Chapter 8

Summary
8.0. SUMMARY

Environment comprises of both abiotic and biotic components and there exist inter-relationship between each and every components of our environment. As when ecosystem is considered, general rules of ecology do persist in each system of our environment when biotic components are involved. Therefore, when a forest system is considered, there also, we find distinct structure and their function. A forest system largely comprises of trees which acts as the producers of the system and provides habitat to several small and large organisms that indeed plays a vital role in functioning of the forest system. Abiotic factors include air, water, sunlight etc. Forests not only provide food and shelter to the wild but also provide resources directly or indirectly to human residing near the forest fringes as well as those settled far away. Thus, if any abnormalities occur then it is obvious that the system will be affected which is a major distress for us. As one of the major concerns of today is global climate change, forests play a dynamic role in maintaining ecological balance of the area as it acts as CO₂ sink in the region.

The study is undertaken in tropical dry deciduous forest known as Matha Protected Forest (MPF) of Purulia district, West Bengal, India which is inhibited with water limitation, lower supply of nutrients. The study focuses on how habitat fragmentation affects the distribution of plant and animal species and also how the natural resources are affected. Site characteristics were evaluated that revealed undulating topography. Study area is fragmented into three habitat patches viz. habitat patch A, habitat patch B and habitat patch C where habitat patch A and C were previously one patch as according to the forest boundary. But with increased encroachment and construction of road, it has got fragmented into two parts. Habitat B is a separate part of the same forest. It is naturally fragmented as river Sankh separates habitat B from habitat A.

From the study it is revealed that Habitat A is larger than habitat B and C. The shape of habitat A is nearly circular while that of habitat B and C is elongated with less interior habitat. Habitat A is more isolated than B and C where interaction among edge species is more at habitat B and C. Species diversity also varies with patch characteristic.
More the interior less is the interaction with edge species and more is the diversity in that patch compared to the others

Causes of habitat fragmentation are various. Demographic changes cause land use changes that includes the biotic factors like illegal forest felling, forest fire (anthropogenic), illegal hunting of wild animals, overgrazing and sweeping of forest floor. Biotic factors indeed accelerate process of habitat loss and fragmentation.

Study on land use and land cover was done with the help of satellite imageries and ArcGIS software. It was studied through several years (1992, 2001, 2005, and 2009) for analyzing the decadal changes that occurred in the area. Class division includes dense forests, open forest and degraded forest. The healthiness of vegetation is measured by preparing NDVI (Normalized Difference Vegetation Index) of successive years for Matha Protected Forest that indicates decreasing trend of forest.

Inventory on plant and animal species were made through field survey and secondary data collected from forest officials. It is also evident from the analysis that most of the plant species are found poor in number than the species which were recorded in the year 1983. In case of animals, many of them have reduced in number and some are not found in the area in recent years. The loss is mainly due to habitat destruction and fragmentation that forced the animals to migrate from the area. Hunting has also become more pronounced in recent past which is directly responsible for loss of animal species. Three major processes for habitat fragmentation is evident at MPF: (i) loss of interior habitat, (ii) increase in amount of edge and (iii) reduction in total amount of habitat.

Coming to the consequences on ecological processes, it is also worth mentioning that habitat fragmentation affects the nutrient dynamics in fragmented landscape. Therefore, while studying nutrient cycling in fragmented patches of Matha Protected Forest, firstly, forest structure is determined through phytosociological analysis that includes determination of tree height, canopy coverage, diameter at breast height (dbh) and above ground biomass (agb). Mainly quadrat study helped in evaluating the forest type, its dominant and predominant plant species.

Matha Protected Forest is found to be a gregarious type of forest with single dominant species of Sal (Shorea robusta) along with predominant species of Piyal.
(Buchanana latifolia), Sidha (Lagerstroemia parviflora) and Kendu (Diospyros melanoxylon) Species diversity varies with different patch characteristics (patch size, shape, isolation and interaction) Three habitats of forest- A, B and C have different patch characteristics as mentioned and thus the respective species diversity is found to be varying as 2.65, 1.43 and 1.85 respectively at tree level.

To determine nutrient dynamics in the forest only major nutrients like N, P, K were analyzed for green leaves and leaf litters whereas for site characteristics, soil pH, moisture content, bulk density, particle density, porosity, soil organic carbon, nitrogen, total and available phosphate, exchangeable K and Na were analyzed. Beside physico-chemical analysis of soil, microbial population of mainly bacteria and fungi are determined as microorganisms play a vital role in nutrient cycling by acting as decomposers in the study area.

Study reveals that soil is acidic in nature Moisture content is found to be 4 to 9% Microbiological studies showed that bacteria and fungi grow well during monsoon than pre and post monsoon due to increase in moisture content Soil organic carbon ranges from 0.75 to 1% in Matha Protected Forest It varies both habitats wise as well as seasonally Similarly N% also varies that ranges between 0.025 to 0.029% Likewise P, K and Na concentrations also vary among the three habitats (habitat A, B and C) of Matha Protected Forest as well as significant seasonal variation is evident in the area.

Major nutrient concentrations of four plant species and nutrient quality of litterfall were evaluated i.e. the dominant species Sal (Shorea robusta) and three predominating species Piyal (Buchanana latifolia), Sidha (Lagerstroemia parviflora) and Kendu (Diospyros melanoxylon) Efficient use of nutrients is determined at each habitat considering four plant species Nutrient use efficiency is high as nutrient concentrations in green leaves are much higher than concentration of nutrients in leaf litters Higher litter nutrient is noticed during rainy season (monsoon) than compared to pre and post monsoon Forest stand has higher within stand nutrient use efficiency of P and K in habitats B and C than habitat A inspite of lower availability of P and K at habitat B and C.
Similarly, indices of nutrient retranslocation efficiency are also determined at Matha Protected Forest. N retranslocation efficiency is increased than P and K and thus N is remobilized. But among the habitats, habitat A has lower nutrient retranslocation efficiency than habitats B and C. Extent of nutrient retranslocation efficiency are higher for Sal (Shorea robusta) than other species. Hence, the study at Matha Protected Forest reveals that habitat fragmentation affects not only the occurrence of species in the area or the species diversity of the area but also hinders nutrient cycling in fragmented patches as site dependent and in between species differences are observed.