VEGETATIONAL ACCOUNT OF THE NORTH WESTERN HIMALAYAS

The area of North Western Himalayas, as covered here, extends from Kashmir (excluding Ladakh and the area under Pakistan occupation) to Nepal. It is about 800 kilometres long and 190-240 kilometres wide and includes the states of Jammu & Kashmir, Himachal Pradesh and the mountainous parts of Uttar Pradesh. Geographically it extends between 29-35° latitude and 74-81° longitude.

Champion and Seth (1964) have recognised North Western Himalayas as one of the nine floristic regions in India. It differs from the Eastern Himalayas in having a greater representation of conifers and thus resembles more closely with the European flora. The wide range of altitude, temperature, rainfall and soil results in a very diversified flora.

The climate is tropical in the foot-hills and up to 1000 m in the outer ranges, subtropical between 1000-2000 m, temperate between 2000-3000 (-3600) m and alpine from 3000 m to the snow line at 4500 m. It may be mentioned here that forests do not extend beyond 3600 m and the alpine zone mostly consists of meadows.
and scrub vegetation.

The rainfall is quite variable and ranges from 600–3200 mm annually. Of the total annual rainfall, 75% is received during the rainy monsoon months of July to September. In general the rainfall is maximum in the eastern parts of the North Western Himalayas (Nainital) which receive the bulk of the monsoon winds, but it goes on decreasing, as the winds move to the western side. In addition to the direction of monsoon winds, some other factors like altitude, location (interior or exterior of the hills) and the direction of the ranges play a part in the distribution of the rainfall. Thus, Dharamsala which is on the western side receives the maximum rainfall of 3200 mm annually.

The regions above 1500 m get snow-fall during the winter months which may remain for a few days to months depending on the altitude and location of the area. At elevations of 3000 m, the average snow-fall is about 300 cm and lasts from December to March, while places above 4500 m have perpetual snow.

The forest types vary from tropical to alpine pastures and may be provisionally classified on the basis of climate alone into four categories, namely, subtropical forests, tropical forests, temperate forests and alpine forests.

**Tropical forests:** These forests are distributed in the plains adjoining the hills and may go up to 1000 m
in the outer ranges. The average annual rainfall is 700-1000 mm and a major part of it falls during the monsoon months of July to September. Summer months are comparatively hot with maximum temperature reaching up to 40°C while the winter is moderately cold with minimum temperature reaching up to 0°C.

The forests are rather poor and are constituted of xerophytic species. Some of the common trees are *Acacia arabica* Willd., *A. modesta* Wall., *Flacourtia indica* (Burm.) Merr., *Diospyros cordifolia* Roxb., *Bauhinia racemosa* Lam., *Zizyphus jujuba* Lam. and *Rhamnus pereis* Boiss etc. Among the shrubs, *Euphorbia royleana* Boiss, *Lantana camara* L., *Capparis* spp., *Zizyphus nummularia* (Burm.) Wt. & Arn. and *Adhatoda vesica* Nees are common. Herbaceous flora makes its appearance mostly in the rainy season.

In the comparatively moist areas of Dehra Dun and Rishikesh, where annual rainfall is above 2000 mm, *Shorea robusta* Gaertn. grows luxuriantly, often forming pure and dense stands. Other common species of trees associated with it are *Terminalia tomentosa* Wt. & Arn., *Mallotus philippinensis* Muell., *Lagerstroemia parviflora* Roxb., *Ficus glomerata* Roxb. etc.

**Subtropical forests:** These spread between 1000-2000 m forming an intermediate zone between the tropical and temperate forests. The average annual rainfall varies
considerably and ranges from 900-2500 mm annually and a major part of it is received during the monsoon months of July to September. Summer months are generally hot with maximum temperature reaching up to 30°C while winter is moderately cold. There is no snowfall or it falls only for a few days in mid-winter in the higher altitudes.

The forests are scanty and never dense. The chief constituent species is *Pinus roxburghii* Sarg. Other species commonly associated with it are *Quercus coccifera* Thunb., *Acer oblongum* Wall., *Eugenia foerdosa* Wall., *Terminalia tomentosa* Wt. & Arn. and *Ficus palmata* Forsk. Some common shrubs are *Viburnum coriaceum* Bl., *Casearia graveolens* Detz. and *Coriaria nepalensis* Wall. In the upper limits *Quercus angana*, *Q. dilatata* Lindl., *Rhododendron arboreum* Sm. and *Lyonia ovalifolia* (Wall.) Drude are the common associates while *Eugenia jambolana* Lam. and *Mallotus* spp. are common in the lower limits.

**Temperate forests:** These extend between 2000-3000 m and form a major part of the forest vegetation in the North Western Himalayas. The annual rainfall varies considerably and ranges from 1000-2500 mm and a major part of it falls during the monsoon months of July to September. The climate is cold in winter with minimum temperature in January reaching up to -10°C while it is moderately hot in summer with maximum temperature reaching up to
32°C. Snowfall is moderate and occurs from December to March. The temperate forests can be divided into lower, middle and upper zones.

The lower zone temperate forests overlap with the subtropical forests and occur in the same altitudinal zone, 1000-2000 m, where the climate is more wet and cold. The principal species of these forests is *Quercus dilatata* which may be associated with *Pinus excelsa*, *P. roxburghii* and *Cedrus deodara* Laud.

The middle zone temperate forests extend between 1500-2500 m and form a major part of the temperate belt. The vegetation is of mixed type with both conifers and angiosperms. In some localities *Quercus incana* is dominant while in others *Cedrus deodara* acquires dominance. Puri (1960) has called such mixed temperate forests as 'Glory of the Himalayas'. Other tree species commonly associated are *Quercus dilatata*, *Aesculus indica* Colebr., *Rhododendron arboreum* Sm., *Acer* spp., *Pinus excelsa*, *Abies pindrow* Spach. and *Picea morinda* Link.

The upper zone temperate forests extend from 3100-3000 m and merge into the alpine zone above. Some of the common species are *Quercus semicarpifolia* Sm., *Juglans regia* L., *Abies pindrow*, *Picea morinda*, *Cedrus deodara*, *Taxus baccata* L. and *Betula utilis* Don.

**Alpine forests and meadows:** These extend from 3000 m to snow line, viz., 4500 m. The climate is cold with
severe winter, with relatively cold and short summer. Rain falls only during the summer months from July to September, while it remains covered under snow from December to April. Maximum precipitation is in the form of snow.

There are no forests in the upper zone adjoining the snow line. Rocks are generally covered with lichens. A few herbs like Sedum and Saxifraga may grow and are cushion shaped. Lower down in the intermediate zone there may be a scrub forest of Rhododendrons and Junipers but more often there are vast alpine meadows with luxuriant ground flora. Generally the plants are cushion shaped with brilliantly coloured flowers. Some common plants in alpine meadows are Thalictrum, Papaver, Lysichis, Potentilla and Pyrola spp. In the lower ranges of alpine forests there may be scattered areas with dominant tree species. Some of the common species are Abies webbiana, A. densa, Betula utilis, Quercus semicarpifolia. Some common shrubs are Cotoneaster, Rosa and Lonicera spp.

The following places in the North Western Himalayas were visited during the course of present study. Various localities with more or less same type of vegetation and having geographical contiguity are grouped together under one heading. The main station is the one which is written first and the smaller and less known places in the area of main station are put in the parentheses.
Jammu & Kashmir:

1. Gulmarg (Ningle Nallah and Khillanmarg), 2700-3200 m, predominantly coniferous forests - upper temperate zone.

2. Pahalgam (Kullar, Bisaran, Shikargah), 2000-2400 m, predominantly coniferous forests - temperate zone.

3. Bhadarwah (Basti), 1500-2500 m, predominantly coniferous or mixed forests - temperate zone.
   -do-
   (Seoj), 2400-3200 m, predominantly coniferous but mixed at 3000 m, upper temperate zone.

4. Batote (Patni Top, Sanasar), 1500-2100 m, angiospermic to coniferous forests-temperate zone.

Himachal Pradesh:

5. Annpukhri (Suru), 2100-3000 m, predominantly coniferous forests - temperate zone.

6. Sahu (Kirli), 1300 m, thin and sparse angiospermic forests - tropical zone.

7. Sillaghrat (Kilor Galla), 1700-2600 m, pure angiospermic, mixed and coniferous forests - temperate zone.

8. Khijjiar (Lakkar Mandi, Kala Tope), 1600-2400 m, predominantly coniferous forests - temperate zone.

9. Dalhousie (Balloon, Lovers' Road, Panj Pulla, Jandhi Ghat), 1600-2000 m, predominantly angiospermic or mixed forests - temperate zone.
   -do-
   (Bakrota, Ahla, Krenlu Falls), 1600-2100 m, predominantly coniferous forests - temperate zone.
10. **Dharamsala**
(Forsythe Ganj, Meleod Ganj), 1400-2000 m, predominantly angiospermic, mixed or pure coniferous forests - temperate zone.

11. **Manali**
(Jagat Sukh, Gojra, Nagar, Rangri), 1800-1900 m, coniferous forests - temperate zone.

-Do-
(Kothi, Rahla and Rohtang), 2400-4200 m, mixed forests, upper temperate to alpine zone.

12. **Parbati valley**
(Jaree, Kasole, Pulga), 1500-2500 m, coniferous and mixed forests - temperate zone.

13. **Kulu**
(Bajaura, Khokhen, Garsa), 1500 m, angiospermic, mixed and coniferous forests - temperate zone.

14. **Khanag**
2700 m, coniferous and mixed forests - temperate zone.

15. **Soja**
2700 m, coniferous and mixed forests - temperate zone.

16. **Sarahan**
(Mashnu, Dharanghati), 2100-3000 m, coniferous and mixed forests - temperate zone.

17. **Simla**
(Anmandale, Glen, Jakh, Mashobra, Summer Hill, Taradevi, Chadwick Falls), 1800-2400 m, predominantly angiospermic, mixed or coniferous forests - temperate zone.

18. **Kufri**
(Chharabra), 2200-2500 m, predominantly coniferous forests - temperate zone.

19. **Markanda**
(Kumarsain side, Mattoo Peak), 2700-3100 m, coniferous and mixed forests - temperate and alpine zone.

20. **Khadrula**
(Baghla), 2700-3000 m, coniferous and mixed forests - temperate and alpine zone.
21. Dehra Dun 300 m, predominantly Shorea robusta forest - tropical zone.

22. Rishikesh (Bisai), 330 m, predominantly Shorea robusta forests - tropical zone.

23. Chakrata 1500-1800 m, angiospermic and coniferous forests - temperate zone.

24. Mussoorie (The Park, Jabber Khet, Kempty Falls, Mossy Falls), 1800-2100 m, predominantly angiospermic and mixed forests - temperate zone.

25. Maghra 2100 m, predominantly angiospermic and mixed forests - temperate zone.

26. Dhanaulti 2100-2400 m, predominantly coniferous forests - temperate zone.

27. Gobind Dham (Hem Kunt), 2900-4400 m, coniferous to angiospermic forests - upper temperate to alpine zone.

28. Nainital (Larya Kanta, Tiffon's Top, Kilbury, Sat Tal, Jeoli Kote), 1400-2400 m, predominantly angiospermic and a few mixed forests - subtropical and temperate zone.

29. Ranikhet 1600 m, coniferous and mixed forests - temperate zone.