Chapter 3
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The term *"Phytosociology"* was coined by Josef Paczoski in 1896. As per the Oxford English Dictionary, the term 'Phytosociology' is the branch of science which deals with plant communities, their composition and development, and the relationships between the species within them. Blanquet (1932) defined Phytosociology or plant sociology as, the science of plant communities or the knowledge of vegetation in the widest sense, includes all phenomena which touches upon the life of plants socially. It is an invaluable method for vegetation survey for investigating the characteristics of plant communities by simple field techniques (Rieley & Page, 1990). Phytosociology is the study of the plant community structure or the study of aspects of communal relations of plant and this study is important for understanding the functioning of community as it implies knowledge of structure and composition of the component species (Singh & Singh, 2010). Phillips (1959) mentioned that the phytosociological study gives us an idea about the correlation of species in an association. It involves the study of structure, nature, organization and development of plant communities. It characterizes and classifies plant communities in terms of their composition and structure, and therefore has been placed under plant ecology (Hargreaves, 2008). Phytosociology analyses number of quantitative and qualitative characteristics of plant communities and exchange multilateral relations of plants to one another and to the environmental parameters thereby classifying the communities (Rieley & Page, 1990). The community is an assemblage of species population that occurs together in the same place at the same time and shows definite association or affinity with each other (Mueller-Dombois & Ellenberg, 1974). Plant community is the key component in determining the structure of an ecosystem and varies from place to place according to habitat heterogeneity of the area (Kukshal *et al.,* 2009). The determination or recognization of the association of a species has important ecological implications. From the phytosociological studies in vegetation, the importance of a species and its behavior within the community can be understood. Phytosociological attributes help in understanding the structure, composition and trophic organization of any community. The number of species in a community reflects the gene pool and adaptation potential of the community (Odum, 1963).

Density, distribution, abundance and dominance are some of the quantitative measures of the species commonly used in phytosociology to describe community structure and study its dynamics in shape and time. The population behavior of component species, particularly woody species in the forest community is evaluated by density-diameter distribution pattern. Reverse J-shaped diameter distribution (Robertson *et al.,* 1978; Kohyama, 1986; Niklas *et al.,* 2003) and approximate negative potential distribution (Manion & Griffin, 2001; Hitimana *et al.,* 2004) have often been described as an emergent property of natural forests in the absence of disturbance. All these information will be useful to identify the habitat structures which in turn are essential for the formulation of any strategy for their conservation and/or utilization (Das & Lahiri, 1997). Phytosociology is a discipline which describes plant diversity in the different habitats and in the landscapes (Loidi, 2004). The most common method of defining this diversity at the ecosystem level is the species diversity which is considered as a spatial form of textural diversity and treated both in structure and dynamics of the plant community (Maarel, 1988). According to many authors, phytosociology (or plant sociology) is defined as the discipline which concerns itself with the study of vegetation as such, with its floristic composition, structure, development and distribution. It helps us to understand the species composition and diversity status of the forest (Phillips *et al.,* 2003). Phytosociological studies ideates the existing vegetation structure, species diversity and soil plant relationship thereby generating data on seasonal and temporal variation (Malik *et al.,* 2007).

The data analysis in phytosociological research can be used to understand the population dynamics of each species and their relation to each other in the same community. The most fundamental attribute in studying the plant community is the species composition. The structure of the species composition may highlight the change in the abiotic conditions of the environment over time which in turn caused disturbances in the community patterns. Community is an assemblage of species population occurring together in the same place and time showing definite association with each other (Mueller-Dombois & Ellenberg, 1974). The distribution of individual species of various girth classes, their association, pattern of dispersion and various indices of diversity are important for understanding the structure of forest community (Longman & Jenik, 1987). The forest communities are organized into different group of plants of varied life forms, which play similar

role (Richards, 1996). These different patterns of organization make up the structure of communities. The phytosociological approach to analyze the diversity of vegetation is an important tool in the hands of biologists trying to understand community structure. Vegetation surveys and habitat analysis provides information that can be useful in conservation, environment management and landscape plannings (Haila & Margules, 1996).

3.1. Concept of Diversity

The concept of diversity is particularly important because it is commonly considered an attribute of natural or organized community (Hairston, 1964). Species diversity is defined by the combination of species richness and species abundance (Molles, 1999). Species richness is based on the number of species and is the simple and most commonly used measure and indicator of biological diversity (Peet, 1974). Many factors like the competition, geography, evolution, environmental parameters are the reason for the pattern of species richness. (Criddle *et al.*, 2003). The species abundance describes the relative abundance of the species. Species evenness is the measure of the degree to which all species share dominance in an area (Rentch *et al.,* 2005), and its relation with the species richness has been assessed (Gosselin, 2006). Based on species abundance models, the comparative analysis of species abundance with associated diversity indices can provide valuable information on the diversity of the community (Magurran, 1988).

3.1.1. Diversity indices: To understand the phytosociology of the forest community, a number of quantitative diversity indices have been proposed (Fisher *et al.,* 1943, Sorensen, 1948, Simpson, 1949, Margaleff, 1958). Preston (1948, 1962), Margaleff (1958), Hairston (1959, 1964), Lloyd and Ghelardi (1964) have given particular attention to the distribution of number of individuals among the species of a community. Gause (1936) explained that the most important structural property of a community is a definite quantitative relationship between abundant and rare species. Several other indices have also been devised to compare the community similarity indices (Whittaker, 1952; Bray & Curtis, 1957; Austin & Orloci, 1966). Another important aspect of a species in the community is the distribution. The species may be distributed in clump, uniform or randomly manner in a community (Odum, 1971). Altitude is another important parameter in phytosociological studies when it comes to mountain regions. It is one of the

decisive factors in shaping the spatial pattern of species diversity (Zimmerman & Kienast, 1999; Lomolino, 2001). Change in altitude reflects the change in the floristic composition and community setup of the vegetation (Sakya & Bania, 1998). The climatic behavior of the area is also dependant on the altitude which in turn affects the temperature and rainfall distribution (Arora, 1995). The altitude and the slope influence the species richness and dispersion behavior of tree species in hilly terrains (Ellu & Obua, 2005). (Kharkwal *et al.*, 2005) suggested that, with increase in altitude, the species richness declined.

3.1.2. Life form classification: Understanding the life form of the plant species is also an important aspect of vegetation analysis. It is a direct indicator of macro and micro environmental conditions and the adaptation of the vegetation to these conditions (Shimwell, 1971). Raunkiaer (1934) recognized life-forms for different habit groups of plants and provided one of the most widely used functional criteria for describing vegetation. His approaches were based on the position of the perennating bud on the plant with respect to ground surface, from which the next season's growth aroused. Later Mueller-Dombois & Ellenberg (1974) modified it to include the plant features in favourable season. The population structure in the forest community is also dependent upon the regeneration behavior of seedlings and saplings, especially of tree species. The presence of sufficient population of saplings indicates successful regeneration in the next season (Saxena & Singh, 1984; Khan *et al.*, 1987). Studies on tree population structure and regeneration behavior in different forest ecosystems have been carried out by (Veblen *et al.*, 1979; Cao *et al.*, 1996; Uma Shankar *et al.*, 1998; Bhuyan *et al.*, 2003; Pokhriyal *et al.*, 2010; Comita & Engelbrecht, 2014).

3.2. Global Phytosociological Studies

Phytosociological studies have been reported from different corners of the globe from different ecosystems. Klinge & Rodrigues (1971) studied on the structure and floristic composition of the central Amazonian rain forest. Herrera (1977), Klinge *et al.*, (1977) and Klinge (1978) investigated the ecology of the Venezuelan Caatinga forest in the San Carlos de Rio Negro. The structure of the Tierra firme rain forest in the San Carlos region were analysed by Christopher & Murphy (1981). Bekele (1994) investigated the floristic composition and ecological relationships of the humid forest of western Ethiopia.

Johnson (1996) studied the phytosociological and gradient analysis in the Rocky Mountain National Park, Colorado. Marimon *et al.,* (2002) based on the stratified sampling studied the stream forest in Eastern Mato Grosso Brazil. Linkie *et al.,* (2004) analysed the satellite imagery map of forest loss in Kerinci Seblat National Park at Sumatra. Lovett *et al.,*(2006) investigated the changes that took place in the tropical forest vegetation in Udzungwa Mountain National Park in Tanzania. Ebenezer *et al.,* (2008) studied the phytosociology of weed flora in three abandoned farmlands in Nigeria. Pitman (1999) studied the distribution of trees in the Amazonian forests. Daemane (2010) studied on the ecology of plant communities in Highveld National Park in South Africa. The phytosociology of the oak and spruce forest in south-eastern Transylvania was explored by Indreica and Kelemen (2011) and represented a peculiar type of phytocenoses. Cano *et al.,* (2014) on the basis of Braun-Blanquet method investigated the phytosociology of some serpentine plant communities in the Dominican Republic and revealed three different kinds of forests. Similarly, Ndah *et al.,* (2013) studied the diversity and species composition in the disturbed Takamanda Rainforest in Cameroon. Ighbareyeh *et al.,* (2014) studied the phytosociology and ecology of plants in Palestine.

3.3. Phytosociological studies in Asian continent

A number of studies on the phytosociology and plant diversity have also been carried out in the Asian continent. Ashton (1972) investigated the quaternary geo-morphological history of Western Malaysia and lowland forest. Proctor (1988) made ecological study on the small basic mountain in Sabah, Malaysia. Phillips (1994) explored the dynamics and species richness of Tropical Rainforest. Adam *et al.,* (2007) investigated the floristic composition and forest structure of lowland forest in Lok Kawi, Malaysia. Cao & Zhang (1997) studied the tropical forest vegetation in Xishuangbanna, South-west China. Winkler (1998) analysed the distribution and fragmentation pattern of southern and northern mountain forests in Tibet. Li Ping *et al.,* (2011a) studied on the factors that affect the community structure in mountain coniferous forest in China. Song (1991) studied the phytosociology of sub-alpine coniferous forest in Korea. The structure, composition and species diversity in Rain forest tree communities on Mount Kinabalu, Borneo was studied by Aiba & Kitayama (1999). Krestov & Nakamura (2002) studied the phytosociology of *Picea jezoensis* in Far East Japanese forests.

Shimono *et al.,* (2010) made a large scale investigation on the pattern of plant diversity at high altitude of Tibetan plateau. Wahab *et al.,* (2008) investigated the phytosociological sampling, structure, age and growth rates of pine forests of Dangam district of Afghanistan. Chaudhry *et al.,* (2001) made phytosociological studies in Chhumbi Surla wildlife sanctuary in Pakistan. Ahmed *et al.,* (2006) quantified the phytosociological status in various climatic zones of Pakistan. Sher & Khan (2007) surveyed the vegetation of Chagharzai valley in Northern Pakistan and recorded 223 plant species. Similarly, Sobuj & Rahman (2011) assessed the plant diversity in Khadimnagar National park in Bangladesh. Nath *et al.,* (2000) studied the tree species diversity of Sitaphar forest reserve in the Chittagong hill tracts forest division in Bangladesh. Vetaas & Grytnes (2002) made study on the distribution and plant species richness along the Himalayan elevation gradient in Nepal. Bhattarai & Vetaas (2003) observed the variation in plant species richness of different life forms along a sub-tropical elevation gradient in the Eastern Nepal. Panthi *et al.,* (2007) studied on the correlation between species richness and elevation in Trans Himalayan Plateau, Nepal between altitudinal ranges of 3000 to 4000 m. Hukusima *et al.,* (2013) studied the phytosociology of Beech forest in East Asia.

3.4. Studies in Indian sub-continent

Over the years, studies on the vegetation analysis, species diversity and community structure have been carried out in different forest ecosystem in the Indian sub-continent. Malik *et al.,* (2007) studied the phytosociological attributes of different plant communities of Pir Chinasi hills of Jammu and Kashmir. Nazir *et al.,* (2012) made phytosociological studies of the vegetation of Sarsawa Hills in Jammu and Kashmir in relation to environmental variables and anthropogenic influences. Sharma *et al.,* (2001) studied the dominance and diversity of vegetation of polluted habitats in Jaipur and reported 74 plant species. Studies on the phytosociology of some selected arid regions of the Thar desert was conducted by Sharma & Pandey (2010). The Western Himalayan regions were explored by many workers in the past decade. Nautiyal *et al.,* (2001) studied the phenology and growth form distribution pattern in Western Himalayan alpine pastures. Kala & Mathur (2002) analysed the vegetation distribution along an altitudinal gradient in the Trans-Himalayan region of Ladakh. Sagar & Singh (2004) examined the demographic instability of tree species in tropical dry deciduous forests of

Northern India. Gupta *et al., (*2014) assessed the phytosociological diversity of kuther watershed in Himachal Pradesh. The plant species diversity along the altitudinal gradient of Bhabha Valley was surveyed by Chawla *et al.,* (2008) which revealed 313 species of higher plants. Gairola *et al.,* (2008) studied the forest vegetation pattern along the altitudinal gradient in sub-alpine zone of west Himalaya. Kukshal *et al.,* (2009) conducted phytosociological analysis and life form pattern study of grazing land between 1100-1400m amsl in the temperate region of Northwest Himalaya. Khan *et al.,* (2012) studied the vegetation dynamics in the Western Himalayas in relation to topography and climate change. The species diversity and tree regeneration pattern in the tropical forests of Western Ghats was investigated by Jaykumar & Nair (2013). Rao *et al.,* (2013) observed the phytosociological pattern of tree species in the tropical forest of Srikakulam district in Andhra Pradesh thereby recording 129 trees species belonging to 96 genera and 46 families. Reddy *et al.,* (2011) studied the structure and floristic composition of tree stand in tropical Eastern Ghats of northern Andhra Pradesh. Similarly, Rao *et al.,* (2013) studied the phytosociology, soil conservation and socio economic aspects in red sand dunes near Bhimili, Visakhapatnam. Phytosociology of roadside community of ecologically tolerant species in Kerala was done by Ray & George (2009). Besides these, the earlier workers have explored the diversity in the peninsular India including the deciduous forest of Madhumalai (Sukumar *et al.,* 1992), wet evergreen forest of the Western Ghats (Parthasarathy *et al.,* 1992; Pascal & Pelissier, 1996). Floristic diversity of the tropical rain forest of Western Ghats was studied by Visalakshi (1995). Flora of Agasthyamala was undertaken by Mohanan & Sivadasan (2002). Singh & Singh (1986) studied the changes in floristic composition of different forest communities in central Himalayas. Towards the Eastern Himalayan region, an enormous amount of work has been done over the past few decades. Nath & Banerjee (1986) studied the phytosociology and soil characteristics of the forests in eastern Himalaya. Species diversity and population structure of tree species along the altitudinal gradient in Kumaon Himalaya was studied by Bankoti *et al.,* (1986). Kumar & Bhatt (2006) studied the floristic diversity and abundance to frequency ratio of trees, shrubs and herb species in different tropical forests sites of Garhwal Himalaya. Kumar *et al.,* (2006) conducted phytosociological investigations on the tree species diversity and distribution pattern in tropical forests of Garo Hills.

Similarly, Todaria *et al.,* (2009) studied the species richness, diversity and composition in *Anogeissus latifolius* mixed forests of Garhwal Himalaya. Devlal & Sharma (2008) concentrated on the dominance and diversity of tree species along the altitudinal gradient of Garhwal Himalaya and revealed *Quercus leucotricophora* as the most dominant species. Hussain *et al.,* (2008) described species composition and community structure of different forests stand within the altitudinal range of 1500-3000m amsl in Kumaon Himalaya. Singh *et al.,* (2009) analysed community composition and soil characteristics of Oak and Pine forests of Garhwal Himalaya. Uniyal *et al.,* (2010) investigated the plant diversity in two forest types along the disturbance gradient in watershed Garhwal Himalaya. Raturi (2012) observed the forest community structure along an altitudinal gradient of Rudraprayag district in Garhwal Himalaya and classified it into four forest types. Rawat & Chandra (2012) studied the tree vegetational analysis in the temperate forest of Uttarakhand lying between 1900-2200m. Reddy *et al.,* (2007) quantified the floristic inventory of tropical forests differing in dominance, composition, diversity and structure in Eastern Ghats of Orissa. Panda & Das (2004) conducted elaborative work on the Flora of Sambalpur. Kumar *et al.,* (2008) analysed the regeneration potential and community structure of natural forests in the Gangotri Valley.

3.5. Studies in North-East India

On the North-Eastern side, the floristic diversity studies were carried out by workers like Jamir & Pandey (2003), Chatterjee *et al.,* (2006), Mao *et al.,* (2009). Flora of Assam was undertaken by Bora & Kumar (2003), the diversity and distribution of bamboos in Assam was studied by Barooah & Borthakur (2003). The Pteridophytic flora of Eastern India was studied by Ghosh *et al.,* (2004). Singh & Panigrahi (2005) surveyed ferns and fern-allies of Arunachal Pradesh. Behera & Roy (2005) analyzed the biological richness in the Arunachal Pradesh part of the Eastern Himalaya by using remote sensing data. Devi & Yadava (2006) assessed the vegetation of tropical semi-evergreen forest of Manipur. Rana & Gairola (2009) analysed the forest community structure and composition along an elevation gradient in Lohit district of Arunachal Pradesh Tripathi *et al.,* (2010) studied the dominance, diversity and population structure of tree species along the fragmented sub tropical humid forest of Northeast India. A study on the flora of Sikkim was done by Hajra & Verma (1996). Singh & Chauhan (1997) surveyed

the plant diversity in Sikkim Himalaya. Maity & Maiti (2007) explored the wild flowers of Kanchenjunga Biosphere reserve in Sikkim. Lepcha (2010) explored and carried out elaborative work on the virgin flora of Pangolakha Wildlife sanctuary in Sikkim. Tambe & Rawat (2010) studied the alpine vegetation of the Khangchendzonga landscape in Sikkim Himalaya. The *Flora of India* (Hajra *et al.*,1993-2000) published by the Botanical Survey of India in seven volumes discusses the distribution of plant species in the Indian sub-continent. However the *"Flora of British India"* by J.D. Hooker (1872 – 1879) produces the regional floras in more elaborative way. Beside these, several forest floras have been published (Hooker, 1872 – 1897; Brandis, 1906; Talbot, 1909-1911; Parker, 1918; Parkinson, 1923; Osmaston, 1927; Gamble, 1984).

3.6. Studies in West Bengal

On the other hand, no any publications on the floristic work in West Bengal have been found prior to Roxburgh (1814). The "*Hortus Benghalensis*" published by Roxburgh (1814) has incorporated around 3500 species of plants under cultivation in the Botanic Garden at Calcutta. A few important publications brought out during the mid-nineteenth century by Long (1857-59) are on indigenous plants of Bengal. Prain (1903), in his two volumes detailed work published the flora of the Plains of Bengal as "*Bengal Plants*".

With the revival of many botanical activists, there were ample floristic researches during the past few decades. Sanyal (1994) contributed distinctively on the knowledge of the forest flora of Bankura district. Bakshi (1984) conducted survey on the flora of Murshidabad district. Other floristic accounts of such studies include contribution to the Flora of Purulia district by Malick (1966), herbaceous flora of Jalpaiguri district by Sikdar & Samanta (1983), vegetation of Malda district by Krishna & Dutta (1983), Chowdhury (2009), on the vegetation structure in the wetlands of Malda district, Enumeration of the plants of Burdwan district by Bhattacharya (1986), Mukherjee (1965) on Jalpaiguri district, Guha (1968) on floristic survey of Birbhum district, Dutta & Majumdar (1966) on flora of Calcutta and its vicinity, Banerjee (1968) on grasses of Burdwan, Banerjee & Pal (1974) enlisting the grasses of Indian Botanic garden, Maji & Sikdar (1983) enumerating the sedges and grasses of Bankura district. Basu (2009) studied the phytosociology of a sacred groove at Biharinath hill in West Bengal and reported 118 species. Das *et al.*, (2010) studied the phytosociology of the medicinal plant conservation areas

in Duars region. Bauri *et al.,* (2013) assessed the phytosociology of selected beats from Durgapur forests. Shukla *et al., (*2014) surveyed the plant diversity at Chilapata reserve forest in sub-humid tropical area of Duars in West Bengal. Apart from these floristic works by many botanists, there have been reports of large number of new species and several new distributional records for the state of West Bengal.

3.7. Explorations in Darjiling Himalaya

As far as the botanical explorations in the Darjiling hills are concerned, when Gamble came to North Bengal in 1872, he was fascinated by the varied forests in the Himalayan district of Darjiling and described its forest types (Gamble, 1875). He prepared an exhaustive and very long list of more than 800 species of trees, shrubs and woody climbers from the district. Cowan & Cowan (1929) further enriched that list. Hooker during his historical journey through Darjiling to Sikkim prepared an excellent narration about the Himalayan vegetation right from its commencement at the foothills to the highest limit at Tonglo in the Singalila range (Hooker, 1849). In his observations, he concluded that the vegetational zones were tropical from the plains to 1600m and beyond this upto 3600m it was temperate. Clarke (1876, 1885) also made thorough collections from the district of Darjiling and prepared valuable notes of this botanically rich valley. He narrated his collections mostly from the temperate zones of Darjiling to Tonglo and further up towards Sandakphu. Champion & Seth (1968) in their survey classified the forest types of Darjiling Himalaya into North tropical semi-evergreen forest, Eastern sub-montane semi-evergreen forest, North Indian moist deciduous eastern hill Sal forest, North Indian moist deciduous Eastern bhabar Sal forest, North Indian moist deciduous forest, Eastern Himalayan sub-tropical wet hill forest, Eastern Himalayan sub-tropical wet temperate forest, Eastern Himalayan mixed coniferous forest, Montane bamboo brakes, Alder forest and Eastern Himalayan sub-alpine birch/fir forest. Dash (1947) classified the forest of Darjiling hills on the basis of altitude as Lower hill forest (upto 970m), Middle hill forest (970 – 1940m) and Upper hill forest (1940 – 2900m).

The other works that followed the previous workers with the description of the taxa includes that of Biswas (1966), Flora of Eastern Himalaya (Hara, 1966, 1971; Ohashi, 1975) who has engrossed the plant collection from North Bengal, Sikkim, Eastern Nepal and Bhutan parts of Eastern Himalaya. The Flora of Kurseong sub-

division of Darjiling by Matthew (1981) covering an altitudinal range from 130 – 2120 m. Not only from Kurseong, but Matthew also incorporated numerous plants out of Kurseong sub-division that included Darjiling (2050 – 2200 m), Gangtok (1800 m), Gairibas (1640 m), Lodhoma (1100 m), Pokhriabong (1680 m), Tonglu-Sandakphu (3000 – 3636 m), Ghoom-Tiger Hill and Senchal lake areas (2300 – 2630 m). Das (1986) and Das & Chanda (1987) have done some floristic and palynological work in this region within a particular altitudinal range of 1500 – 2400 m. Pal & Chanda (1983) have also worked on the palynology of few common herbaceous plants of Lava, Rechila and Lolegaon areas of Darjiling district. Samanta & Das, (1995) studied the distribution of angiospermic climbers from this region. The angiospermic diversity and endemism in the hill was investigated by Das (1995, 2004). Das & Lahiri (1997) studied the phytosociology of the ground cover vegetation in Tiger hill.

Another extensive work can be found in the Flora of Bhutan (Grierson & Long, 1983, 1987, 1991, 1999, 2001; Noltie, 1994, 2000) that covered areas from Darjiling and Sikkim too. Rai (2001) surveyed the Angiospermic Flora of Neora Valley National Park covering an altitudinal range of 300 – 3100 m and revealed a high diversity of floristic elements with the record of 812 species and varieties of angiosperms distributed over 138 families. Kadir (2001) studied the ecology of sub-himalayan herblands with special emphasis on the ecology of *Streptocaulon sylvestre*. Lama (2004) has worked specifically on the taxonomical and ecological studies of the maples (*Acer* spp.) of Darjiling – Sikkim region. Ghosh (2006) studied the biology of tea garden weeds of the region. Rai (2006) have characterized the plant diversity of Darjiling hills using remote sensing techniques.

Although it is understood that the vegetation of Darjiling have attracted several explorers, researchers, scientists, conservationist from around the globe, it has undergone a tremendous change in course of time. These earlier works and explorations do not reflect the absolute vegetation structure in the area. Bhujel (1996), Samanta (1998) and Rai (2001) tried to produce one classification of Darjiling vegetation but with no basic data and/or the floristic composition for different types of vegetation along the altitude and also the synecological approaches. It is now important to map the vegetation structure of this area along with their trend of modification along the altitudinal gradient, change of aspects, slopes, extension of human settlement etc. Rai (2006) have produced some

important maps related to land use of Darjiling, but these maps alone cannot express the formation of different types of vegetation, their present flora and existence of endemic and RET species etc.

Keeping these thoughts in mind, the present work has been planned to characterize and classify the vegetation types as a function of altitude in Darjiling hills, to study and co-relate the distribution of plant communities to some environmental parameters and compare the species richness of different community, to describe trends in vegetation along altitude with special focus on diversity and community composition, establishing relationship (phytosociological status) of plant diversity with different habitats, assess the magnitude of impact at different level of disturbances on vegetation of Darjiling hills, to identify and prioritize the habitats for different threatened species of plants and determining the corridors for reintroduction practices and also to obtain information that could provide guidelines to implement sustainable management of these biologically rich resources.