CHARACTERISTIC FEATURES OF STUDY AREA

**Geography**

Garhwal Himalaya comprises the central part of Western Himalaya and lies between the latitude 29°26'N - 31°28'N and longitude 77°49'E - 80°6'E. It is surrounded by districts of Nainital, Almora and Pithoragarh in the east, Tibet in the north, State of Himachal Pradesh in north-west and districts of Bijnor and Sharanpur in the south and south-west. The study area constitutes different topographical localities of Garhwal Himalaya, particularly covering the districts of Chamoli, Pauri, Tehri and Uttarkashi.

**Climate and soil**

Garhwal Himalaya exhibits a considerable climatic variation with respect to different topographical features. Likewise to other parts of India, three distinct seasons are generalized in the area.

The winter extends from middle of October to March. December and January are the coldest months. The winter rains occur chiefly in the months of January and February. Snowfall occurs above 2000 m a.s.l. from December to March and occasionally upto 1000 m a.s.l. elevation. The snow at lower elevations seldom stays long. On account of heavy dew during night period, some enclosed
hilly tracts have foggy atmosphere during the winters.

Summer season extends from April to June and May and June are the hottest months. In submontane zone, the temperature in these months varies from 16° to 40°C.

Rainy season is marked by heavy rains and high humidity with slight variation in temperature. The monsoon usually breaks late in June and extends till the end of September. Maximum rainfall usually occurs in July - August. The rainy season is generally followed by a short day period with scanty rain and low temperature.

The minimum temperature in alpine zones falls down to below zero in winters and reaches to 20°C in May. Most humid month in the alpine zone is June with 90% relative humidity. July and August are the months with highest rainfall in submontane and montane zones. Sharp fluctuations in weather conditions are commonly associated in the alpine zones, as compared to the lower mountainous zones. Relative humidity and temperature vary considerably with respect to topography and vegetational covers.

The soils vary considerably in texture and composition. The texture of the soil is generally light loam to clayey loam formed by limstones. The layer is thinner in the sparsely stocked areas and on steep slopes and spurs, while it is deep and loamy in densely stocked areas, where it is enriched by humus deposits.
Geology

The Himalayan mountains are one of the youngest mountain chains of the world. In general the geological composition of the area is of tertiary origin along with sedimentary and metamorphic rocks. This part of Himalaya falls into four broad stratigraphical zones (Wadia, 1975; Valdiva, 1980) viz., Siwalik foothills or outer Himalayan zones, about 10-15 km wide with an average altitude of 900m; Lesser Himalayan zone 50-80 km with an altitude of about 3000 m a.s.l. The Great Himalaya or Central Himalayan zone - 140 km wide with an altitude of 4000 - 5000 m a.s.l.; and Trans - Himalayan zone - about 40 km wide.

Brief outline of vegetation

The abrupt change in elevation, topography and subsequent climatic extremes have resulted into varied floristic pattern in the Himalaya. The major part of the vegetation is in the form of forests, which constitutes different types of plants associated with corresponding change in topographical and climatic conditions.

In the submontane zone the forests are mixed deciduous and mainly consisting of the species like Acacia catechu, Adina cordifolia, Anogeissus latifolia, Butea monopera, Dalbergia sissoo, Holoptelea integrifolia, Launaea grandis, Mallotus philippensis, Ougenia.
The common shrubs of the area are Adhatoda zeylanica, Carissa opaca, Clerodendrum, species of Debregeasia, Desmodium, Indigofera, Euphorbia royleana with some of the thick populations of Lantana camara, along with the climbers like Phanera vahlii, Pueraria tuberosa, Dioscorea sp., Ichnocarpus fruticans and Vallaris solanacea.

Herbaceous component in the zone consists of Achyranthes, Ageratum convozoides, Apluda mutica, Argemone mexicana, Arundinella nepalensis, Arundo donax, Cassia occidentalis, Crotalaria medicaginea, Fumaria indica, Oxalis corniculata, Pogostemon plectranthoides, Portulaca oleracea, etc.

In the montane zone Pinus roxburghii forms pure strands in several patches on drier and exposed sides. Between 800-2200 m with the increase in elevation, it is replaced by Abies pindrow, Cedrus deodara, Cupressus torulosa, Picea morinda, Pinus wallichiana, Taxus baccata, Quercus leucotrichophora, and Q. semecarpifolia. Besides these, the tree species in montane zone are Acer oblongum, Aesculus indica, Alnus nepalensis, Betula alnoides, B. utilis, Buxus wallichiana, Juglans regia, Lyonia ovalifolia, Machilus odoratissima, Myrica esculenta, Neolitsea tuberosa, Pyrus pashia and Rhododendron arboreum, etc.
The shrub component consists of *Berberis lycium*, *Cotoneaster microphyllus*, *Deutzia staminea*, *Indigofera heterantha*, *Myrcine africana*, *Nyctanthes arbor-tristis*, *Rubus niveus*, *R. spectabilis*, *Spirea corvmbosa*, *Symlocos crataegoides* and *Viburnum* spp. Plants like *Aster* spp., *Bergenia ligulata*, *Gentiana* spp., *Micromeria biflora*, *Pimpinella diversifolia*, *Polygonum* spp., *Senecio chrysanthemoides*, *Swertia* spp., *Thymus linearius*, *Valeriana hardwickii*, *Viola canescens* and *V. biflora* are some of the herbaceous members.

In the alpine zone the timber line is represented by *Betula utilis*, *Rhododendron campanulatum*, *Rosa sericea*, *Rubus pedunculosus*, *Sorbus foliolosa*, and *Quercus semecarpifolia*.

With the melting of snow in April - May, a luxuriant growth of alpine herbs emerges out which attains its flowering mainly in July - August, and senescence starts in September - October, with the ultimate covering down of these plants by snow in the November onward the year. Some of the species completing their life cycle completely or partly in these months of summer are *Aconitum heterophyllum*, *A. atrox*, *Allium wallichii*, *Anemone obtusiloba*, *Angelica clausa*, *Cirsium verutum*, *Corydalis govaniana*, *Dactylorhiza hataeira*, *Delphinium vestitum*, *Doronicum roylei*, *Fragaria nubicola*, *Geranium wallichianum*, *Jurinea*
The inhabited localities have their own traditional agricultural systems. The vegetation of inhabited localities differ from the natural vegetation. The common trees in the vicinity of the villages are *Bombax malabaricum*, *Celtis eriocarpa*, *Ficus* spp., *Grewia optiva*, *Mangifera indica* etc.

The common cultivated cereals and millet crops of the region are *Echinochloa frumentacea*, *Eleusine coracana*, *Hordeum vulgare*, *Oryza sativa*, *Pennisetum typhoides*, *Jutaria italicca*, *Triticum aestivum* and *Zea mays*.

Among the vegetable crops that are grown in the region are *Cucurbita pepo*, *Luffa aegyptiaca*, *Lagenaria* spp., *Solanum tuberosum*, *S. melongena*, *Lycopersicum esculentum*, *Capsicum annuum*, *Colocasia esculenta*, *Trichosanthes anguina*, *Raphanus sativus*, *Spinacea oleracea*, *Abelmoschus esculentus*, *Brassica* spp., *Allium cepa* and *A. sativum*. The important legumes are *Macrotyloma uniflorum*, *Vigna mungo*, *V. radiata*, *Glycine max*, *Lablab purpureus*, *Lens culinaris* etc.
The common fruit trees are *Carica papaya*, *Citrus* spp., *Juglans regia*, *Mangifera indica*, *Morus alba*, *Prunus armeniaca*, *P. persica*, *Psidium guajava*, *Pyrus communis*, *P. malus*, *Syzygium cumini*, etc.