of the three biggest parks there are visitor information centres, with food service, park guides and interpretive programs; there are also trails, shelters and viewing towers, low cost accommodation, bungalows and campgrounds. Small scale trekking and river rafting are beginning to become popular. Ta Phraya by contrast had only 280 visitors in 2003, down from 2,720 in 1999, probably due to its lesser accessibility, fewer facilities and its location on the border. No visiting or recreation is allowed in the Dong Yai Wildlife Sanctuary. A Tourism and Recreation Plan in the site's 10-year Management Plan provides for eight activities including ecotourism and gateway development (UNESCO, 2010).

SCIENTIFIC RESEARCH AND FACILITIES

The nomination bibliography lists eight past studies specific to the area, mostly of Khao Yai which has been longer and more closely studied than the other areas. During 2002-3 the DNP with the Wildlife Conservation Society conducted faunal surveys of the sites in preparation for their World Heritage nomination. Studies are ongoing into the unique natural hybridising between pileated and white-handed gibbons in Khao Yai.

MANAGEMENT

The National Parks were established under the act for "public education and enjoyment" as much as for conservation. They come under two authorities, the Office of National Parks, Wildlife and Plant Conservation (ONP) and the Office of Wildlife Conservation and each park is separately administered, a division which has inherent difficulties. The ONP cooperates with the police, national and international NGOs, and sometimes the army, in its three basic functions of preservation of biodiversity and ecosystems, research and education, and promoting recreation with tourism. Local issues are being addressed such as the poverty which leads to illegal activities, the employment of locals as park guards and the need for educational programs and the de-gazetting of areas of less use for conservation, especially in Thap Lan. In addition to preserving a wide range of animals, the forest provides an essential water catchment for the southern half of the dry north-east, protecting the hills from erosion and the streams from sedimentation. A Strategic Management Plan for the complex was drafted in 1997 and operational management plans were drawn up for Khao Yai and Thap Lan, with plans for the others to be completed in 2004. The strategic plan for the complex was updated by the ONP and Kasetsart University in 2004. It proposed regular monitoring of hunting, of extraction of timber and non-timber forest products, and all forms of encroachment, river degradation and plant-collecting of aroids and orchids. It allowed for the post of a Forest Complex Manager and for research. A new Management Plan for 2007-2016 considers the management of sustainable tourism and ecotourism, visitor carrying capacity and community participation (UNESCO, 2010)

Khao Yai Park is a national symbol of nature conservation, being Thailand's first national park, near to Bangkok and well promoted for tourism. This is reflected in higher levels of funding. It was established in 1962 and was then divided into six zones: Intensive Use, Outdoor Recreation (12% of the area), Special Use (for services), Forest Regeneration (Recovery zone), limited Strict Nature Reserves, and Primitive Areas (78% of the Park). In this Park an Environment Protection Society project reduced poaching and gained local support for the Park. The subsequent Khao Yai Conservation Project started by the Wildlife Conservation Society and WildAid worked with the ONP between 1999 and 2002 aiming to integrate protection, community outreach and wildlife monitoring in a regional model. It had over 100 staff and in 300 long-range patrols successfully reduced poaching (mainly for fragrant aloewood oil, mostly by Cambodian intruders). At the same time it reached into local communities with small farms to provide alternative incomes to poaching, with awareness training in camps for 1,500 children, and

festivals; and it set up a regular schedule of monitoring wildlife and poaching. Tourist pressure is increasing, especially in Khao Yai, but is not yet too heavy, though the areas around riverside attractions are vulnerable, especially the waterfalls in Khao Yai. A tourism strategy for the whole Complex has been suggested. Highway 304 to Korat separates Khao Yai from Thap Lan parks along a strip of agricultural land and is scheduled for widening from two to four lanes. To mitigate the effects of this on wildlife movement, especially between the 28th and 29th km points where it crosses several wildlife trails, the construction of underpasses, tunnels or green overpasses along Highway 304 to provide wildlife corridors has been considered. Detailed pre- and post-construction monitoring would inform subsequent management of the route (UNESCO, 2010).

MANAGEMENT CONSTRAINTS

During the civil unrest in Cambodia during the 1980s and 1990s, the east half of the area suffered from incursions which have now reduced, although there remains unexploded ordinance in Ta Phraya Park on the border. Settlers and insurgents have cleared land for farming which has now become grassland and secondary woodland, and hunted the larger mammals. There are still problems of encroachment, by farms buildings and highways, habitat degradation and disturbance, illegal sport hunting and poaching, illegal logging and the harvesting of forest products like aloewood. Encroachment for agriculture has occurred in the east, on the north side of Thap Lan park, and in the west for the development of resorts and estates. In the past this has led the Parks' administrations to emphasise law enforcement. Coordination between park staffs is not always smooth, and due to inadequate funding staff cannot spend enough time on relations with the public.

Management is made more difficult by the complicated boundaries of the complex, especially in north and northwest Thap Lan where the most significant incursions and farmland clearances have occurred; also in most of Ta Phraya which has an equally high ratio of boundary to area, making protection of the remaining linear stretch of forest along the Thai-Cambodian border difficult. There is no clear external buffer zone delineation and other land uses border directly onto protected areas, except where the northern boundary of Thap Lan borders the Sakaraet Biosphere Reserve. The Government is committed to boundary adjustment by 2007. This will result in the degazetting of 437.73km² of inhabited degraded land in Thap Lan and the addition of 176.27km² of primary forest from the National Forest Reserve.

Fragmentation of the forest by roads is another ongoing threat. Highway 304 to Korat separates Khao Yai from Thap Lan along a strip of agricultural land and is to be widened from two to four lanes which will disrupt the movement of animals and must be provided with safe crossing points. A highway runs north within a 100m-wide clearing from Prachinburi through western Khao Yai, and a highway crosses the west end of Ta Phraya and between the two sections of Dong-Yai. Although speed humps have been introduced in Khao Yai in an attempt to enforce speed limits, road kills occur on all three roads since they cross wildlife corridors which should remain continuous if the complex is to realise its potential as a reserve. In 2004 the Thai Government approved a budgetary allocation to undertake a feasibility study for construction of wildlife corridors.

COMPARISON WITH SIMILAR SITES

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, including Dong Phrayayen-Khao Yai Forest Complex (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, comprised of 17 protected areas covering 18,730 km² and located in the Indochinese Rainforest biogeographic province. The Huai Kha Khaeng-Thung Yai (HKK-TY) Wildlife Sanctuaries World Heritage property forms the core of this huge area.

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 nomination 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. 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 human 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 the vegetation/habitat types remaining in northeast Thailand, including rainforest habitats; representing not only successional processes but also those resulting from landforms and soils, and from the east-west climatic gradient. DPKY-FC Khao Yai Park contains a significant area of hill evergreen forest (39% of its total area) above 600m in altitude.

The DPKY-FC is the last substantial remnant habitat in eastern Thailand capable of sustaining viable populations of large fauna. In faunal biodiversity, 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 or tracks, although it appears unclear whether or not tigers remain in Khao Yai. 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. 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".

STAFF

The Complex has a total of 148 staff: 26 professionals with 122 permanent and 756 seasonal employees, totalling 904. Half of these are employed in Khao Yai. Each park has a separate headquarters. In addition Khao-Yai has 21 substations, Thap Lan 14, Pang Sida, 11 and Ta Phraya and Dong-Yai, 4 each. A range of training courses is supported by WCS, WWF, WFT and WildAid.

BUDGET

In 2003 the government supported the five units of the Complex with 59,985,400 baht (US\$1,500,000), a sum similar to that of recent years, with Khao Yai taking the major share: budgets for Thap Lan and Pang Sida remained fairly constant between 1998-2003, but in 2003 they increased for Khao-Yai and declined to 11% of that provided to Khao Yai for Ta Phraya and Dong Yai which have lower levels of staffing and equipment in consequence.

LOCAL ADDRESSES

The Director-General, Department of National Parks, Wildlife and Plant Conservation, 61, Phaholyothin Road, Chatuchak, Bangkok 10900.

The Director, Office of National Parks, 61, Phaholyothin Road, Chatuchak, Bangkok 10900, Thailand.

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