CHAPTER 3.
STUDY SITE DESCRIPTION

3.1. Introduction

This study was carried out in Doi Suthep-Pui National Park which lies a few km west of Chiang Mai, Thailand's second largest city. Doi Suthep-Pui National Park was designated as a national park in 1981 and is under the Royal Forestry Department. It covers 261 km^2. The summit of Doi Pui, 1685 m, is at 18° 50' N, 98° 54' E. The base rock is granitic, but shale occurs in some lowland places. Soils are generally deep and highly weathered.

Annual rainfall varies from about 1,000 mm/year at the base of the mountain to about 2,000 mm/year near the summit. There is a marked dry season from December to March, when rainfall is close to zero and a rainy season from May to November, with peak rainfall in August (about 250 mm). The cool season is from November to February when mean temperatures at the base of the mountain are 20-24°C, after which mean temperatures rise sharply and peak in April at 30°C. Temperatures at higher elevations are considerably cooler. Mean monthly rainfall and temperature of Chiang Mai and Chang Kian village are shown in Figure 3.1 and 3.2.

For a description of the vegetation of Doi Suthep-Pui see **Maxwell** (1988) and **Kuchler and Sawyer** (1967). There are two basic kinds of forest, viz. deciduous forest up to about 950 m elevation and evergreen forest above that. The evergreen forest contains some very large trees 30-40 m high, including *Sapium baccatum* Roxb. (Euphorbiaceae), *Eugenia albiflora* Duth. ex Kurz (Myrtaceae), *Lithocarpus elegans*

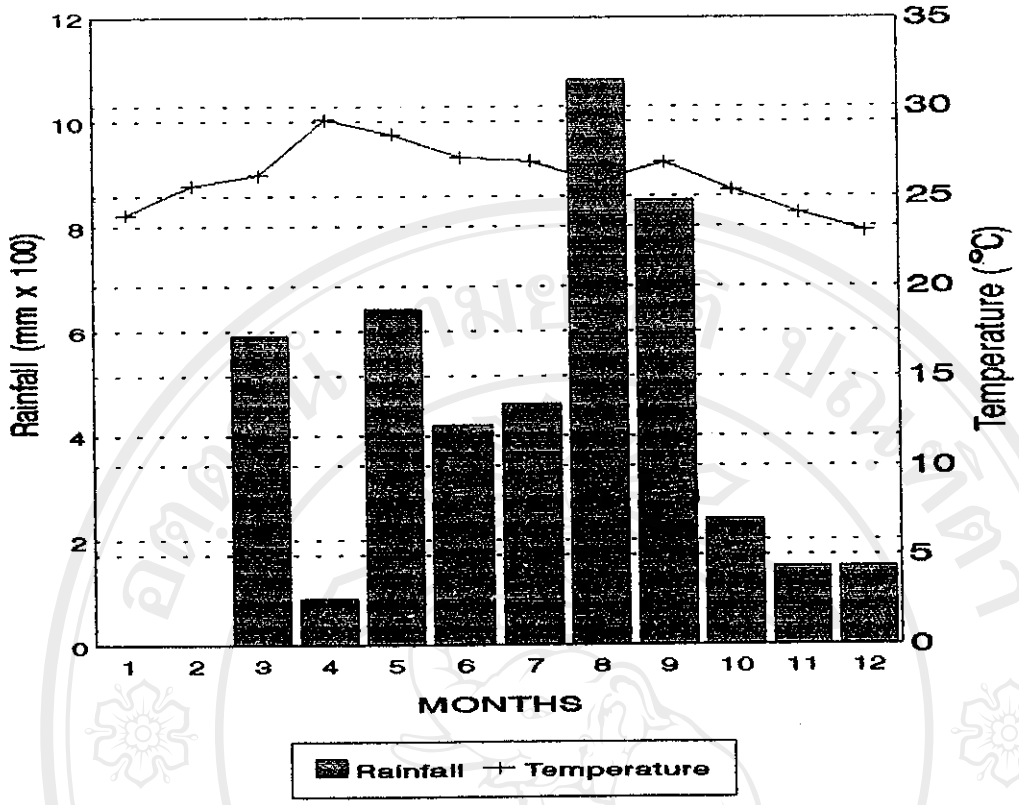


Figure 3.1. Mean Monthly rainfall and temperature of Chiang Mai, (Data from Seismic Station, Chiang Mai city, 1994).

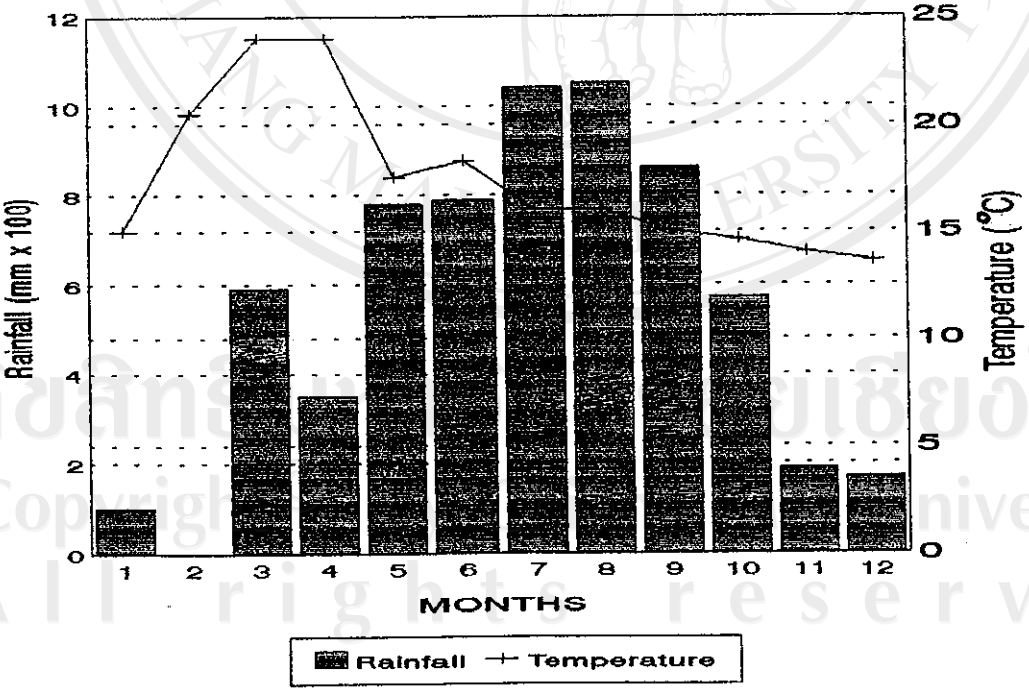
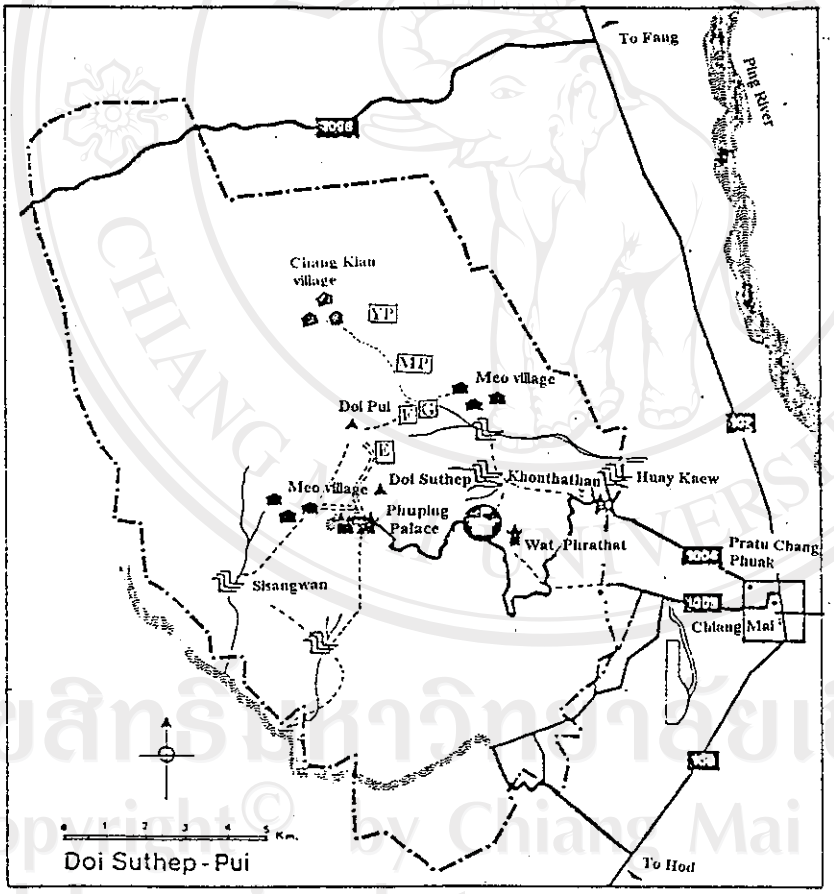


Figure 3.2. Mean Monthly rainfall and temperature of Doi Suthep-Pui National Park, (Data from Chang Kian Meterological Station, 1994).

(Bl.) Hatus. ex Soep. (Fagaceae), *Castanopsis diversifolia* King ex Hk. f. (Fagaceae). *Pinus kesiya* Roy. ex Gord. (Pinaceae) occurs naturally and has also been planted (**Elliott and Maxwell**, 1993).

Five sites were selected in evergreen forest (1525 mASL), viz. a regenerating gap (1500 mASL), a eucalyptus plantation (1550 mASL), a mature pine plantation (1375 mASL) and a young pine plantation (1275 mASL). The bedrock of all sites is granite. A sketch map showing Doi Suthep-Pui Headquarters, Chang Kian village, roads and locations of study sites is shown in Figure 3.3.



F = Evergreen forest site
G = Regenerating gap site
E = Eucalyptus plantation site
MP = Mature pine plantation site
YP = Young pine plantation site

Figure 3.3. Map showing Doi Suthep-Pui National Park, Chang Kian and Meo village, roads, Phuping Palace and locations of five study sites.

3.2. Site Description

3.2.1. Evergreen Forest

This site (c. 1525 m) is located at 7.9 km along the road from the Headquarters of Doi Suthep-Pui National Park. It consists of disturbed primary evergreen forest with some pine and much secondary growth which forms a dense forest understorey. The aspect is 25° southwest and the slope is 45% (Figure 3.4).

Figure 3.4. Vegetation of the evergreen forest, site 1, with *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) C.E. Hubb. & Vaugh. (Gramineae) in the foreground. The liana is *Spatholobus floribundus* Craib (Leguminosae, Papilionoideae), *Styrax benzoides* Craib (Styracaceae) (middle), and *Castanopsis tribuloides* (Sm.) A. DC. (Fagaceae) (left and right) are the more obvious trees represented. 18 July 1994, 1525 m.

The general soil characteristic is deep top soil, high organic matter content and high water holding capacity. The soil texture is sandy-loam. Tree species include *Helicia nilagirica* Bedd. (Proteaceae), *Castanopsis tribuloides* (Sm.) A. DC. (Fagaceae), *Schima wallichii* (DC.) Korth (Theaceae), *Vaccinium sprengelii* (D. Don) Sleum. (Ericaceae), *Aporusa villosa* (Lindl.) Baill. (Euphorbiaceae), *Styrax benzoides* Craib (Styracaceae), *Vernonia volkameriifolia* DC. var. *volkameriifolia* (Compositae) and *Wendlandia tinctoria* (Roxb.) DC. ssp. *floribunda* (Craib) Cow. (Rubiaceae). Abundant herbaceous plants and climbers include *Microstegium vagans* (Nees ex Steud.) A. Camus (Gramineae), *Rubus blepharoneurus* Card. (Rosaceae), *Curculigo capitulata* (Lour.) O.K. (Hypoxidaceae), *Lepidagathis incurva* Ham. ex D. Don (Acanthaceae), *Polygonum chinensis* L. (Polygonaceae) and *Aerva sanguinolenta* (L.) Bl. (Amaranthaceae). There are also abundant vines, e.g. *Shuteria involucrata* (Wall.) Wight & Arn. (Leguminosae, Papilionoideae), *Smilax ovalifolia* Roxb. (Smilacaceae) and *Thunbergia similis* Craib (Acanthaceae).

3.2.2. Regenerating gap

This site (c. 1500 m) is located immediately adjacent to the evergreen forest site (site 1). It is a deforested open area with some secondary treelets and shrubs. The aspect is 65° northwest and the slope is 25% (Figure 3.5).

The general soil characteristic is a shallow top soil, less organic matter than in site 1 and low water holding capacity. The soil texture is sandy loam. Treelets include *Debregeasia longifolia* (Burm.f.) Wedd. (Urticaceae), *Prunus persica* (L.) Bat. (Rosaceae, peach, planted), *Artocarpus heterophyllus* Lmk. (Moraceae, jackfruit, planted), *Prunus cerasoides* D. Don (Rosaceae, planted), *Melastoma normale* D. Don var. *normale* (Melastomataceae) and *Trema orientalis* (L.) Bl. (Ulmaceae). The most

Figure 3.5. Regenerating gap, site 2, with site 1 in the background. *Eupatorium adenophorum* Spreng. (Compositae), *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) C.E. Hubb. & Vaugh (Gramineae) (foreground), *Thysanolaena latifolia* (Roxb. ex Horn.) Honda (Gramineae) (middle), and secondary growth trees, e.g. *Trema orientalis* (L.) Bl. (Ulmaceae), are conspicuous. 18 July 1994, 1500 m.

abundant herbaceous plants in this site were *Eupatorium adenophorum* Spreng. (Compositae), *Thysanolaena latifolia* (Roxb. ex Horn.) Honda (Gramineae), *Thunbergia similis* Craib (Acanthaceae), *Clitoria mariana* L. (Leguminosae, Papilionoideae), *Urena lobata* L. ssp. *lobata* var. *lobata* (Malvaceae), *Pteridium aquilinum* (L.) Kuhn ssp. *aquilinum* var. *wightianum* (Ag.) Try.(Dennstaedtiaceae) and *Imperata cylindrica* (L.) P. Beauv. var. *major* (Nees) C.E. Hubb. ex Hubb. & Vaugh. (Gramineae).

3.2.3. Eucalyptus Plantation

This site (c. 1550 m) is located about 6.6 km along the road, north-west of the Headquarters of Doi Suthep-Pui National Park or 1.3 km from the forest site (site 1). The aspect is 60° northwest and the slope is 55% (Figure 3.6).

Figure 3.6. Site 3 is situated in a c. 37 year old *Eucalyptus camaldulensis* Dehnh. (Myrtaceae) plantation. The herbaceous ground flora includes the vine *Rubus blepharoneurus* Card. (Rosaceae) and *Thysanolaena latifolia* (Roxb. ex Horn.) Honda (Gramineae), a 2 - 5 m tall grass. 12 September 1994, 1550 m.

Eucalyptus camaldulensis Dehnh. (Myrtaceae), native to Australia, was planted in 1957 (c. 37 years of age) and is now 25-35 m tall, well spaced (c. 8 m). Charcoal and other evidence of ground fires are common. The general soil characteristic is shallow

top soil, less organic matter than in site 1 and low water holding capacity. The soil texture is sandy-loam.

Some deciduous and evergreen tree or treelets grow at this site, e.g. *Litsea cubeba* (Lour.) Pers. (Lauraceae), and *Dillenia aurea* Sm. var. *aurea* (Dilleniaceae). There are also many herbaceous plants and weeds, e.g. *Urena lobata* L. ssp. *lobata* var. *lobata* (Malvaceae), *Rubus blepharoneurus* Card. (Rosaceae), *Polygonum chinensis* L. (Polygonaceae), *Microstegium vagans* (Nees ex Steud.) A. Camus (Gramineae), *Eupatorium adenophorum* Spreng. (Compositae), *Pteridium aquilinum* (L.) Kuhn ssp. *aquilinum* var. *wightianum* (Ag.) Try.(Dennstaedtiaceae) and *Phragmites vallatoria* (Pluk. ex L.) Veldk. (Gramineae).

3.2.4. Mature Pine Plantation

This site (c. 1375 m) is located about 14.6 km along the road, north of the Headquarters of Doi Suthep-Pui National Park and close to Chang Kian Village, about 5.4 km from the forest site. The aspect is 30° southwest and the slope is 15% (Figure 3.7).

Pinus kesiya Roy. ex Gord. (Pinaceae) was planted in 1970-1971 (c. 25 years of age) and is now 15-20 m tall. Ground fires are frequent and there is some secondary growth. The general soil characteristic is very shallow top soil and very little organic matter (mostly pine leaves). The soil texture is sandy clay loam.

The ground flora, due to shade and pine needles, is very sparse at this site, but coppicing stumps of *Albizia odoratissima* (L. f.) Bth. and *Dalbergia fusca* Pierre (Leguminosae, Mimosoideae), *Schima wallichii* (DC.) Korth (Theaceae) and

Fagerlindia sp. (Rubiaceae) are common. Charcoal and other evidence of ground fires are common in this site. *Clitoria mariana* L. (Leguminosae, Papilionoideae), a vine, is abundant from August to October.

Figure 3.7. ***Pinus kesiya*** Roy. ex Gord. (Pinaceae) was planted c. 25 years ago and was study site 4. Frequent fires have maintained a minimum of ground flora which include ***Clitoria mariana*** L. (Leguminosae, Papilionoideae), ***Osbeckia stellata*** Ham. ex Ker-Gawl. var. ***marginulata*** (Cl.) C. Han. (Melastomataceae), and ***Cheilanthes tenuifolia*** (Burm. f.) Sw. (Parkeriaceae). The leaf litter is about 10 - 12 cm thick. 12 September 1994, 1375 m.

3.2.5. Young Pine Plantation

This site (c. 1275 m) is located about 16.8 km along the road, north of the Headquarters of Doi Suthep-Pui National Park, is also close to Chang Kian village near site B (Faculty of Agriculture Station, Chiang Mai University), about 2.2 km from the mature pine plantation (site 4). The aspect is 90° west and the slope is 25% (Figure 3.8).

Figure 3.8. Site 5 is a c. 12 year old plantation of *Pinus kesiya* Roy. ex Gord. (Pinaceae). The ground flora, due to less shade, is better developed than in site 4. *Pteridium aquilinum* (L.) Kuhn ssp. *aquilinum* var. wig*htianum* (Ag.) Try. (Dennstaedtiaceae), *Clitoria mariana* L. (Leguminosae, Papilionoideae) and seedlings of *Styrax benzoides* Craib (Styracaceae) and *Schima wallichii* (DC.) Korth (Theaceae) are found. 12 September 1994, 1275 m.

Pinus kesiya Roy. ex Gord. (Pinaceae) was planted in 1982-1983 (c. 12 years of age) and is now 7-9 m tall. The ground flora is sparse and there is evidence of frequent fires and much secondary growth. The general soil characteristic is a shallow top soil, little organic matter and low water holding capacity. The texture is sandy clay-loam.

The most abundant tree seedlings are *Wendlandia tinctoria* (Roxb.) DC. ssp. *floribunda* (Craib) Cow. (Rubiaceae), *Castanopsis diversifolia* King ex Hk. f. (Fagaceae), *Dalbergia fusca* Pierre and *D. stipulacea* Roxb. (Leguminosae, Papilionoideae), *Aporusa villosa* (Lindl.) Baill., *Phyllanthus emblica* L. and *P. sootepensis* Craib (Euphorbiaceae) and *Styrax benzoides* Craib (Styracaceae). *Pteridium aquilinum* (L.) Kuhn ssp. *aquilinum* var. *wightianum* (Ag.) Try. (Dennstaedtiaceae), *Smilax verticalis* Gagnep., *S. ovalifolia* Roxb. (Smilacaceae) and *Inula cappa* (Ham. ex D. Don) DC. *forma cappa* (Compositae) are common herbs.

The general description of each site is summarized in Table 3.1.

Table 3.1. The aspect, slope, and elevation of each site.

Site	Plot	Elevation (mASL)	Aspect (°)	Slope (%)
1	Evergreen Forest	1525	25 SW	45
2	Regenerating gap	1500	65 NW	25
3	Eucalyptus plantation	1550	60 NE	55
4	Mature pine plantation	1375	30 SW	15
5	Young pine plantation	1275	90 W	25