Indian Journal of Tropical Biodiversity
© Society for Promotion of Tropical Biodiversity, Jabalpur

Short Communication

STANDARDIZATION OF QUADRAT DIMENSIONS FOR PHYTOSOCIOLOGY IN MEJA FOREST, PRAYAGRAJ, INDIA

VANDITA[1]* AND KUMUD DUBEY[2]

[1]*Forest Research Institute, Dehradun (ICFRE-ERC, Prayagraj), India*
[2]*ICFRE - Eco-Rehabilitation Centre, Prayagraj, India*

**Corresponding author email: vandita1313@gmail.com*

ABSTRACT: Plant sampling through quadrat is one of the most widely accepted methods to conduct vegetation survey. However, it is crucial to determine optimal size of quadrat to adequately represent the community composition. The site for this study was a forest next to the stone mines in the Meja region of Prayagraj district, Uttar Pradesh, India.This study was conducted as a prelude to plant community structure analysis of the forest for analysing impact of stone mining on the flora. The appropriate size of quadrats to sample the field was determined using 'Species-Area Curve'. The quadrat size was determined for herb, shrub and tree species. The optimal size of quadrat required to sample the forest was determined to be 90x90 cm, 3x3 m and 30x30 m for herb, shrub and tree species, respectively. The determined quadrat size ensures a balance between adequate species representation and practical feasibility in field studies. The findings of this study will not only facilitate resource optimization but will also ensure consistency and comparability across studies.

Keywords: *Forest sampling, Plant community structure, Plant sampling, Species-Area Curve*

Citation: Vandita, Dubey K (2025) Standardization of Quadrat Dimensions for Phytosociology in Meja Forest, Prayagraj, India. Indian J Trop Biodiv 33 (1): 50-53.

Received on: 03/08/2025; Accepted on: 10/09/2025

INTRODUCTION

To understand the impact of stone mining on plant community structure, its phytosociological study needs to be conducted. The analytical characteristics of plant community are determined mainly by three sampling unit viz. area, line, and point, as used in quadrat, line, and point methods respectively (Misra, 1968). In ecology, quadrat method refers to an intensive study of the vegetation of a small area, known as quadrat, in order to get a comprehensive understanding of the vegetation as a whole. The size of the quadrat used for sampling determines the chance for every species to be present in that quadrat (Saleem *et al.* 2019); a small size quadrat may not adequately represent the characteristics of plant community, whereas a large size quadrat increases the research issues due to excess data collection and

more time consumption for the same (Hao *et al.* 2021). Therefore, it is most suited to determine the optimal requirements in this respect based on the conditions of study area before conducting the sample survey.

This study sets out to determine the optimal quadrat size for herbs, shrubs, and trees in a mining-adjacent tropical dry deciduous forest.This study was conducted as a prelude to plant community structure study of the forest. For this study, the quadrat size was standardized using the "Species-Area Curve" methodology given by (Misra, 1968). Their methodology determines a minimal area for plot, above which the number of species does not increase further. Sampling the vegetation using plot size larger than the determined 'minimal area' yields comparable results. By identifying the minimum area required to capture species diversity for each life form, this study provides a solid foundation for the phytosociological assessment. Beyond its methodological role, the work contributes to ensuring that ecological surveys in disturbed forest landscapes are efficient, comparable, and capable of revealing the true extent of mining impacts on plant communities.

MATERIALS AND METHODS

STUDY AREA

The study site (Figure 1a and 1b) is a forest near the stone mines in Meja Tehsil of Prayagraj district, Uttar Pradesh (25º07'39" N, 82º04'02" E). It is a tropical dry deciduous forest situated in the Trans-Yamunaregion of Prayagraj. The climate of the region is characterized by three distinct seasons: a hot dry summer (March–June), a monsoon season with the bulk of annual rainfall (July–September), and a cool dry winter (October–February). Mean annual rainfall is around 800-1000 mm, most of which is concentrated in the monsoon months, while mean temperatures range from about 8 °C in winter to over 45 °C in peak summer. The study was conducted in early March before the start of dry summer months.

The selected forest patch lies immediately adjacent to active stone mining sites, making it a critical area to study as it is subjected anthropogenic pressures from mining activities.

(a) (b)

Fig. 1. (a) Satellite image of the study site, (b) The study site

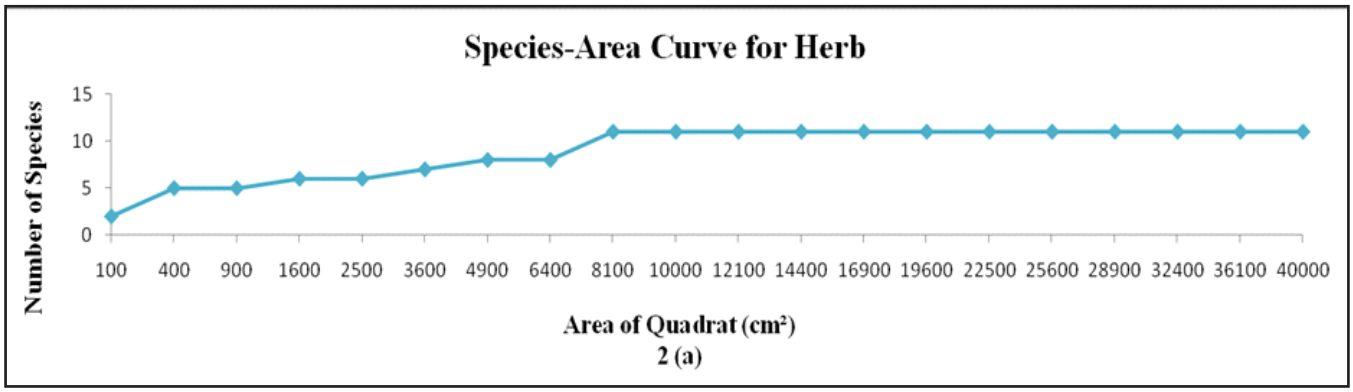
METHODOLOGY

For this study, the quadrat size for all the three vegetation stratawas standardized using the "Species-Area Curve" methodology given by (Misra, 1968). For determining the optimal size of quadrat for herbs, after randomly selecting a spot in the forest, an L-shaped structure was formed with a piece of string and some nails. With another piece of string and nails an area of 10×10 cm^2 was differentiated and the number of herb species present in this area was noted.Then the area was increased to 20×20 cm^2 repeating the above process and the additional number of species were recorded. The process in the above step was repeated increasing the area by 10×10 cm^2 every time till 200×200 cm^2 of area, and additional number of species was recorded every time. After summarizing the data in a table, a graph was plotted with total number of species on Y-axis vs. area of quadrat on X-axis. The point at which the curve starts flattening up determines the minimum area of quadrat required to sample the field for herb. This curve is called "Species-Area Curve".

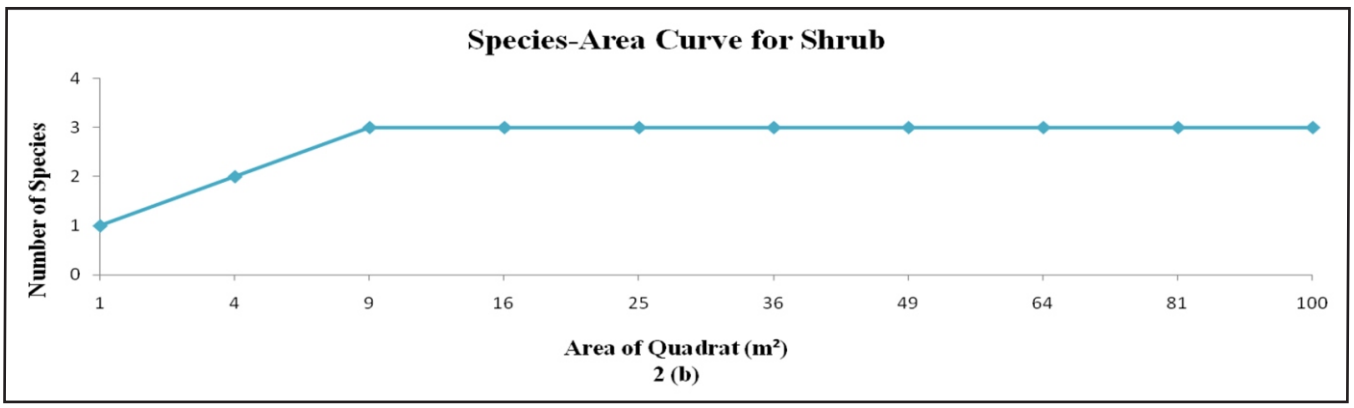
The above mentioned process was repeated for shrub and tree species as well by keeping the area of quadrat for shrub as 1x1 m^2, 2x2 m^2 and so on upto 10x10 m^2; and in case of tree as 5x5 m^2, 10x10 m^2 and so on upto 50x50 m^2.

RESULTS

In order to determine the appropriate size of quadrat for sampling the field a "Species-Area Curve" was plotted. In the graph, as the quadrat size is increasing, initially the data content is noted increasing, but eventually the curve flattens. The point at which the curve flattens gives the minimum required area of the quadrat. The area of quadrat required for the sampling of herb species was estimated to be 90x90 cm² (Figure 2a), for shrub species it was 3x3 m² (Figure 2b) and for tree species it was 30x30 m² (Figure 2c).



2 (a)



2 (b)

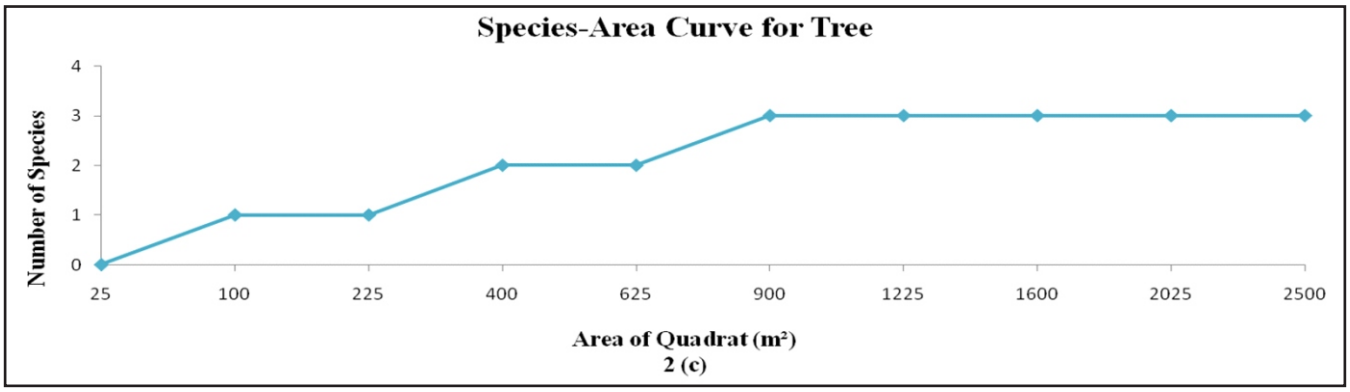


Fig. 2. (a) Species-Area Curve for herb, (b) Species-Area Curve for shrub and (c) Species-Area Curve for tree

DISCUSSION AND CONCLUSION

Determining optimal sampling structure is an essential prerequisite to the field survey. An ideal sampling strategy is the one which covers the complete variability of vegetation within the defined geographical extent, while minimizing the heterogeneity within the plot and maximizing it among the plots (Dengler, 2017). Quantitative description of vegetation characteristics of a population is obtained by plant sampling, but an unfitting sampling size may limit the reliability of the data for population estimates (Keith, 2000). The standardized size of the quadrats for sampling the field, presented in this study, will aid the phytosociological data collection of the forest more accurately and scientifically. The findings of this study will not only facilitate resource optimization but will also ensure consistency and comparability across studies.

The determined quadrat size presented in this paper ensures a balance between adequate species representation and practical feasibility in field studies. Furthermore, the findings of this paper may be used for phytosociological study of other such type of forests to analyze the plant community structure.

REFERENCES

Dengler, J. (2017). Phytosociology. *International Encyclopedia of Geography: People, the Earth, Environment and Technology, iDiv,* 1–6. https://doi.org/10.1002/9781118786352.wbieg0136

Hao, M., Zhao, W., Qin, L., Mao, P., Qiu, X., Xu, L., Xiong, Y. J., Ran, Y., and Qiu, G. Y. (2021). A methodology to determine the optimal quadrat size for desert vegetation surveying based on unmanned aerial vehicle (UAV) RGB photography. *International Journal of Remote Sensing,* 42(1), 84–105. https://doi.org/10.1080/01431161.2020.1800123

Keith, D. A. (2000). Sampling designs, field techniques and analytical methods for systematic plant population surveys. Ecological Management and Restoration, 1(2), 125–139. https://doi.org/10.1046/j.1442-8903.2000. 00034.x

Misra, R. (1968). Ecology workbook. Scientific publishers.

Saleem, I., Mughloo, J. A., Mughal, A. H., and Baba, A. A. (2019). Quadrant Standardization for Herbaceous Species of Benhama, Ganderbal Area in Kashmir. International Journal of Current Microbiology and Applied Sciences, 8(03), 1697–1705. https://doi.org/10.20546/ijcmas.2019.803.197