



World Heritage Sites

Protected
Areas and
World
Heritage



TROPICAL RAINFOREST HERITAGE OF SUMATRA INDONESIA

These three National Parks contain some of the richest and most varied of the world's remaining rainforests, comparable with those of Borneo and New Guinea. They are in forested volcanic mountains of exceptional beauty, range from coastal lowlands to highlands, and are large enough to preserve the integrity of their ecosystems and catchments. They have a wide range of soils, hydrological conditions and habitats from marine to sub-alpine volcanoes, supporting a high diversity of flora and fauna which contain much of Sumatra's natural heritage and its threatened species. They retain their importance as critically important refugia for future evolutionary processes but they are under great threat.

Threats to the Site: Five threats to the integrity of the forests are still extremely serious: illegal logging, fire-setting and forest-clearance for palm oil plantations and farming, poaching, road building and lack of support from other government agencies. Funds for staff, equipment and effective law enforcement against these threats are inadequate.

COUNTRY Republic of Indonesia - Sumatra

NAME Tropical Rainforest Heritage of Sumatra

NATURAL WORLD HERITAGE SERIAL SITE

2004: Inscribed on the World Heritage List under Natural Criteria vii, ix and x.

IUCN MANAGEMENT CATEGORY

Gunung Leuser National Park (GLNP)	II	National Park
Kerinci Sablat National Park (KSNP)	II	National Park
Bukit Barisan Selatan National Park (BBSNP)	II	National Park

BIOGEOGRAPHICAL PROVINCE

Sumatra (4.21.12)

GEOGRAPHICAL LOCATION

The World Heritage property comprises three widely separated sites along the Bukit Barisan mountain range which runs down the western side of the island of Sumatra. These are Gunung Leuser National Park (2° 53' - 3° 50'N by 96° 45' - 97° 35'E) in the northern provinces of Nanggroe Aceh Darussalam and Sumatra Utara; Kerinci Sablat National Park (1° 7'13" - 3° 26'14"S by 100° 31'18" - 102° 44'1"E) in the south-central provinces of Sumatra Barat, Jambi, Sumatra Selatan and Bengkulu; and Bukit Barisan Selatan National Park (4° 29' - 5° 57'S by 103° 24' - 104° 44'E) in the far southern provinces of Sumatra Selatan, Bengkulu and Lampung, partly bordering the southwest coast.

DATES AND HISTORY OF ESTABLISHMENT

1914: The Acehnese requested protection of forests in Aceh province;

1934: **Gunung Leuser** Wildlife Reserve established (416,500ha); 1936 & 1938: Area of Reserve enlarged;

- 1972 & 1973: Two private orangutan rehabilitation and research stations set up;
- 1976: Area of Reserve again enlarged;
- 1980: Gunung Leuser National Park established by Forestry decree # 719 DJ/VI;
- 1984: Final additions made to Gunung Leuser Park;
- 2005: Designated an ASEAN Heritage Park.
- 1921: **Kerinci Sablat** National Park area: 3 forests created Nature Reserves, and 3 forests given limited protection status (270,637 ha);
- 1929 & 1936: Five forests given Nature Reserve status;
- 1979: Three forests given Wildlife Reserve status;
- 1982: National Park status extended to a total of 17 gazetted and proposed reserves and forests;
- 1984: Gunung Leuser and Kerinci Sablat National Parks designated ASEAN Heritage Parks of 1,094,692 ha and 1,386,000 ha respectively;
- 1992: Kerinci Sablat National Park established by Ministry of Forestry decree 1049/Kpts II; amended by decrees 192/Kpts II in 1996 and by 991/Kpts in 1999;
- 1999: KSNP officially gazetted;
- 2005: Designated an ASEAN Heritage Park.
- 1935: **Bukit Barisan** Selatan area: a Wildlife Reserve set up;
- 1979: Bukit Barisan Selatan proclaimed a Nature Reserve;
- 1982: BBS National Park established by Ministry of Agriculture decree 736/MENTAN/X , and in 1982 by Ministry of Forestry decree 096/Kpts II;
- 1990: BBSNP Marine Reserve (21,600 ha) established by Ministry of Forestry decree 71/Kpts II;
- 1990: Management plans required from Parks under law UURI #5 on biological reserve conservation.

LAND TENURE

State. Administered by the Directorate General of Forest Protection and Forest Conservation (PHKA) within the national Ministry of Forestry through separate managements for each Park. From 2004, the EU sponsored Leuser Ecosystem of protected areas adjacent to GLNP has been managed by the Leuser International Foundation as a buffer zone (IUCN/WCU, 2004).

AREAS

Total area of three World Heritage sites:	2,595,124 ha
Gunung Leuser National Park (GLNP):	862,975 ha
Kerinci Sablat National Park (KSNP):	1,375,349 ha
Bukit Barisan Selatan National Park (BBSNP):	356,800 ha

ALTITUDE

Sea level to 3,805m (Gunung [Mount] Kerinci).

PHYSICAL FEATURES

The composite site of the Tropical Rainforest Heritage of Sumatra, Indonesia's third largest island, straddles the equator from north to south along the volcano-studded Bukit Barisan mountain range on the west side of the island. The range runs 1,650 km the length of the island paralleled by a rift valley to the east which almost divides the Parks. Geologically the range and valley result from the down-thrusting of the Austro-Indian tectonic plate under the Asian plate. The eastern side of Sumatra is predominantly lowland and in the past has periodically been linked to the Asian mainland. From north to south the parks are: Gunung Leuser, Kerinci Sablat and Bukit Barisan Selatan.

Gunung Leuser National Park (GLNP) in the north is 150 km long, over 100 km wide and is predominantly mountainous. It covers most of the West Barisan, West Alas and East Barisan ranges and is nearly divided by the Alas valley graben. 40% of the Park, mainly in the north, is steep and over 1,500 meters high; only 12% of the Park, in the lower southern half, is below 600 meters and for 25 km runs along the coast. The highest peak is Gunung Leuser at 3,466m; there are 11 other peaks over 2,700m.

Kerinci Sablat National Park (KSNP) in the centre of the range extends 350 km down the spine of the Bukit Barisan, averaging 45 km wide and 2000m above sea level. The northern half includes a lower eastern mountain range 800-1,500m high, nearly cut off by the 15 km wide Merangin river valley and is about 75 km wide. Three quarters of the Park is steep. Its highest point, embedded in rainforest, is the active volcano Gunung Kerinci at 3,805m, the highest peak in Sumatra and highest volcano in Indonesia. Nearby Gunung Tujuh is an outstandingly beautiful crater lake at 1,996m. The buffer zone is very degraded.

Bukit Barisan Selatan National Park (BBSNP) is also 350 km long but only 45 km wide on average. The northern two-thirds are mountainous, averaging 1500m with a highpoint at Gunung Pulung of 1,964m. The southern half is lower: 90 km of it is a peninsula and the Park borders the sea for half its length. Dozens of rivers originate in the Parks and there are several lakes and hot springs.

The Bukit Barisan mountains are composed largely of sedimentary rocks uplifted at the same time as the Himalayas about 70 million years ago: limestone, shale, schist, sandstone quartzite and breccias. Three million years ago a period of faulting created the central rift valley (Semangko zone) which parallels the Bukit Barisan on the east. Relatively recent magmatic activity associated with tectonic movement created volcanoes still active today, the most devastating of which, 75,000 years ago, being the eruption of Gunung Toba just south of Gunung Leuser. Many soil types in the humid climate result from these rocks, especially in GLNP where brown and red-yellow podsoles with lithosols and latosols predominate. In KSNP the dominant soils, podsoles, are erodible and infertile. Latosols in the lowlands are somewhat more fertile, and in the volcanic uplands, moderately to highly fertile andosols are common. Most of BBSNP has easily eroded rather infertile podsoles.

CLIMATE

The mountains have year-round little varying high temperatures, high humidity and high rainfall for 9 months in wetter areas, 7 months in drier areas. This climate has encouraged the high speciation and diversity of species. GLNP has a 3000 mm rainfall in the north to 4657 mm in the lowland south. Temperatures average between 21° to 28°C and the humidity is always above 60%, especially over 1700m. In KSNP the rainfall averages 2990mm, temperatures range from 16° to 28°C and humidity is constantly high (77-90%). In BBSNP the mountainous west is wet especially during the November to May monsoon: rainfall is 3000-4000 mm but the east is drier: 2500-3000 mm. Temperatures range between 20° and 28°C. The December 2004 tsunami did not seriously damage Gunung Leuser Park.

VEGETATION

The Indonesian archipelago contains more than 10% of the world's flowering plants and Sumatra, the third largest island, is the location of the Sumatran Islands Lowland and Montane Forests Ecoregion and part of Conservation International's Sundaland hotspot. Its forests are among the largest tropical rainforests in southeast Asia, comparable with those of Borneo and Papua-New Guinea. They contain an estimated 10,000 species of plants, including mainland species, in conditions from coastal to subalpine. 17 genera are endemic. This very diverse flora is largely shared with the West Malesian region that extends from southern Thailand to the island of New Guinea. North of Lake Toba near KSNP there is a distinctive Sumatran flora most distinctive in the montane and sub-alpine vegetation, especially the *blang* forest (de Wilde & Duyfjes 1996). All the Parks are species-rich, totalling over 4,000 species, more than 50% of the total plant diversity of Sumatra. The giant meter-wide flower *Rafflesia arnoldii* and the 2-meter high flowers *Amorphophallus titanum* and *A. gigas* grow in all three Parks. Many of the island's *Dipterocarpus*, *Hopea*, *Shorea* and *Vatica* species are critically endangered or endangered.

There are major differences between the island's lowland and highland vegetation, and between north and south due partly to physical barriers which have encouraged subspeciation. But the lowland tropical forest, the most threatened type of forest on the island, is now only 20% of its original extent of 25 million hectares. It has been largely destroyed in very recent decades, only some 20% remaining, mostly as small remnants. The montane forest is increasingly threatened by logging and agricultural encroachment. Between 1985 and 2002, GLNP lost 9.37% of its forests; in 1997 BBSNP lost about 1% of its area, to fire - 1,500-2,000 hectares, and since 1998 KSNP's forests have been reduced by 0.4%.

GLNP is the largest block of yet undisturbed forested wilderness in the north of Sumatra. The distinct phytogeographic sub-regions which are visible in all the parks, are especially obvious at its higher elevations. There, tropical conditions extend up to 1,000m: 5% of the Park's forest is comprised of coastal forest and other varieties of lowland forest from sea level to 300m, 29% is foothill forest from 400m to 1,000/1,300m; 30% is submontane forest between 1,000m and 1,500m, rich in *Fagaceae* and *Lauraceae*; 35% is montane forest from 1,500m to c. 2,500m - the lower 15% is rich in rattans, palms and mosses, and the upper 20%, with acid-loving plants. The remainder is low subalpine forest and ericoid scrub from 2,400m to 3,400m. This higher part of this zone includes the distinctive heath-like *blang* forest, in wet peaty or dry stony conditions, and sphagnum swamp. 4,000 species are claimed to exist in the Park, 92 being locally endemic. It contains 12% of all Sumatran species and 17% of its genera are endemic. A dry season regimen along with the tuff and unusual soils resulting from the Mt. Toba eruptions appear to have blocked seed dispersal and increased the conditions for endemism. Amongst its flora are the 4-5 meter leaved joey palm *Johannesteijmannia altifrons* and the large-flowered rafflesias *Rafflesia acehensis*, *R. arnoldi*, *R. rochussenii*, and *R. micropylorum* with the related smaller *Rhizanthus zippelii* and *R. lowii*.

KSNP is one of the most important rainforests in Asia with mountains covering 70% of the area. Its eight vegetative zones are: lowland forest (150m-200m), hill forest (300m-800m) dominated by *Hopea beccariana* (CR), *Dipterocarpaceae*, *Fagaceae* and *Burseraceae*, submontane forest (800m-1,400m) with *Myrtaceae* and *Fagaceae*, lower, mid and upper montane forests (1,400m-1,900m, 1,900m-2,400m and 2,400m-2,900m) with a great variety of genera and species, and sedge-peat swamp and subalpine thickets (above 2,900m) dominated by *Ericaceae*. There are several types of forested wetlands and a distinct forest type on the karst of Sebelah Hill dominated by the Kerinci pine *Pinus merkusii*. Again, 4000 species are recorded, with 300 orchids. The record includes these threatened species: *Hopea beccariana*, *Vatica obovata* (CR), *Shorea ovalis* ssp. *seicea* (CR), *S. ovata* (EN), *S. platyclados* (EN), *Horsfieldia triandra* (VU), *H. mecilenta* (VU), *H. macrothyrsa*, *Rafflesia arnoldi* and *Amorphophallus titanum*.

BBSNP has the last and largest block of the very threatened Sumatran lowland forest. 55% of its area is mountainous but lower than 2000m. It has coastal forest (1% of the Park's area), a very diverse lowland forest up to 600m (45%) dominated by *Shorea*, *Dipterocarpus* and *Hopea* species; highland forest from 600m to 1,000m (34%) with trees of the *Dipterocarpaceae*, *Lauraceae*, *Myrtaceae* and *Annonaceae*, submontane forest from 1,000m to 1,500m (17%) and above 1,500m, montane forest covering 3% of the Park. 514 species are recorded, with 126 orchids, 26 rattans and 15 bamboos. The record includes these threatened species: *Vatica obovata* (CR), *Anisoptera costata* (EN), *Shorea ovata* (EN), *Dipterocarpus retusus* (VU), *Saurauia cauliflora* (VU), *Casearia florovirens* (VU) *Aglaia edulis* and *Knema intermedia*.

FAUNA

Historically these mountains have been important climatic refugia and have now become critically important refugia for future evolutionary processes (Hitchcock & Meyers, 2006). Animal diversity in Sumatra is impressive, with 201 mammal species in the nominated sites, and some 580 bird species, 465 being resident, and 21 endemic (UNESCO, 2004). The mammalian fauna of Sumatra, which includes some mainland Asian species, is comparable in diversity with those of much larger Borneo and New Guinea: Sumatra 201 species, Borneo 222, New Guinea 220 and Java 182. 22 are Asian species not found elsewhere in the Indonesian archipelago and 15 are confined to the region, including the endemic Sumatran orangutan *Pongo pygmaeus abelii* (CR). The wide range of different vegetation types and habitats from lowland to highland, and between north and south due partly to physical barriers, have increased subspeciation and resulted in the very rich mammalian fauna. Sumatra's 465

species of breeding birds compare with 420 on Borneo and 340 on Java. 58 birds in the nominated sites are listed in the 2000 IUCN global Red List. The comparative herpetofauna (about 200 species), fish species (30 or more species) and invertebrates of the sites are comparably rich.

Sumatra has a high level of endemism, which is well represented in the three sites. It is evidence of the land bridge/barrier between the Sumatran biota and that of mainland Asia due to changes in sea level. Some of the animal distributions may also be evidence of the effect of the Mount Toba tuff eruptions 75,000 years ago. The Sumatran orangutan *Pongo abelii* (CR) for example, with very small exceptions, is not found south of Lake Toba nor the Asian tapir *Tapirus indicus* (VU) north of it. The altitudinal range and connections between the diverse habitats in these areas, in particular in GLNP and KSNP, must have facilitated the on-going ecological and biological evolution.

GLNP is a part of one of 18 Indonesian regions classified by the WWF among the 200 global ecoregions of importance for conservation of the world's biodiversity. This includes the surrounding ecosystems which are as diverse as the Park itself and cover 47% of the orang-utan habitat - which could soon be lost to development (Marshall *et al.*, 2000). It has a cross-section of north Sumatran wildlife with 174 mammals, 3 being endemic and 21 listed as threatened in 2000 (2 CR 3 EN and 8 VU). Important mammal species are: the Sumatran orangutan *Pongo abelii* (CR: ± 5,000), its flagship symbol, increasingly under threat from logging, Sumatran grizzled langur *Presbytis thomasi*, pigtailed macaque *Macaca nemestrana* (VU), Sumatran rhino (CR), Asian wild dog *Cuon alpinus* (EN), Sumatran tiger (EN), clouded leopard *Neofelis nebulosa* (VU)* and otter civet *Cynogale bennettii* (EN), flat-headed cat *Prionailurus planiceps* (VU), Temminck's golden cat *Catopuma temminckii* (VU), Malayan porcupine *Hystrix brachyura* (VU) and Sumatran serow *Capricornus sumatrensis* (VU). Little is known about the smaller mammals except for Hoogerwerf's rat *Rattus hoogerwerfi* (VU). The birds are not known in depth but 380 species are listed, 13 being endemic and 52 threatened (1 CR, 1 EN and 7 VU). Important bird species are Rueck's blue flycatcher *Cyornis ruckii* (CR), white-winged duck *Cairina scutulata* (EN), Wallace's hawk-eagle *Spizaetus nanus* (VU), Aceh pheasant *Lophura hoogerwerfi* (VU), Salvadori's pheasant *L. inornata* (VU), spotnecked bulbul *Pycnonotus tympanistrigus* (VU), large green pigeon *Treron capellei* (VU), Schneider's pitta *Pitta schneideri* (VU) and Sumatran cochua *Cochoa beccari* (VU). 57 species of the herpetofauna are recorded; hawksbill and green turtles *Eretmochelys imbricata* (CR) and *Chelonia mydas* (EN) occur offshore. In all, 92 of the Park's species are endemic (IUCN/WCU, 2004). * found to be a separate species, 2007.

For **KSNP** some 4,000 species are recorded, including 86 mammals, 6 endemic and 23 listed as threatened (4 CR, 3 EN and 2 VU). There are 8 species of primate. 370 species of birds are listed, 17 being endemic and 58 threatened (1 CR, 1 EN and 7 VU), also 10 reptile and 6 amphibian species: Important mammal species are: dwarf gymnure *Holomys parvus* (CR), Sumatran rabbit *Nesolagus netscheri* (CR), Sumatran tiger *Panthera tigris sumatrae* (CR:±80 individuals), Sumatran rhino *Dicerorhinus sumatrensis* (CR: 4 individuals in the Park), Beccari's shrew *Crocidura beccari* (EN), Sumatran elephant (EN), Asian tapir *Tapirus indicus* (VU), Asian wild dog *Cuon alpinus* (EN), clouded leopard *Neofelis nebulosa* (VU), Sumatran goral *Naemorhedus sumatrensis* and, rediscovered in 2008, the Sumatra muntjac *Muntiacus montanus*. Important bird species are Sumatran ground cuckoo *Carpococcyx viridis* (CR), white-winged duck *Cairina scutulata* (EN), Salvadori's pheasant *Lophurus inornata* (VU), Asian finfoot *Heliopais personata* (VU), large green pigeon *Treron capellei* (VU), bluebacked kingfisher *Alcedo euryzona* (VU), Schneider's pitta *Pitta schneideri* (VU), graceful pitta *Pitta venusta* (VU) and Sumatran cochua *Cochoa beccari* (VU). It has also nine species of hornbill. Lake Gunung Tujuh has an interesting fauna of amphibians and insects.

In **BBSNP** 98 mammals are recorded, with 1 endemic and 25 threatened (3 CR, 2 EN and 4 VU). 379 species of birds are listed, 7 being endemic and 58 threatened (2 CR, 2 EN and 5 VU). 59 reptile and 6 amphibian species are recorded (1 CR, 2 EN and 1 VU). Important mammal species are: Sumatran tiger *Panthera tigris sumatrae* (CR), Sumatran rhino *Dicerorhinus sumatrensis* (CR), Sumatran rabbit *Nesolagus netscheri* (CR), Sumatran elephant *Elephas maximus sumatranus* (EN), otter civet *Cynogale bennettii* (EN), Asian tapir *Tapirus indicus* (VU), smoothcoated otter *Lutrogale perspicillata* (VU), flatheaded cat *Prionailurus planiceps* (VU) and Malayan porcupine *Hystrix brachyura* (VU). Important bird species are Sumatran ground cuckoo *Carpococcyx viridis* (CR), Rueck's blue flycatcher *Cyornis ruckii* (CR), Storm's stork *Ciconia stormi* (EN), white-winged duck *Cairina scutulata* (EN), bluebacked

kingfisher *Alcedo euryzona* (VU), Wallace's hawk-eagle *Spizaetus nanus* (VU), milky stork *Mycteria cinerea* (VU), large green pigeon *Treron capellei* (VU) and graceful pitta *Pitta venusta* (VU). The herpetofauna includes leatherback turtle *Dermochelys coriacea* (CR), green turtle (EN), spiny terrapin *Heosemys spinosa* (EN), Bornean river turtle *Orlitia borneensis* (EN) and Malayan flatshell turtle *Notochelys platynota* (VU).

CULTURAL HERITAGE

Ten sites with tools of stone and wood 10,000 years old have recently been discovered in Tiangko Panjang cave in KSNP, proving long settlement of the island. Sumatra has a great variety of ancient and sophisticated ethnic tribal groups and sub-groups among which the Minangkaban have a very finely developed artistic tradition. There are at least seven different tribes in and around GLNP, with their own languages and cultures from the Aceh and Gayo muslim farmers in the north, Batak highland farmers and Pakpak hunters and swidden hill farmers to the Alas, Singhil and Melayu rice farmers and fishermen of the lowlands mixed with Javanese once imported by the Dutch. The Minangkaban are a leading tribe in the north of KSNP with the Kerinci in the middle, the Ipuh on the west coast and the Rejangin in the south. Most farm various crops, living in longhouses with traditional clothing and dances but are being challenged by outside influences. In BBSNP the native Lampung form only 15%, the rest being immigrants from further north or from Java, Sunda, Bali, and Madura.

LOCAL HUMAN POPULATION

In GLNP a population of over 867,000 lived in the 31 buffer sub-districts in 1990, itself an increase of 50% on the 1970 figure. Six small enclaves have been discovered whose people have been persuaded not to harm the forest. Within the nine buffer zones of KSNP 3,647,241 lived in 1996, an increase of a fifth on the population ten years previously. And within the 20 buffer zone sub-districts and 4 enclaves of BBSNP 225,471 people lived in 2001. This fast expanding population is putting pressure on Park boundaries, forests and resources which makes the effective protection of these all the more urgent.

VISITORS AND VISITOR FACILITIES

All three Parks have outstanding tourism potential. However, a variety of factors impede its development: inadequate strategic planning, totally inadequate and derelict infrastructure and poor roads in some places outside the protected areas, uncertainty in the protection of natural resources, illegal activities degrading the land, and security problems in the Aceh province. Relatively little tourism has therefore developed except for visitors to the orangutan rehabilitation stations in GLNP where there is also some jungle trekking and river rafting. Visitation has fluctuated with the political situation but GLNP has averaged 15,490 visitors a year during the past five years, over half being foreigners. Facilities include accommodation, a visitor centre, guides, a trail, observation tower, campground and shelter. KSNP averaged 3,799 visitors a year between 1993 and 2001. It has accommodation, interpretation boards, a trail and guide services. From 1995 to 2001 BBSNP which is less accessible, had an average of 331 visitors a year. It is only accessible to tourists in the dry season. It has four cottages, a guest house, a dock with 2 speedboats, an information centre, a campground, 2 shelters and 13 km of trails. This low level of tourism has not yet degraded the land, but all the Parks plan to develop ecotourism in the future.

SCIENTIFIC RESEARCH AND FACILITIES

Nearly all the references quoted in the bibliography are from the last twenty years, most from the last decade. However, from 1972 and 1973, work has been done in the two private orangutan rehabilitation and research stations, now to be continued by Conservation International (CI). In GLNP during the 1980s and 1990s, several inventories were made with WWF-Indonesia of species, habitats and populations in certain areas, including of rhino, elephant and tiger. With cooperation between universities and the Park's research stations, 34 research projects were started between 1999, 12 by Indonesians, 22 by foreigners, and in 2000, 60 projects are said to be ongoing, three-quarters of them by Indonesian researchers. Funding has come from the government, WWF-I, the EU and Conservation International. In 2004 long-term research was ongoing into tool-using orangutan from the Bohoruk-Bukit Lawang Centre. The Sumatran Orangutan Survival Foundation at Bukit Tigapuluh in Jambi funds reintroduction, research from four research stations and monitoring from two monitoring posts. In KSNP there have been 30 small recent projects with funding from FFI, WWF-I, and the Indonesian Biodiversity Foundation. Forest cover and loss have been analysed. In BBSNP 15 surveys have been ongoing into

birds, monkeys, rhinos, tiger, elephant, green turtles, the herpetofauna, communities and fire prevention, funded by the EU, WWF-I, the World Conservation Society, the Indonesian Rhino Conservation Program and PT Sac Nusantara, a private nature tourism project.

CONSERVATION VALUE

In the three National Parks Sumatra has a series of forested mountains of exceptional beauty, from lowlands to highlands, large enough to preserve the integrity of their ecosystems and water catchments, with a wide range of soils, hydrological conditions and habitats from marine to sub-alpine, and a very high diversity of flora and fauna representing much of Sumatra's natural heritage and threatened species. Despite the vast amount of destruction, Sumatra still contains some of the richest and most varied of the world's remaining rainforests, comparable with those of Borneo and New Guinea. They retain their importance as critically important refugia for future evolutionary processes but they are under continual threat. The area is one of the WWF's 200 global ecoregions of importance for conservation. The Parks lie within a Conservation International-designated Conservation Hotspot, a WWF Global 200 Eco-region, a WWF/IUCN Centre of Plant Diversity and in one of the world's Endemic Bird Areas. All three are ASEAN Heritage Parks.

CONSERVATION MANAGEMENT

The main reason for the Parks' designation as a cluster was to promote internal coordination and international cooperation in protecting these very vulnerable forests, but simultaneous inscription as endangered was opposed by the State Party. At present each of the Parks is administered by a separate authority under the national Directorate General of Forest Protection & Forest Conservation in the Ministry of Forestry and each Park follows its own policies. The government's policy of decentralisation to district level is not applied to protected areas because some extend over several districts and some districts see them as uneconomical and neglect their upkeep. There is unsettling confusion about this. With World Heritage status granted, workshops involving government, villagers, stakeholders and NGOs are to work towards these goals, but there is no present coordinated management framework - the first meeting between the three Park Directors only occurred in 2006. In 2004 the government passed a decree heavily penalising illegal logging and fire-setting. This has been effective in involving 18 Ministries and District Administration heads but adequate funding, border delineation and patrolling remain essential to its success. A 2007 UNESCO Mission recommended that an Emergency Action Plan drawn up in 2006 for all three parks to arrest the decline of the sites' World Heritage values and integrity should involve all the key partners and stakeholders over the major problem of encroachments. The most important points were: effective application of the ban on illegal logging, closure of all sawmills and logging roads, rehabilitation of closed roads, and implementation of the law on illegal logging; also, revised boundaries to exclude encroached land, prohibition of new roads in the property, coordination of all the organizations in the WH Property in one integrated management framework and the establishment of trained and effective law enforcement units (UNESCO/IUCN, 2007).

In 1990 the government required each Park to produce a 25-year Master Plan. These were completed in 1995. Adjusted for each Park, they covered boundaries, zoning, species and habitat management, protection, coordination with local government, NGOs and villagers, sustainable uses and community participation, services and public awareness, nature tourism, training, facilities and infrastructure, research, monitoring and enlargement of the protected area. Each Park has developed major programs to meet specific needs, often assisted and funded by national and international organizations. At present policies for protection cover the improvement of training, equipment and the regularity of ranger patrols, the coordination of different agencies and educating villagers, especially in buffer zones, to help fight natural disasters and to help to police illegal logging and poaching. Monitoring reports are expected every month, 3-months, 6 months and year on primary indicators of the Parks' health: forest loss through fire, logging, encroachment and disease, presence of indicator species, numbers of visitors, research projects and publications, arrests and prosecutions and condition of staff and equipment. However, there is a need for more training in the application of these policies.

GLNP has five conservation programs: a Less Developed Village Program to improve villagers' welfare and reduce their pressure on the Park with advice on farming and crafts; an Enclave Development Program to move people living in the Park and train them not to disturb it; a Conservation Development Program with WWF-Indonesia to provide alternatives to conflict between local communities and the

Park; also educational exhibitions, training and conservation courses and rallies; the Leuser Development Program to conserve 2.5 million hectares of rainforest in the Leuser ecosystem; CI's Indonesia's Orangutan Project to promote law enforcement and public awareness and CI's Critical Ecosystem Partnership Fund to provide district level coordination for effective forest stewardship. The EU sponsored Leuser Ecosystem of protected areas within which the GLNP is embedded is to be independently managed as a buffer area for the next 30 years although this is outside the World Heritage area. However, the Ecosystem, especially the contiguous Singkil Barat Wildlife Reserve, a lowland swamp forest, Langkat lowlands and foothills, the Aceh Highlands and Tapaktuan lowlands, contains essential (and for orangutan, critically important) habitat and migration routes for the four GLNP threatened flagship species. Similar protected buffer areas adjoin the other two sites but these are far more vulnerable.

KSNP has four programs: the Kerinci Sablat Integrated Conservation and Development Project (with the World Bank, GEF, FFI, WWF-I, the Indonesian Biodiversity Foundation, local NGOs and villagers) to secure biodiversity and halt fragmentation by improving the protection and management of the Park; a Village Conservation Agreement to legalise accession to the Park for 72 villages in return for their cooperation in protection, using local sanctions against violators; an *Adat* Village Forest Program to conserve rich buffer area forests through local village participation using traditional sanctions (*adat*); support for the inclusion of Sippurak Hook to absorb a rich privately owned primary lowland forest; 4 Governors and 9 District Heads have also signed a note of agreement to cooperate to protect the Park; also awareness campaigns among politicians, journalists and NGOs and an extension service to villagers, schools and youth clubs. The irregular borders exclude several adjacent protected lands used by flagship species. But being difficult to defend they are vulnerable to logging and encroachment, are widely degraded and can no longer be assumed to be permanent (IUCN,2004).

BBSNP has four programs: a Wildlife Conservation Society-Indonesia Program to research and conserve the Sumatran tiger and elephant populations; a WWF-Indonesia Program to improve the protection of the Sumatran rhino and elephant; the Indonesian Rhino Conservation Program; and PT Sac Nusantara; also conservation education for local people. All three use all the usual written methods of dissemination. Protected lands beyond the irregular borders are difficult to defend and have been degraded.

MANAGEMENT CONSTRAINTS

The forests of Sumatra, among the last and largest tropical hardwoods in Asia, are being destroyed faster than anywhere else in Indonesia. Five fundamental threats continue to impact on the nominated sites. Encroachments for illegal logging and agriculture are far the most serious, but also poaching, road building and insufficient law enforcement. There is comprehensive and well-organised illegal logging, often with the covert support of local authorities, the police and the military, especially in Aceh. There is deliberate starting of fires to convert virgin forest to timber, palm oil plantations and subsistence plots. There is poaching, intrusion of new roads, and inadequate management due partly to insufficient funding (IUCN/WCU, 2004). The devolution of central government control to districts is open to their control instead by rich local individuals and companies. Poaching for the illegal pet trade and of birds and animals considered of medicinal value such as pangolin is rife. The loss of biodiversity, particularly of elephant, tiger and rhinoceros is accelerating. Road construction is a major threat, especially in GLNP and KSNP, but occurs in all three Parks. In the absence of effective law enforcement, it opens the way for logging which is the major cause of degradation, among other incursions. There are three more local threats - fires, mining and natural disasters. Generally, destruction by fire is serious: in 1997 1.5 million hectares of Sumatra were burnt, mostly by fires deliberately set to clear land for other uses. Natural disasters such as landslides and erosion, flash flooding and silting of rivers, are occurring more often, aggravated by such clearances.

Managements have failed to deal with the mounting threats due to a range of institutional constraints: lack of funds, inadequate cooperation and support from local, provincial and central government agencies, including some law enforcement agencies, confusion over the rights of local government within national parks; and bureaucratic constraints and inefficiencies. Local communities and local government remain largely uninformed about the importance of and threats to World Heritage property, and are therefore often antagonistic (UNESCO/IUCN,2007). The management plans which exist are not

well known by the staff. Better training is needed, also better pay to attract more rangers, better villager relations and better departmental cooperation at government level. The lack of staff, threats to life, and corruption are major problems. Law enforcement needs to be more effective and better supported with vehicles and equipment. The success of managements in limiting logging, poaching and new roads in the Parks has alienated local governments. The surrounding people regard the forests as theirs to use by right and their poverty leads to conflict with authority and lack of cooperation. Several programs of cooperating with them have been tried with varying success. In some cases, local communities and local government are seen by managers as a serious threat to the Parks; in others they are supportive. Large areas of each park have already been degraded below World Heritage standard and should be excluded.

GLNP suffered heavily from logging for its valuable hardwoods between 1976 and 1988: 25% of its rainforest is already damaged, especially in the southeast, and the Park recently lost 16,000 ha in a single encroachment on a lowland area previously known as critical elephant and prime tiger habitat. Degraded Park land has been settled by people displaced by the civil war, and some has even been 'sold' by land speculators (Hitchcock & Meyers, 2006). It is suffering from many smaller agricultural encroachments. Moreover, many of the best habitats for its valuable endemic mammals lie outside the Park's boundaries. A mixture of persuasion and legal action is used to control loggers. It is countered by confiscation and arrests but there is little political will to control the illegal activities of the combination of businessmen and powerful members of the police, the army, the government and parliament who profit greatly from the trade. In Aceh province the proposed network of roads will fragment the northern part of the National Park, bisecting orangutan habitat, and make exploitation far easier. The development of the Ladia Galaska roads through 100 kilometers of protected forest will cut through an area of conservation forest, dividing the Leuser ecosystem into 9 segments. However, mining and oil prospecting in the Park have been limited by objections lodged with the Ministry of Forests. In late 2003 GLNP suffered a disastrous flash flood, which destroyed a tourist village with 140 deaths, which were attributed to uncontrolled illegal logging. In December 2004 the Park's lands escaped serious damage by the tsunami, but the Nature Conservation Unit in Bandah Aceh disappeared, with several of its staff. The consequent need for construction timber has been met by a nationwide 400% increase in the permissible cut (IUCN/WCU, 2004). The post-tsunami destitution led displaced people to supplement their incomes by any means possible at the expense of the forest. UNESCO and IUCN have set up Tsunami Task Forces to provide technical support.

KSNP is the most critically threatened Park. It is very vulnerable because of its irregular borders which have to be consolidated to ensure protection for the larger mammals, and the narrow link between the east and west parts of the Park needs strengthening. The Park lost 10% of its forests between 1998 and 2000, and by 2005 157,756 ha (11.5% of the Park) had been occupied by some 41,000 families (UNESCO, 2007), the flat lands suffering much incursion, especially for cinnamon gardens. The management has lost control of such illegal encroachments by local farmers, and the elephant population has been divided and surrounded by agriculture. Poaching, especially of rhino - which on the verge of local extinction - and tiger, also of elephant, sambar, wild pig and birds is serious, though the loss of tigers may be slowing due to greater local awareness of the situation. 13 sawmills operate on the southern boundary of the Park and the responsible government authorities are uncooperative if not antagonistic. The local government is in fact planning to build 34 roads through the core zone of the park which will further disrupt wildlife corridors and in 2006 had illegally started on one with logging and clearing. The Park authority cannot respond to, let alone deter, new encroachments nor press prosecutions against such destruction and the corruption which facilitates it (Hitchcock & Meyers, 2006). There are also small gold mines in the Park though they are less damaging than their access roads. However, a consortium of 20 local NGOs (AKAR) who were given a grant under the Rapid Response Facility project of UNF-FFI-UNESCO, has been crucial in blocking the construction of these roads (UNESCO/IUCN, 2007).

BBSNP which also has irregular borders, has been invaded for coffee plantations and rice growing and, legally, for logging. Cumulative loss of forest to encroachments now total some 22.5% (86,000ha) of the Park. Three roads cutting across this Park are planned. As with logging access roads, these will open it up to other uses. Between 1998 and 2001, 32 tigers were taken - 10 tigers in 2001 alone. The Park is in

need of far better protection and management, including the buffer zone which is important to the larger mammals. The December 2004 tsunami did not cause any major damage to either Park.

STAFF

GLNP: 4 Heads of sub-areas with 237 staff: 7 administrative with 124 support staff, 82 rangers and 24 foresters. KSNP: 4 Heads of sub-areas with 162 staff: 57 administrative staff, 105 rangers plus 5 provincial officials and 176 in regional offices. BBSNP: 3 Heads of sub-areas with 127 staff: 6 administrative with 42 support staff, 61 rangers, 8 foresters and 10 labourers. Training is given in park management, administration and finance, tourism and ecotourism, inventorying species, forest protection and fire fighting, communication and guiding, wardening and law enforcement. The 2004 tsunami destroyed buildings and took the lives of several members of the GLNP staff.

BUDGET

GLNP: In 1995 the EU granted \$40 million via the Gunung Leuser Project for rainforest conservation and economic help to the local people. In 2000, annual funding was estimated at US\$192,696: 50% coming from the national budget, 43% from the Reforestation and Forest Development Funds and 7% from the Management Strengthening Fund. For KSNP between 1996 and 2002 funding of US\$46 million came from the Kerinci Sablat Integrated Conservation & Development Project: a US\$19 million loan from the World Bank, US\$15 million from the GEF and US\$12.5 million from the government. Approximate annual funding is US\$6,546,000. New sources are now needed.

BBSNP: In 2001 funding was approximately US\$240,450: 73.5% from the national budget directly and through provincial and district subventions, 26.5% from the Reforestation Fund. Following the tsunami the WHF and Spanish governments provided emergency funds totalling US\$681,000. That year the approximate annual funding for all three parks was US\$6,546,000 (IUCN, 2004) which is still inadequate to manage and also challenge destruction of the Parks, let alone to prosecute the offenders.

LOCAL ADDRESSES

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