



Impact of Silica Mining on Floristic Diversity of Shankargarh Forest, Allahabad, India

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Flora is an important part of the ecosystem that integrates the effects of the total environment. It is predominantly a result of physico-climatic conditions of a region. In other words, floristic composition represents a true image of a terrain and seasonal variations of temperature and precipitation and provides basic information for understanding of regional development. It has a highly functional role in providing nutrients for an ecosystem and provides suitable habitat, food and shelter for other biota. It can provide information regarding species composition and structure and its functional role in the landscape as a whole. Knowledge of floristic composition is valuable for many ecological studies such as succession and nature of plant communities which are supportive in reclamation of abandoned sites.

Mining is an economic activity that withdraws resources from nature. In the process of mineral extraction, mining causes massive damage to the landscape and biological communities. The forests and mining are intimately and intricately linked. The forests are the major victims of the mining activities, which can be gauged from the denudation of the forest cover in all the mine belts. Natural plant communities get disturbed due to mining activities and following mining, the habitats become impoverished presenting a very rigorous condition for its growth. The unscientific mining of minerals poses a serious threat to the environment resulting in the reduction of forest cover, erosion of soil at a greater scale, pollution of air, water and land and reduction in biodiversity.

An understanding of the impact of mining on the environment particularly on vegetation characteristics is a prerequisite for further management plan of these mining sites. The present study deals

with the study of the floristic composition of the silica mining area of Shankargarh Forest both at disturbed and undisturbed site and elucidates the difference in floral composition between disturbed and undisturbed sites. Experimental basis of the impact of silica mining on floristic diversity of Shankargarh forest, Allahabad, India has been evaluated.

The vegetation characteristics of the disturbed area were compared with that of adjacent undisturbed forests of the area. Plant species diversity at tree, shrub, climber and herb levels was more in undisturbed forest of the area as compared to disturbed area. A total number of sixty four (70) species representing twenty five (25) families of vascular plants (including trees, shrubs, climbers and herbs) occurred on the undisturbed forest site whereas in case of vegetation of disturbed site, a total of thirty three (33) species representing eighteen (18) families occurred.

As far as vegetation of the undisturbed forest area was concerned, the most dominating tree species of the area was *Butea monosperma* followed by *Flacourtia indica*, *Prosopis juliflora*, *Dalbergia sissoo*, *Acacia leucophloea*, *Lagerstroemia parviflora*, *Acacia catechu* and *Acacia nilotica* which were also the major species of the area. Among shrub and climber species, *Blepharis repens*, *Crotalaria* sp., *Hemidesmus indicus* and *Zizyphus numularia* were the major species. Among herbs and grasses, *Euphorbia hirta*, *Dactyloctenium aegyptium*, *Cynodon dactylon*, *Evolvulus nummularious*, *Vernonia cinerea*, *Digitaria ciliaris*, *Achyranthus aspera*, *Alysicarpus monilifer*, *Evolvulus alsinoides*, *Tridax procumbans* were the major species and were comprising higher part of the community structure, whereas tree vegetation at



Table 1: Species and family compositions of Flora reported at disturbed and undisturbed site:

Vegetation	Species composition at Un disturbed Site			Species composition at Disturbed Site		
	Trees	Shrubs and climbers	Herbs	Trees	Shrubs and climbers	Herbs
No. of species	18	12	40	10	5	18
No. of genera	16	11	37	9	4	18
No. of family	10	9	13	8	4	10

Table 2: Indices of similarity for vegetation between disturbed and undisturbed site:

Indices of Similarity	Trees		Shrubs/Climbers		Herbs	
	Similarity	Dissimilarity	Similarity	Dissimilarity	Similarity	Dissimilarity
Sorensons Index	0.5714	0.4286	0.4706	0.5294	0.4483	0.551
Jaccard's Index	0.4	0.6	0.31	0.69	0.288	0.712

disturbed site was dominated by *Butea monosperma* and *Flacourtia indica*. Dominance of *Butea monosperma* and *Flacourtia indica* in disturbed site suggests their ability to grow in the disturbed environments and harsh conditions. In case of shrubs and climbers, *Carissa opaca*, *Hemidesmus indicus* and *Zizyphus numularia* were major species. Among herbaceous species, *Cynodon dactylon*, *Eragrostis tenella*, *Dactyloctenium aegyptium*, *Vernonia cinerea*, *Gomphrena celosioides*, *Oldenlandia corymbosa* and *Aristida* sp. were contributing major part to community structure. The predominance of Poaceae was observed and species reported were mainly specific to poor soil.

The undisturbed area had greater plant density compared to that of the disturbed areas because of the moisture stress and nutrient deficient soil. Low growth form, sparse density and ability to tolerate low nutrient levels and low moisture conditions are probably the adaptations to the harsh physical nature of substrate. Low nutrient habitats are usually colonized by species with low relative growth rates. These adaptations enable colonizing species to maximize the nutrient uptake and ensure high nutrient

use efficiency in low nutrient environments.

Though, economic development, social equity and environmental protection are the essential elements for sustainable development. Reconciling the economic and social development opportunities with the need for biodiversity conservation and environmental protection requires the development of more scientific, strategic and integrated approaches to manage the mining area. Vegetation potential of any area is dependent upon physical conditions, soil surface characteristics, edapho-biotic components, climate, vegetation, environmental limitations and their interaction. Individual species success and community composition are governed by local site variables. The substrate conditions on individual mine sites act as an 'environmental sieve'. Most suited species are able to establish and become an important component of the community. In the present study, due to extensive silica mining, large chunks of the Shankargarh forests have been turned into degraded forest thereby creating unfavorable habitat conditions for plants and animals. Mining has caused massive damage to the landscape and biological communities.