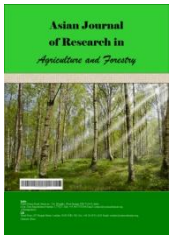

Asian Journal of Research in Agriculture and Forestry

7(4): 67-72, 2021; Article no.AJRAF.72605
ISSN: 2581-7418

Diversity of Tree Species in Rivers State University, Port Harcourt, Nigeria

P. C. Nnadi[1], B. B. Otene[2*] and Nwiisator David-Sarogoro[1]

[1]Department of Forestry and Environment, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria.
[2]Department of Fisheries and Aquatic Environment, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJRAF/2021/v7i430140
Editor(s):
(1) Prof. Nebi Bilir, Isparta University of Applied Sciences, Turkey.
Reviewers:
(1) Joseph Orkuma Cheikyula, Joseph Sarwuan Tarka University, Nigeria.
(2) Ahmet Cihangir Yalınkılıç, Dumlupınar Üniversitesi, Turkey.
Complete Peer review History: https://www.sdiarticle4.com/review-history/72605

Original Research Article

Received 12Jue 2021
Accepted 24 August 2021
Published 28 October 2021

ABSTRACT

This study was carried out to examine the distribution of plant species in Rivers State University campus at different locations at the Rivers State University Nkpolu-Oroworukwo Port Harcourt Nigeria. The general objective of this study was to examine the Ecological distribution of plant species in Rivers State University campus at different locations. The specific objective was to determine the species abundance of various plants in the study area and also to examine the ecological diversity of tree species in the various groups. The study area was divided into three groups (stations) with the various plants species identified and recorded. Data gotten from the field was analyzed using descriptive statistic and some ecological indices such as Margalef, Mehinick, Shannon diversity, Shannon Wiener, Evenness/Equitability and Simpson dominance. A total of one thousand Sixty-nine (1069) individual plant were identified with 16, 17 and 12 species in stations 1-3 respectively. The highest individual plants (561) were observed in station 1 while the least (87) were observed in station 3. The mean values of stations 1 and 2 were significantly and statistically different from site 3 at $p<0.05$. The results obtained showed some dominant species to include *Elaeis guincensis, Polyaithia longifolia, Pinus spp, Gmelina arborea, Wodyetia bifareata, Citrus sinensis, Cocos nuciferia* while *others* were the least dominant species found in the study

**Corresponding author: E-mail: benjaminotene56@yahoo.com;*

area. The Margalef, Mehinicks and Shannon Wiener values were consistently highest in station 2 but lowest in station 3. Human disturbances had negative impact on tree species abundance especially in site 3. It is therefore recommended that management interventions are necessary in other to stop indiscriminate felling of the various trees species that made up the different groups.

Keywords: Tree species; diversity.

1. INTRODUCTION

Biodiversity is the totality of genes, species and ecosystem in a region. It is essential for human survival and economic well-being and for the ecosystem function and stability [1]. The total number of species available on the earth is not determined yet; however, it is estimated that the total number of animal and plant species could be between 13 and 14 million [2]. The earth surface contains about thirty percent (30%) of green life, vegetation or floristic component [3]. Conservation biologists warned that 25 percent of all species could become extinct during the next twenty to thirty years [4]. The cause for the loss of species is numerous but the most important is the loss and fragmentation of natural habitats due to climate change and other forms of environmental degradation which affect both Terrestrial and Aquatic Ecosystem [5].

Also, one form of environmental degradation is the deforestation of the indigenous fruit tree species such as *Chrysophyllum albidum* in Nigeria which have enormous socio- economic values to man but going into extinction as a result of these activities [6,7]. The destruction of the world forest cover from 2005 to 2010 was estimated to 0.14% per year, but in the West Africa this deforestation rate was estimated to 0.46% per year [8]. Many forests which includes Mangrove Forest are under great anthropogenic pressure and require management intervention to maintain the overall biodiversity, productivity and sustainability [9,10]. Understanding species diversity and distribution patterns is important to evaluate the complexity and resources of these forests [11].

Vegetation is an assemblage of plant species and the ground cover they provide. Primeval redwood forests, coastal mangrove stands, sphagnum bogs desert soil crusts, road side weed patches, wheat fields, cultivated gardens and arboretum, botanical garden, lawns, etc.; are encompassed by the term vegetation [12]. Vegetation or floristic component plays an important role in the life of man and its ecosystem involved in the regulation of various biogeochemical cycles such as water, carbon, etc. Vegetation also converts solar energy into biomass and forms the base of food chain. It influences the energy balance at the earth's surface and within the atmospheric boundary layer which often mitigate extremes of local climate. Vegetations are generally known to have Spiritual, cultural and medicinal benefits to man.

The vegetation type is defined by characteristic dominant species, or a common aspect of the assemblage, such as an elevation range or environmental commonality. Vegetation is the functional array of plant in a given location or zone of the earth. It is characterized by its component species and by a combination of structural and functional parameters. A considerable proportion of the ecological work has been concerned with effort at understanding the nature of vegetation so as to have adequate description of it, be it a forest, woodland, grassland, scrub or tundra type. The main purpose of such description is to enable others who have no first-hand knowledge of a given vegetation type to build a mental picture of an area and its vegetation and to allow the comparison and ultimate classification of different units of vegetation. Floristic inventory is a necessary prerequisite for much fundamental research in tropical community ecology, such as modeling patterns of species diversity or understanding species distributions [13].

Destruction of trees to give way for Infra-structural development is on the increase which have altered floristic design, paved way for insect and disease attacks on trees, and subsequently lead to the death of such trees species, hence this study is to assess the impact of human activities on tree species composition and abundance in Rivers State University.

2. METHODOLOGY

2.1 Study Area

Rivers State University (RSU) is located on Longitude 6.9825^0N and Latitude 4.7923^0E Nkpolu–Oroworukwo, mile 3 Diobu, Port

Harcourt, Rivers State Nigeria as in Fig. 1 below. The study area was divided into three (3) Site Divisions; main gate to senate building ,Senate building to back gate car park and back gate car park to Eagle Island back gate .Each Site was studied to know the number of plant species and its abundance.

2.2 Floristic Survey and Species Identification

This method was carried out by counting the various trees species that made up the different sites (divisions) and by collecting different parts of the plant such as the leaves and stems for identification. About 200 meters each of three major roads in the campus were selected through a random sampling and data were collected from the trees in the selected roads. The service of Taxonomist was required in the identification of the trees to species level with their scientific name and local name.

2.3 Data Analysis

The data obtained were subjected to descriptive and inferential statistics such as means, standard deviations, Duncan Multiple Range Test (DMRT) to separate the mean.

3. RESULTS

3.1 Tree Species Composition

A total number of 1,069 individual species of trees were found in the Rivers state university with each site having 16, 17, 12, different species respectively (Table 1). Site 1 had the highest number of individual plant species (561) while the lowest (87) was observed in site 3. The results obtained showed that *Elaeis guincensis, Polyaithia longifolia, Pinus spp, Gmelina arborea, Wodyetia bifareata, Citrus sinensis, Cocos nuciferia*, were the seven most dominant species, while *Terminalia catappa, Psidium guajava, Persca americana, Chrysophyllum albidum, Syzyguim malaccense, Azadirachta indica, Cola lepidota, Annona muricata, Treculia africana, Artocarpus altilis, Moringa oleifera, Mangifera indica, Terminlia superba, Terminlia ivorensis, Entrandrophragma cylindrium* were the least dominant species found in the study area (Table 1).

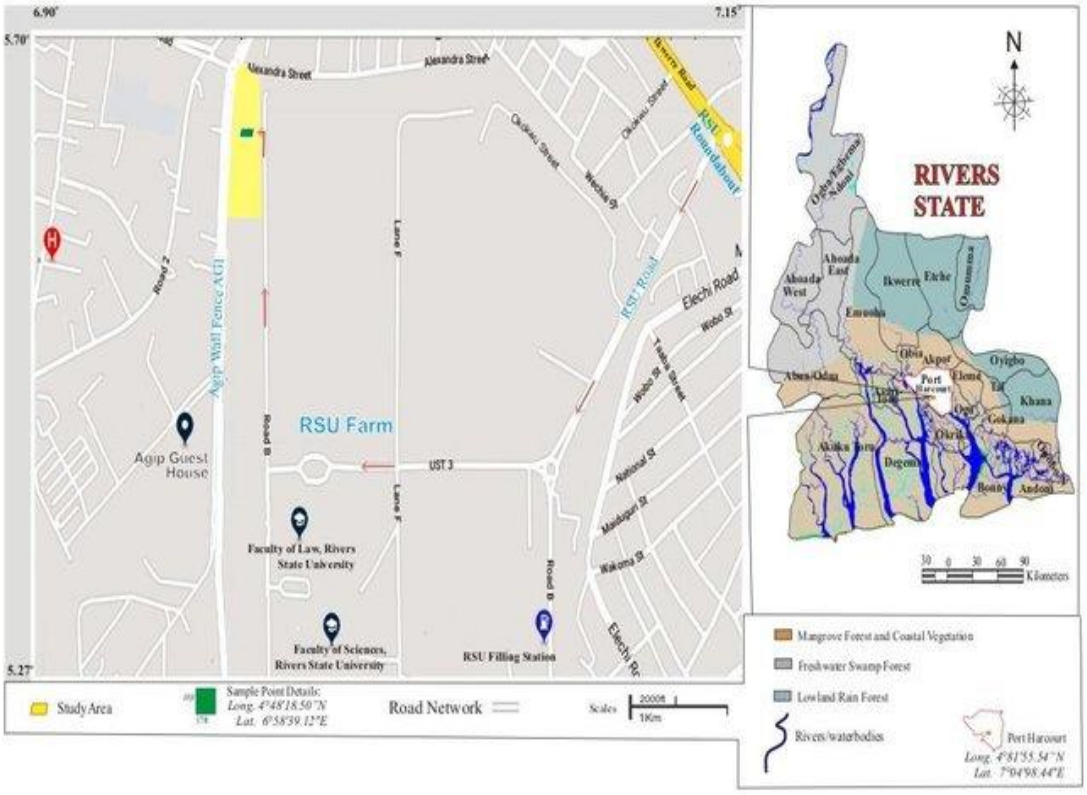

Fig. 1. Map of the rivers state university showing the sampling locations
Source: Durojaye, A

Table 1. Trees species composition and distribution among the sites

Common Name	Scientific Name	Site 1	Site 2	Site 3
Pinus	*Pinus caribaea*	24	100	36
Palm tree	*Elaeis guincensis*	183	42	1
Coconut	*Cocos nucifera*	44	7	0
Mango	*Mangifera indica*	10	5	5
Guava	*Psidium guajava*	17	5	0
Foxtail palm	*Wodyetia bifarata*	38	41	0
Avocado	*Persca Americana*	7	12	8
Masquerade tree	*Polyalthia longifolia*	68	97	5
Almond tree	*Terminalia catappa*	1	7	4
Malay apple	*Syzygium malaccense*	2	1	0
Moringa	*Moringa oleifera*	46	5	3
Neem	*Azadirachita indica*	26	1	0
Orange	*Citrus sinensis*	54	2	0
Gmeliana	*Gmelina arborea*	2	66	12
Sour sop	*Annona muricata*	24	0	0
Monkey kola	*Cola lepidota*	15	0	0
Bread fruit	*Artocarpus altilis*	0	7	0
Black afara	*Terminalia ivorensis*	0	5	5
White afara	*Terminalia superba*	0	18	6
Africa star apple	*Chrysophyllum albidum*	0	0	1
Sapele mahogany	*Entrandrophragma spp*	0	0	1
Africa bread fruit	*Treculia africana*	0	0	0
Number of Species		16	17	12
Number of Individuals trees		561	421	87
Mean		25.5±40.66[a]	19.14±30.76[a]	3.96±7.87[b]

The mean values of sites 1 and 2 (25.5±40.66 and 19.14±30.76) were significantly and statistically different from site 3 (3.96±7.87) at $p<0.05$ (Table 1 and Fig. 2).Table 2 showed the results of the plant ecological indices studied. Margalef index ranged from 2.370 in station 1 to 2.768 in station 2. Mehinichs index ranged between 5.678 in station 3 and 7.668 in station 2. Shannon diversity index ranged between 1.946 in 3 and 2.226 in station 1 while Shannon Wiener index ranged from 0.845 in station 3 to 0.984 in station 2. Evenness/Equitability index ranged from 0.769 in station 2 to 0.863 in station 1 while Simpson dominance index ranged from 0.156 in station 1 to 0.217 in station 3.

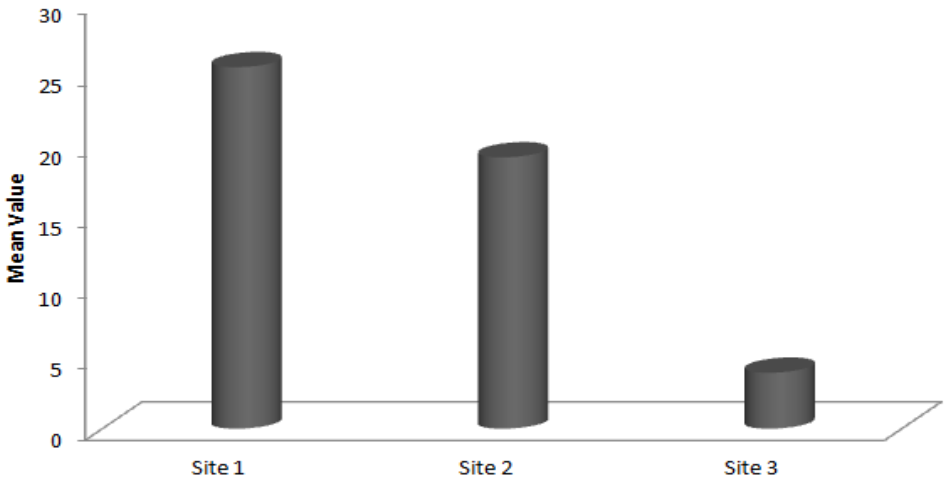

Fig 2. Mean values of plant species in the study area

3.2 Diversity indices

Table 2. Diversity indices of Trees in the study area

Indices/Stations	Station 1	Station 2	Station 3
Margalef index(d)	2.370	2.768	2.463
Mehinick's Index(d1)	6.360	7.668	5.678
Shannon Diversity Index (H^1)	2.226	2.160	1.946
Shannon Wiener (H)	0.967	0.984	0.845
Evenness/ Equitability index(E)	0.863	0.769	0.783
Simpson Dominance index(C)	0.156	0.165	0.217

4. DISCUSSION

Plant species richness, which is the number of species per unit area, is important in other to have an understanding of the diversity of the species in the study area because, quantifying patterns of species richness in degraded forests provide an insight into the ability of the forest vegetation to recover (Gillespie *et al*. 2004). Hence, regular assessment of the floristic composition and structure of exploited forest ecosystems is instrumental in the management, sustainability and conservation of such areas (Nchor and Nnadi, 2018) [14,15]. It is suggested that some of the major causes of scanty species is due to the fact that most of the trees were are cut down in other to create space for building roads and some natural disturbances such as wind, diseases, pest attack especially in Urban Areas [16]. The study showed that *Elaeis guincensis, Polyaithia longifolia, Pinus spp, Gmelina arborea, Wodyetia bifareata, Citrus sinensis, Cocos nuciferia* were the seven most dominant species, while *Terminalia catappa, Psidium guajava, Persca americana, Chysophyllum albidum, Syzygium malaccense, Azadirachta indica, Cola lepidota, Annona muricata, Treculia africana, Artocarpus altilis, Moringa oleifera, Mangifera indica, Terminalia superba, Terminalia ivorensis, Entrandrophragma cylindrium* were the least dominant species observed.. Understanding how and why species richness varies over space and time is important in ecology. The high level of plant species diversity in degraded forest suggests that there is a need to place an economic value on the forest vegetation and other biological diversity. Failure to institute that could result in complete degradation and the truncation of forest restoration, especially with the continuous pressure from resource utilization and drivers of deforestation [17]. Forest recovery is possible only if secondary forests are protected from repeated clearing because the return of the species composition of secondary vegetation to that of old-growth forests may require several years due to limited seed availability and dispersal, and slow growth of mature forest tree species [18,19]. Human intervention in the recovery process may therefore be desirable in Rivers state university.

5. SUMMARY

The Study provides findings on the assessment of tree diversity in Rivers State University, Port Harcourt, Nigeria. The assessment revealed a total of 22 Species with 1069 individual trees which was distributed among three Site Divisions.

6. CONCLUSION

Anthropogenic activities/disturbances in the above mentioned area had negative impact on tree species hence this low abundance.

7. RECOMMENDATIONS

It was recommended from the study that management interventions (such as enrichment planting, regulated selective logging and protection of naturally regenerating germplasm) can further assist in the restoration of this ecosystem and that research should be carried out on how to improve on the species diversity and richness of the flora in Rivers state university

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Singh JS. The biodiversity crisis: a multifaceted review. Current Science. 2002;82:638–647.
2. Heywood VH. Global Biodiversity Assessment. Cambridge University Press, Cambridge, UK;1995.

3. National Aeronautics and Space Administration (NASA). Earth Observatory. Notes from the Field: Eco3D—Exploring the Third Dimension of Forest Carbon. Academy of Sciences. 2011;108(24): 9899–9904.
4. Khera AN, Kumar A, Ram J. Plant biodiversity assessment in relation to disturbances in midelevational forest of Central Himalaya, India. Tropical Ecology. 2001;42:83-95.
5. Otene BB, Nnadi PC. Water quality Index and Status of Minichinda Stream, Port Harcourt, Nigeria. International Journal of Geography and Environmental Management. 2019;5(1):1-9
6. Nnadi PC, Anyanwu DI. Effect of extraction methods, soil media on germination and seedling establishment of *Chrysophyllum albidum.* International Journal of Horticulture and Forestry Research. 2018;2(1):1-1.
7. Nnadi PC, Amadi GO. Effect of Climate change on tropical forest ecosystem of three selected local government in Rivers State, Nigeria. Journal of Applied Science, Environment and Management. 2019;23(1):83-86.
8. Food and Agricultural Organisation(FAO). Global Forest Resources Assessment. Rome: FAO Forestry Paper No. 163;2010.
9. Nnadi PC, Simbi-Wellington. Proceedings of the national workshop of the forestry association of Nigeria;2018.
10. Kumar A, Gupta AK, Marcot BG. *Management of forests* in India for biological diversity and forest productivity, a new perspective. Volume IV: Garo Hills Conservation Area (GCA). Wildlife Institute of India – USDA Forest Service collaborative project report, Wildlife Institute of India, Dehra Dun, India. 2002;206.
11. Kumar A, Marcot BG, Saxena A. Tree species diversity and distribution patterns in tropical forests of Garo Hills. Current Science. 2006;91:1370-1381
12. Burrows Colin J. Processes of vegetation change. London: Unwin Hyman. 1990;1. ISBN 978-0045800131
13. Phillips OL, Martinez RV, Vargas PN. Efficient plot-based floristic assessment of tropical forests. Journal of Tropical Ecology. 2003;19: 629-645
14. Addo-Fordjour P, Obeng S, Anning A, Addo M. Floristic composition, structure and natural regeneration in a moist semideciduous forest following anthropogenic disturbances and plantinvasion. International Journal of Biodiversity and Conservation. 2009;1(2) :21-37.
15. Cannon CH, Peart DR, Leighton M. Tree species diversity in commercially logged Bornean rainforest. Science. 1998;281 (5381):1366-1368.
16. Odum A, Nwonuala A, Nnadi PC. Selectivity of Trees and Shrubs Species as Ornamentals in Urban Areas of Rivers States. Nigeria. Proceeding of the 33rd Annual Conference of the Forestry Association of Nigeria;2010.
17. Adekunle V, Olagoke A. Diversity and biovolume of tree species in natural forest ecosystem in the bitumen-producing area of Ondo state, Nigeria: a baseline study. Biodiversity and Conservation. 2008a ;17(11):2735-2755.
18. Makana JR, Thomas SC. Dispersal limits natural recruitment of African Mahoganies. Oikos. 2004;106 (1):67-72.
19. Makana JR, Thomas SC. Impacts of selective logging and agricultural clearing on forest structure, floristic composition and diversity, and timber tree regeneration in the Ituri Forest, democratic republic of Congo. Forest Diversity and Management, Springer. 2006;315-337.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/72605