STUDY AREA

Western Ghats is a chain of mountains running parallel to the West coast of Peninsular India. The range starts from the mouth of river Tapti and extends southwards up to Kanniyakumari (Cape Camorin) through the states of Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu. The continuous chain of mountains has a major discontinuity in the Palghat gap thus separating the Nilgiris from the Anamalais. Western Ghats lie between 8° 20' – 20° 40' N and 73° – 77° E and is approximately 1,600 km long (Nair and Daniel, 1986) and covers an area of 1,60,000 km². The average elevation is around 900 m and the highest mountain peak is Anaimudi (2695m). Western Ghats lies towards the western edge of Deccan plateau and separates the plateau from the narrow coastal zone of the Arabian Sea. It is surrounded by the Arabian Sea towards the west, the arid Deccan plateau towards the east and the Vindhya-Satpura ranges in the north.

Western Ghats are characterised by conical as well as flat topped hills interspersed with valleys and spurs (Vajravelu and Vivekananthan, 1996). Along the Western side there are steep ravines and canyons and towards the eastern side there are the flat topped spurs intersected by valleys (Subramanyam and Nair, 1974). The mountain chains of Western Ghats are steep on the windward side and sloping towards the Deccan plateau on the leeward side in the state of Maharashtra whereas the range south of Palghat is sloping towards the windward side in Kerala and steep towards the leeward side in Tamil Nadu (Nayar, 1996).

The hills north of the Krishna basin (largely Maharashtra and Gujarat) are with fragile basaltic rocks. South of the Krishna basin is the region of precambrian archean crystalline hard rock’s (nearly 2000 million years old granites, schists, gneisses,
PLATE 1: Map of Western Ghats showing study area (Source: IIRS Publication, June 2002).
quartzites, etc). Soils vary from humus rich peat in the montane areas to laterite in the lower elevation and high rainfall belts. Soils are generally acidic.

The Western Ghats sector receives rains from the southwest monsoon. It rains all the year round in southern parts while in the areas in the north remain dry for 8–9 months. The average annual rainfall in the Western Ghats region is 2500 mm. Rainfall is as high as 7600 mm in localities such as Agumbe (Daniels and Vencatesan, 2008). The climate is generally warm and humid but becomes hot in summer and cold in winter months. Mean temperature ranges from 18° to 24° C, rises beyond 30° C in summer season and sometimes down up to 0° C in winter season in places of high altitudes. There are 38 east flowing and 27 west flowing major rivers in the Western Ghats. The rivers which originate in the west in the Western Ghats drain into the Arabian Sea while the three major rivers in the Western Ghats – Kaveri (Cauvery), Krishna and Godavari flows eastwards into the Bay of Bengal (Murthy et al., 1996).

Champion and Seth (1968) classified the vegetation of Western Ghats into four major types:

1. Moist tropical forests (Tropical evergreen forest, tropical semi evergreen forest, tropical moist deciduous forest, and littoral and swamp forests).
2. Dry tropical forests (tropical dry deciduous forests, tropical thorn forests)
3. Montane subtropical forests (subtropical broad leaved hill forests)
4. Montane temperate forests (montane wet temperate forests)

Apart from the above mentioned vegetation types different types of vegetation occurs along the Western Ghats. This includes scrubs, sholas, montane grasslands, tropical moist deciduous forest, tropical dry deciduous forest, peat blogs, Myristica swamps, tropical evergreen forests, semi-evergreen forest and lateritic rocky plateaus.

**Evergreen forests:** These forests occur along the windward side at an altitude of 200
- 1,500 m with 2,500 - 5,000 mm rainfall. The canopy is dense with trees which are up to 60 m high. Evergreen forests are found in the western slopes of the Western Ghats in Kerala and Karnataka (Nair and Daniel, 1986; Daniels and Vencatesan, 2008).

Semi-evergreen forests: Semi-evergreen forests occur in the Western Ghats of Maharashtra, Goa, Karnataka and Kerala within an elevation range of about 300-900 m.

Moist Deciduous forests: Moist deciduous forests occur between 500 - 900 m altitudes where the rainfall is 2,500 mm to 3,500 mm. Trees are as high as 60 m but the canopies of the trees in these forests are not as dense as the ones in the evergreen forests (Nair and Daniel, 1986; Daniels and Vencatesan, 2008).

Dry Deciduous forests: Dry Deciduous forests are confined to areas with an elevational range of 300 – 900 m with 1000 – 2000 mm mean annual rainfall (Nair and Daniel, 1986; Daniels and Vencatesan, 2008).

The Sholas (Grasslands): In the Western Ghats natural grasslands are found above 1,500 m with 2500 - 5000 mm rainfall in Bababudangiris, Kudremukh, Nilgiris, Anaimalais, Palnis and Cardamom hill ranges. The grasslands which are also called as shrub savannas or the sholas are characterized by number of herbaceous and shrubby species mixed with grasses (Nair and Daniel, 1986; Daniels and Vencatesan, 2008).

Rocky lateritic plateaus: Undulating lateritic plateaus occur along the west coast of the Western Ghats. These harbour herbaceous vegetation. These are commonly found in the Northern and Central Western Ghats (Nair and Daniel, 1986).

Myristica swamps: These are located at the bottom of valleys which are covered with water during the greater part of the year. These are found in southernmost part of Kerala, Tamil Nadu, Karnataka and Goa. These occur up to 600 m altitude in areas
with medium to high rainfall (Nair and Daniel, 1986).

**Scrub forest:** Scrub jungles are located in areas between 200-500 m elevation with 300-600 mm of annual rainfall. This vegetation type is dominated by short trees which are 15-20 m high (Nair and Daniel, 1986; Daniels and Vencatesan, 2008).

**Savannas:** Savannas are seen in areas between 1,700-1,900 m in elevation with 2500 – 3500 mm rainfall (Nair and Daniel, 1986; Daniels and Vencatesan, 2008).

Pascal (1988) categorized Western Ghats into three regions: the Northern Western Ghats, the Central Western Ghats and the Southern Western Ghats. The geographical area of present study is restricted to the Northern Western Ghats and the Central Western Ghats (up to the political boundary of Karnataka).

1) **Northern Western Ghats (Tapti to Goa):** The northern Western Ghats are popularly known as *Sahyadris*. It starts from the mouth of river Tapti and extends 750 km in length up to Goa. The altitudinal range is between 300-1500 m msl excluding high crests (Karthikeyan, 1996). Along the Northern Western Ghats isolated, conical, flat-topped hills occur with steep sides which are marked with distinct striations. The major peaks in Northern Western Ghats (*Sahyadris*) are Kalsubai (1645m), Mahableswar (1438m) and Harishchandragad (1424m).

The main groups of soils found along the Northern Western Ghats are high and low level laterites, red loam, medium black soil, red gravelly soils and mixed red and black soil. Medium black soils are found on flat hill tops while the valleys have deep red gravelly soils with good humus content (Karthikeyan, 1996).

The South west monsoons bring heavy rains in the Northern Western Ghats. The rainy season begins in early June and ceases off during September. The mean
annual rainfall varies from 2000 - 7000 mm. The humidity is 70 - 90% during the monsoons and 10 - 30% during dry periods. The mean annual temperature varies from 20° - 24°C. Mean daily temperature in the coldest months (December - January) ranges between 18° - 24°C while the absolute minimum temperature is 6° - 15°C in different places of Northern Western Ghats (Karthikeyan, 1996).

The vegetation occurring along the Northern Western Ghats can be classified as: scrub forest, dry deciduous forest, moist deciduous forest, montane subtropical evergreen forest (Karthikeyan, 1996).

2) Central Western Ghats (South of Goa up to Palghat gap): Central Western Ghats starts from south of Goa up to the Palghat gap. However, due to logistic reasons, in the present study the area is restricted up to the political boundary of Karnataka. This region is approximately 320 km long (Kamath, 1982). The ghats in this section rise sharply to form unbroken and uneven rampart averaging an altitude of 900 m. In the study area of Central Western Ghats, Kudremukh (1892 m) is the highest peak followed by Thadiandamol (1745 m) and Pushpagiri (1713 m). The Western Ghats in this section are very close to the coast and at several places touches the shore.

The main groups of soils found along the Central Western Ghats are lateritic soil, red soil, mixed red and black soil, red loam and brown clay. Lateritic soils occur in the coastal regions of Uttara Kannada, Dakshina Kannada, Shimoga and Hassan districts. Red soils occur in Shimoga, Hassan and Chikmagalur districts.

Western Ghats in Karnataka though receive rainfall from the south west monsoons also receive rains from the north east monsoons during October to January. Annual rainfall varies from 4000 mm to 8000 mm. Annual rainfall is highest in the
Western Ghats section and lowest in the eastern parts of Chitradurga towards the leeward side. Agumbe receives highest rainfall (8270 mm) in this sector followed by Bhagamandala (6032 mm). The mean annual temperature varies from 18° - 20°C. Mean daily temperature ranges between 20° - 24°C. The humidity is 90% during the monsoons in the month of July and August.

The vegetation occurring along the Central Western Ghats can be classified as: tropical evergreen forest, semi-evergreen forest, moist deciduous forest and the *sholas*. 