Plant Formations in the Thailandian BioProvince

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Thailandian Seasonal Evergreen Forest

These forests, which also include a few deciduous species, occupy northern sheltered, moist valleys and low hills to an altitude of about 900 m, and are widespread in the central highlands and on the south and southwest slopes of the Korat Plateau. They are well developed along large watercourses in open broad valleys where they often form distinct gallery forests. In these situations magnificent stands of lofty evergreen dipterocarps occur, especially *Dipterocarpus turbinatus,* while others may include *Anisoptera costata, Dipterocarpus alatus, D. costatus, Hopea odorata, Shorea assamica, S. roxburgii, S. thorelii* and *Vatica cinerea*. Although not as tall as the tropical evergreen forests of peninsula Thailand certain stands can reach heights of 35 m, but they have fewer dipterocarp species. In terms of structure they usually have three tree layers, while emergent trees are uncommon. Nevertheless, their canopies include a rich variety of species with at least 23 families represented. Some of the more typical include *Ailanthus triphysa, Altringia excelsa, Antiaris toxicaria, Bischofia javanica, Dracontomelon dae, Irvingia malayana, Lagerstroemia balanse, Nyssa javanica, Pterogygota alata, Tetrameles nudiflora* and *Toona ciliata*. The middle and lower tree layers also comprise many species including the two endemic or near endemic species *Chisocheton siamensis* (Meliaceae) and *Mammea siamensis* (Hypericaceae). Many of the taller trees have large buttresses including the evergreen *Dracontomelon dae* and the deciduous *Tetrameles nudiflora*. Like tropical forests cauliflory and ramiflory are frequent (e.g. *Baccarea ramiflora* and species of *Ficus*), and fagelliflory can be found in some species (e.g. *Oroxylum indicum* and *Parkia leiophylla*). The well-developed shrub layer includes *Alchornia rugosa, Ardisia vestita, Barleria strigosa, Canthium horridum, Clausena excavata, Dendrocnide stimulans, Lepisanthes rubiginosa, Melodorum fruticosum, Sterculia lanceolata,* and the cycad *Cycas micholititzii*. Palms are also common especially in the more moist places and along watercourses. The principal species are *Areca triandra, Arenga pinnata, Caryota mitis, Livistonia speciosa, Pinanga gracilis* and the endemic *Wallichia siamansis* (Arecaceae). Lianas are plentiful with at least 20 families represented. Examples of endemic species are *Artabotrys siamensis* (Annonaceae) and *Randia siamensis* (Rubiaceae). Finally ground layer herbaceous species are characterized by genera such as *Alpinia, Aglaonema, Amorphophallus, Arisaema, Boesembergia, Catimbium, Ctenolophon, Curcuma, Globba, Hedychium* and *Tacca*.

Thailandian Northern Lower Montane Forest

These forests cover the moist valley basins and slopes at altitudes ranging from 1000-1800 m. Here the forest composition is dominated by the families Fagaceae, Magnoliaceae, Lauraceae and Theaceae, while members of the dominant lowland families like Annonaceae, Diperocarpaceae, Meliaceae, Sapindaceae and so on become far less conspicuous. The principal trees are *Actinodaphne henryi, Canarium subulatum, Castanopsis acuminatissima, Lithocarpus auriculatus, Quercus brandisiana, Paramichelia baillonii* and *Schima wallichii*. Structurally they can be divided into three tree-layers, but have poorly developed undergrowth and there are few woody lianas. Examples of some of the smaller trees are *Adinandra integerrima, Lindera pulcherrima, Symplocos racemosa* and the two endemics *Chionanthus sutepensis* (Oleaceae) and *Glochidion acuminatum* var. *siamensis* (Euphorbiaceae). The endemic palm *Wallichia siamensis* (Arecaceae) may also be encountered. In the shady areas the rare root parasite *Sapria himalayana* (Rafflesiaceae) may also be found. Like its larger relative *Rafflesia*, it has striking large orange-red flowers. In parasitizes the two herbaceous climbers *Parthenocissus*

himalayana and *Tetrastigma serrulatum*. The few other climbers are *Gnetum montanum, Myxopyrum smilacifolium* and *Ventilago calyculata*. Epiphytic shrubs, on the other hand, such as *Agapetes hosseana* and *Rhododendron veitchianum* are frequently found, and there are many epiphytic herbaceous species including the endemic orchid *Vanilla siamensis*. In areas affected by shifting cultivation, the secondary growth is often dominated by oaks such as *Castanopsis fissa*, while the herbaceous elements typically includes the two endemic species *Hieracleum siamensis* (Apiaceae) and *Pedicularis siamensis* (Scrophulariaceae). On exposed ridges and steep slopes where there is frequent soil erosion or where there are excessive anthropogenic impacts such as burning, cutting and grazing, the native pine *Pinus kesiya* becomes an important component.

Thailandian Northern Upper Montane Forest

At altitudes above 1800 m in the Northern Highlands this type of upland forest is now confined to just a few peaks such as Doi Inthanon. They are often no more than about 23 m in height and typically have a continuous, flat crowned canopy with no lower tree layers. At these altitudes most of the magnolias of lower levels have disappeared and a different assemblage of oaks are found including *Castanopsis purperea, Lithocarpus aggregatus* and *Quercus glabricupula*. Other characteristic trees are *Acer laurinum, Beitschmiedia globularia, Cinnamomum tamala, Eury nitida, Gordonia dalylieshiana, Heliciopsis terminalis, Lindera thomsonii, Neolitsea foliosa, Schima wallichii* and *Symingtonia populnea.* Among the smaller trees are *Helicia formosana, Macropanax oreophilus, Myrsine semiserrata, Neocinnamomum caudatum, Osmanthus fragrans* and *Symplocos dryophila*. Under the dense canopy, the undergrowth is generally sparse, but often includes a mossy ground layer, while in wet depressions bog mosses (*Sphagnum*) predominate. The few herbaceous elements include several endemic species such as *Delphinium altissimum* var. *siamensis* (Ranunculaceae) and *Scabiosa siamensis* (Dipsaceae). Shrubs, on the other hand, are mainly confined to the forest margins where the endemic *Cornus oblonga* var. *siamica* (Cornaceae) can be found. Large woody lianas are also absent, but there are a number of herbaceous vines such *as Hedera himalaica, Jasminium dispermum, Streptoliron volubile* and the endemic *Amphicarpaea siamensis* (Fabaceae). The typically crooked trees support a luxuriant epiphytic flora of flowering plants, ferns mosses and lichens including many orchids of the genera *Bulbophyllum, Dendrobium, Eria, Luisia, Malaxis, Otochilus* and *Pholidota,* comprising several endemic species.

Thailandian Northern Upper Montane Scrub

These uplands scrublands have been described as unique and support many endemic species. They are mainly confined to the crests of exposed barren summit areas of the limestone massif in the Chiang Dae District, and range in altitude from1900 and 2200 m. Despite being called scrublands they are overwhelmingly dominated by herbaceous elements including many temperate genera and species. The low growing shrubs, on the other hand, thrive in the many mossy cracks and crevices giving these communities the appearance of attractive rock gardens. The few trees include a scattering of gnarled oaks such as *Quercus franchetii, Q. lanata, Q. semecarpifolia*, the palm *Trachycarpus martianus* and the deciduous, hemi-epiphytic tree *Wrightia speciosissima* (Scrophulariaceae). Common shrubs are *Cotoneaster franchetii, Indigofera dosua, Lespedeza harmsii, Luculia gratissima, Mahonia nepaulensis, Premna interrupta* var. *smitinandi, Rosa helenae, Sophora dispar, Viburnum atro-cyaneum, Zanthoxylum acanthopodium* and the endemic *Rhododendron ludwigianum* (Ericaceae), which is noteworthy since most rhododendrons are calcifugous species. The parasitic shrub *Hymenopogon parasiticus* (Rubiaceae) can also be occasionally found on the epiphytic shrub *Agapetes hosseana*. The principal herbs are spread over at least 25 familes and

include many endemic or near endemic taxa such as *Corydalis siamensis* (Fumariaceae), *Delphinium altissimum* var. *siamensis* (Ranunculaceae), *Geranium lamberti* subsp. *siamense* (Geraniaceae), *Hypericum siamensis* (Hypericaceae), *Primula siamensis* (Primulaceae), *Saxifraga gemmipara* var. *siamensis* (Saxifragaceae), *Swertia calcicola* (Gentianaceae) and *Thalictrum siamensis* (Ranunculaceae). By comparison with the upper montane forest, the epiphytic flora is not rich, but still comprises many orchids including several endemic species such as *Dendrobium continale, D. wilmsianum* and *Luisia thailandica* (Orchidaceae). The principal pteridophytes are *Araiostegia pulchra, Asplenium antrophyroides, Cheilanthes farinose, Crypsinus griffithianus, Microsorium membranaceum, Polypodium amoenum* and *Selaginella repanda*.

Thailandian Tropical Deciduous Forest

These can be broadly divided into mixed deciduous forest and deciduous dipterocarp forest. The former usually reach their best development on soils derived from limestone, while the latter is characteristic of soils derived from sandstone and quartzite with extensive stands on the sandstone formations of the Khorat Plateau. However, in some areas, such as on some of the drier slopes, the forest include elements of both these forest types. Notable families in the mixed deciduous forest are Fabaceae, Combretacaea, Lythraceae and Verbenaceae, but these forests are usually evenly mixed and rarely have any single species dominance; the exception being the occasional dominant stands of teak (*Tectona grandis*) encountered on the fertile alluvium soils of the valley plains. In general, these forests reach heights of 30 m or so and have three tree layers. Among the principal trees of the upper layer are *Ailanthus triphysa, Anogeissus acuminata, Bombax ceiba, Butea monosperma, Cananga latifolia, Chukrasia velutina, Dillenia pentagyna, Eugenia cumini, Garuga pinnata, Gmelina arborea, Haldina cordifolia, Haloptelea integrifolia, Lagerstroemia calyculata, Spondias pinnata*, *Stereospermum colais*, and the endemic *Chionanthus velutinus* (Oleaceae), *Horsfieldia amygdalina* var. *macrocarpa*, *Knema andamanica* subsp. *peninsularis*, *Knema tenuinervia* subsp. *kanburiensis* (Myristicaeae), *Pithecellobium tenue* (Fabaceae), *Pterospermum grandiflorum* and *P. littorale* (Sterculiaceae).

The middle and lower layers have equally rich assemblages of species including, for example, the three endemic or near endemic trees *Cassa siamensis* (Fabaceae) *Grewia winitii* (Tiliaceae) and *Maerua siamensis* (Capparidaceae). Undergrowth species are also numerous with many shrubs like *Clausena excavata, Clerodendron serratum, Croton hutchinsonianus* together with a variety of endemic or near endemics like *Ardisia tristis* (Myrsinaceae), *Barleria siamensis* (Acanthaceae), *Capparis echinocarpa, C. siamensis* (Capparidaceae) *Enkleia siamensis* (Thymelaeaceae), and many bamboos such as the endemic *Thyrsostachys siamensis* (Poaceae). Many of the climbers are also unique to these forests with endemics such as *Alyxia thailandica, Ichnocarpus fulvus* (Apocynaceae), *Bauhinia winitii* (Fabaceae), *Jasminum annamense* subsp and *J. siamense* (Oleaceae), *Stephania crebra* (Menispermaceae) and *Tinospora siamensis* (Meninspermaceae). The ground layer herbaceous species also comprise several endemics such as *Fimbristylis prabatensis* (Cyperaceae), *Gentiana arenicola* (Gentanaceae) and the hemi parasite *Centranthera siamensis* (Scrophulariaceae). The deciduous dipterocarp forests have a more open canopy with some trees reaching heights of 35 m, but in general they seldom exceed more than about 18 m. They can have either a two or three layered canopy, with the most characteristic upper layer species comprising several deciduous dipterocarps such as *Dipterocarpus obtusifolius, D. tuberculatus, Shorea obtuse* and the endemic or near endemic *Shorea siamensis* (Dipterocarpaceae). Other common trees *include Canarium subulatum, Gluta usitata, Morinda pubescens, Sisyrolepsis muricata* and the endemic *Sindora siamensis* (Fabaceae). The principal

shrubs are *Crotalaria bracteata, Ellipeiopsis cherrevensis, Holarrhena densiflora* and the endemic *Barbleria siamensis* (Acanthaceae). Also frequently found in the shrub layer is the endemic cycad *Cycas siamensis* (Cycadaceae). The endemic *Bauhinia strychnifolia* (Anacardiaceae) is one of the many climbers. At ground layer, these forests are characterized by a conspicuous layer of graminoides including many dwarf bamboos and the endemic *Eulalia siamansis* (Poaceae).

Thailandian Tropical Evergreen Forests (information required).

Further information required.

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