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IDENTIFYING THE CHANGE IN FOREST COMMUNITY STRUCTURE DUE TO ANTHROPOGENIC ACTIVITIES

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ABSTRACT

The Rungwe Forest Reserve is a degraded tropical montane forest. On the western side of the Rungwe mountain forest reserve, the impacts of unlawful human intervention on the structure of the plant community were studied. Several people with DBHs between 19 and 57 cm, 10 and 47 cm, and 11 and 14 cm were located in the smallest, moderately, and severely disturbed areas, respectively. It was determined that human activities have had a significant effect on shaping the current composition of plant communities. Hence, forest preservation efforts must include conservation management actions. Extensive surveys were conducted in all three habitats during the course of the investigation's three main seasons. Throughout the course of the research, scientists documented 4,268 individuals, distributed among 68 species, 39 genera, and 9 families. Fifty-two species were recorded from Bhimashankar Wildlife Sanctuary (WLS) during the current study, and forty of them were first-ever sightings in the region.

KEYWORDS: Forest, Conservation, Community, extensive, Preservation

INTRODUCTION

As a result of human activity, freshwater habitats throughout the globe are seeing a decline in water quality. Climate change and increased human population could make this problem much worse. Increases in primary production and eutrophication may be attributed, in part, to the organic pollution caused by the excessive enrichment of nutrients brought about by the expansion of agriculture, industry, and urban areas. The chloride levels in freshwater ecosystems have increased to unsafe levels in many running rivers due to recent stresses such as the use of salt to de-ice roads in the north and mining activities across the globe. The aquatic plant communities and, by extension, the ecological processes of almost all rivers in Europe have suffered as a result of human activity. Research on the effects of human activity on macrophytes in moving water and the administration of aquatic ecosystems is crucial in this era of rapid urbanization and increasing global temperatures.

Several areas' biodiversity is threatened by the human development process, among other things. Opening new roads, installing electricity transmission lines, developing energy sources, and excavating and impounding rivers are all examples of building operations that have been shown to alter land cover and various species. For instance, the development of new roads in the central African rainforest has worsened the predicament of forest elephants, which has allowed poachers easier access to formerly inaccessible areas. There has also been growing evidence that the presence of humans has a negative impact on the local animal and plant biodiversity in recently

constructed industrial sites like hydropower plants and wildlife parks. To anticipate possible negative effects on species and to devise appropriate mitigation methods to increase biodiversity conservation, it is crucial to evaluate how local biodiversity fares under such development-related risks.

LITERATURE REVIEW

Ramadan Bedair et.al (2021) Humans pose a danger to wildlife via actions like poaching, habitat loss, and global warming. Wadi Hagul is an unprotected location in the northern Egyptian Eastern Desert that has experienced obvious encroachments of plant species in recent years, and this study examined how human activity has affected the ecology there. The new route connecting Al-Galala and Wadi Hagul and Zafarana poses the greatest danger. There are a total of 80 species identified from Wadi Hagul here; the Asteraceae (15 species) and Brassicaceae (6 species) groups are particularly well represented (6 species). The majority of documented species were perennials, chamaephytes, and Saharan-Arabian endemics. Canonical correspondence analysis with no trend removal revealed that latitude, longitude, altitude, silt, sand contents, pH, and CO3 2 content all play significant roles in determining plant distribution in the analyzed stands. Many alien and invasive plants, including Euphorbia prostrata, are on the list; they usually have a detrimental impact on local flora and fauna. According to the Soil Adjusted Vegetation Index (SAVI), there was less plant cover throughout the research period than in years before. The estimated SAVI varied from 0.02-0.42 in 2013 and -0.18-0.28 in 2020. Since the rate of poaching and habitat loss has escalated in recent years, protecting animals and other forms of biodiversity has become a pressing imperative.

H. S. Grantham et.al (2020) While preserving biodiversity, halting land degradation, and taming climate change are all top worldwide environmental concerns, neither the scale nor extent of forest changes have been effectively recorded or mapped. We create a globally consistent, continuous measure of forest condition as indicated by the degree of anthropogenic change using data on observed and inferred human activities and an estimate of lost connectivity. About 27% of the world's forest cover is located under legally protected areas, yet only 17.4 million km2 has exceptional landscape-level integrity. The landscape integrity of just 56% of the woods in these areas is high. For the world's forests to be protected from destruction and restored to their natural state, ambitious policies that prioritize the protection of forest integrity, particularly in the most intact locations, are now desperately required.

Fabio Berzaghi et.al (2019) Ecosystems and biogeochemical cycles may be significantly impacted by elephants and other large herbivores. Nevertheless, the precise role that elephants play in altering the composition, productivity, and carbon reserves of Africa's rainforests is not yet well understood. The Ecosystem Demography model was updated to account for elephant disturbance, and its projections were compared to data from inventories of two lowland African primary forests, allowing us to quantify the impacts of elephants on these ecosystems. We discover that elephants reduce forest stem density, which in turn alters tree competition for light, water, and space. As a result of these alterations, bigger, stronger trees are more likely to sprout. The long-term stability of the continent's above-ground biomass has been enhanced as a result of the change in structure and species mix. Because of the compromise between productivity and wood density, the

change affects the forest's net primary production. When there are 0.5-1 elephants per square kilometer, the result might be an increase in aboveground biomass of 26-60 t ha1. If elephants vanished from the woodlands of central Africa, the amount of plant life above ground would decrease by 7 percent. The results from the models are consistent with the data from the actual inventory. We speculate that forest elephants had a key influence in differentiating the structure of Africa's rainforests from those of the Amazon.

Noel Gorelick et.al (2017) Deforestation, drought, calamity, sickness, food security, water management, climate monitoring, and environmental protection are just some of the many high-impact social concerns that Google Earth Engine was designed to solve. This integrated system is the first of its kind, with the goal of enhancing the capabilities of both traditional remote sensing experts and the general public, but to a far broader audience that doesn't have the expertise to use conventional supercomputers or massive commodity cloud computing resources.

METHODS

As the Odonates are most active in the morning, collections were done between 9 a.m. and 1 p.m.

As the Odonates are most active in the morning, collections were done between 9 a.m. and 1 p.m. Site of collection The locations where the Odonates were collected from were classified primarily according to one of three land-use types. Here are several examples:

1. Agricultural lands: There are 3,100 hectares of farmable land in the Pune district. There are four of Maharashtra's seven agricultural climatic zones represented here: the Ghat, Sub-Mountain, Plain, and Scarcity. There is a vast variety of soil types in the region, and yearly precipitation varies from 60 to 300 centimeters. Kharif and Rabbit are the two harvest seasons in the region. The most common Kharif crops in the area under investigation are jowar, bajara, rice, tur, moong, groundnut, and soybeans, while wheat, gram, maize, and sunflower are cultivated during the rabbi season. Both the Kharif and Rabi seasons see extensive sugarcane cultivation in Pune District.

2. Forests and Wetlands: The hill ranges of the Western Ghats make up the majority of the forest cover in the Pune district. The Bhima Shankar wildlife sanctuary covers an area of 120 square kilometers spanning the Pune, Raigad, and Thane districts of Maharashtra, with its headquarters in the Ambegaon taluka of the Pune District. As it is located in a heavily wooded region, this haven is subject to significant monsoon rains. Ujani Reservoir, a massive wetlands area, is the last major body of water in the upper Bhima River basin. A large portion of its 1, 4500 sq. km. catchment area is located inside the Pune administrative division. The water there has changed throughout time as a result of heavy urbanization, industrialization, and agriculture.

Sampling and data collection

Belt transects were used as the sampling strategy. The transect was positioned in the middle of the stream for monitoring purposes, whereas for reservoirs it was set up on the banks. Latitude, longitude, and altitude readings were taken using a Garmin GPS unit out in the field. Numbers of individuals, habitat type, and the presence or absence

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of aquatic vegetation at the collecting location were all recorded. Only the most elusive ones were captured, while the others were tracked down in the wild and shot using Olympus and Canon 50D digital cameras. All specimens were correctly identified using canonical sources in accordance with the most up-to-date guidelines of the International Code of Zoological Nomenclature. The specimens have been sent to the Western Regional Centre of the Zoological Survey of India in Pune. Diversity Indices and Statistical Analysis Genus and family diversity were quantified by using alpha diversity and beta diversity. Simpson's index was used to determine the level of alpha diversity. Using the program PAST, we were able to determine diversity indices. Data clustering Cluster analysis, which takes into account the similarity between various collecting sites, sheds light on the differences and similarities across ecosystems. Dendograms were used to display the results of Bray-Curtis clustering performed on a non-matrix multivariate scale.

Description and location of Rungwe Mountain Forest Reserve

The Rungwe District in Tanzania's Mbeya Region is home to the Rungwe Mountain Forest Reserve (Figure 1). Its coordinates are 9 degrees 02 minutes 12 seconds south and 33 degrees 35 minutes 45 seconds east. Mount Livingstone Forest reserve and the Bujingijila Forest Corridor form the forest's eastern boundary. This covers the precipitous cliffs above Mwakaleli town on Lake Nyasa. Lake Ngozi, an amazing crater, is located in the Mporoto ridge forest reserve, some 10 kilometers to the northwest. Tukuyu Town may be found to the south of the reserve. Ndaga, Ilolo, Rungwe, Syukula, Ikama, and Katabe are only some of the names of the six settlements that border the western half of Rungwe Mountain Forest Reserve.

DATA ANALYSIS

1. The variety of life in the region under examination Throughout the research period, a total of 68 species were documented, with 4,268 individuals representing those 68 species across 39 genera and 9 families. Anisoptera, with 40 species (59%), was discovered to be more numerous than Zygoptera, with 28 species (41%), during the current study.

Species Diversity in Agricultural Land use type:

A total of 1,080 individuals from 42 species were documented from 17 sample locations located in various talukas of the Pune district's agricultural fields. With 23 species (55%), the Libellulidae family was the most numerous, followed by the Coenagrionidae family with 12 species (29%). The two families with the most species were the Lestidae and Platycnemidae, each with three (7%) and the Aeshnidae, with only one (2%). (Figure 1).

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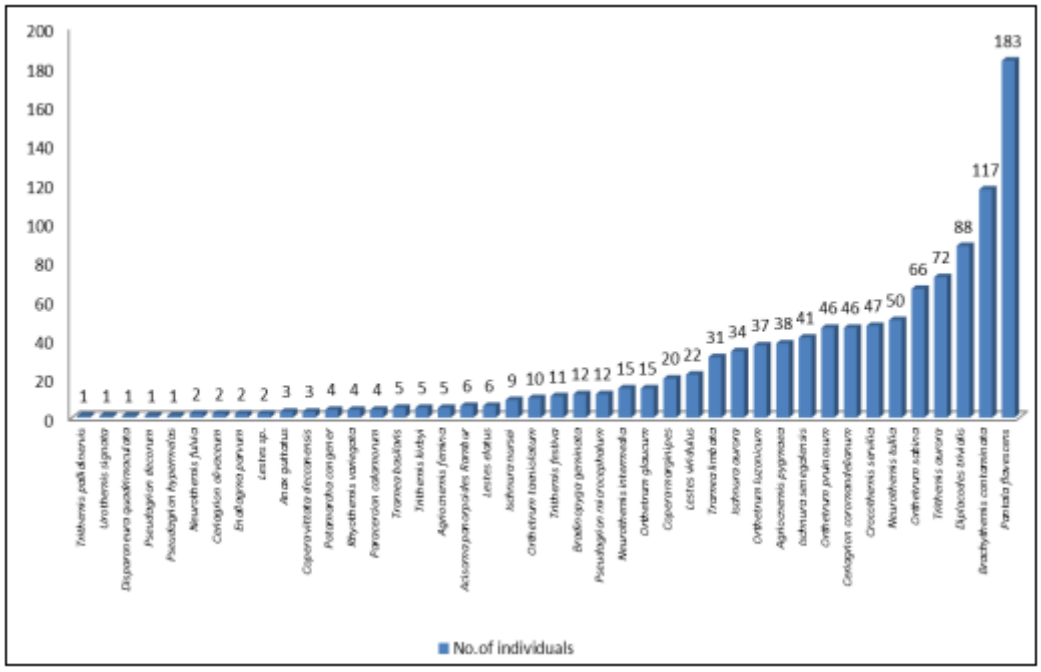

Fig 1: Species abundance in Agricultural land-use type

Species Diversity in Forests and wetland habitat type

Six hundred and sixty-one individuals from fifteen different places were documented in forest streams and wetland habitats, representing 59 different species. These regions were relatively less impacted by human activities such as pollution and land disturbance. The Libellulidae family has the most representatives, with 27 (46%), followed by the Coenagrionidae family with 13 (22%). Both the Gomphidae and Aeshnidae families contributed 5%, with 4 species each. There were three members of the families Lestidae (5%) and Platycnemidae (5%). Two species each were found in the families Chlorocyphidae (3%) and Calopterygidae (3%). The family Macromiidae has the fewest members, and just one species was found (2%). (Figure 2).

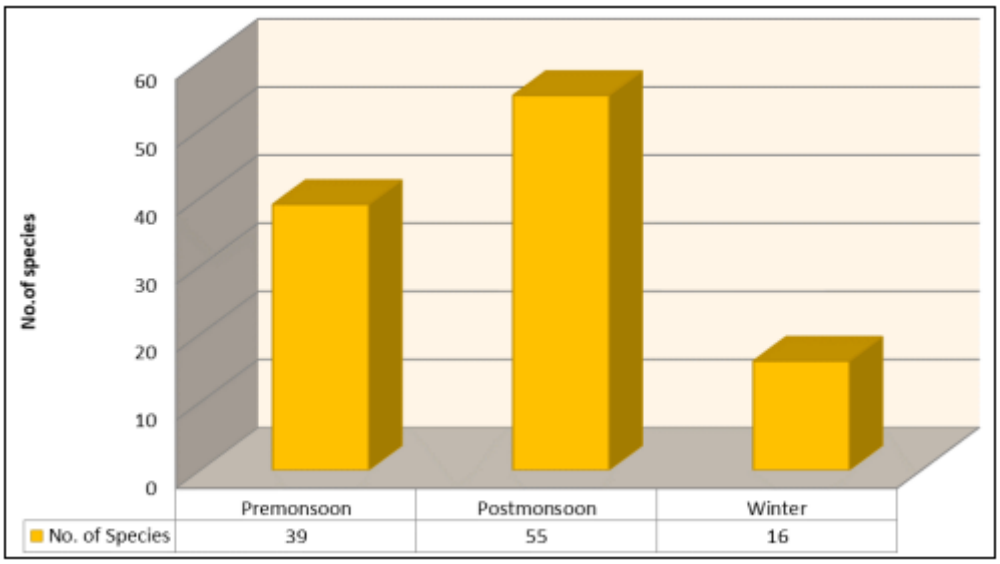

Fig 2: Seasonal Abundance of Species in study area

Population size structure of trees and shrubs in Rungwe forest

Several research sites displayed different tree and shrub population size patterns, with the DBH of trees in the least affected site ranging from 10 to 109 cm and those in the moderately disturbed site ranging from 10 to 79 cm. Trees in the severely disturbed location ranged in DBH from 10 to 39 cm (Figure 3). Trees with trunk diameters of 100 centimeters or more were more numerous in the least disturbed site than in the moderately disturbed or highly disturbed locations. Large numbers of people gathered in small DBH sizes, whereas the density of the population fell with larger DBH sizes, demonstrating an inverted Jdistribution pattern (Figure 3).

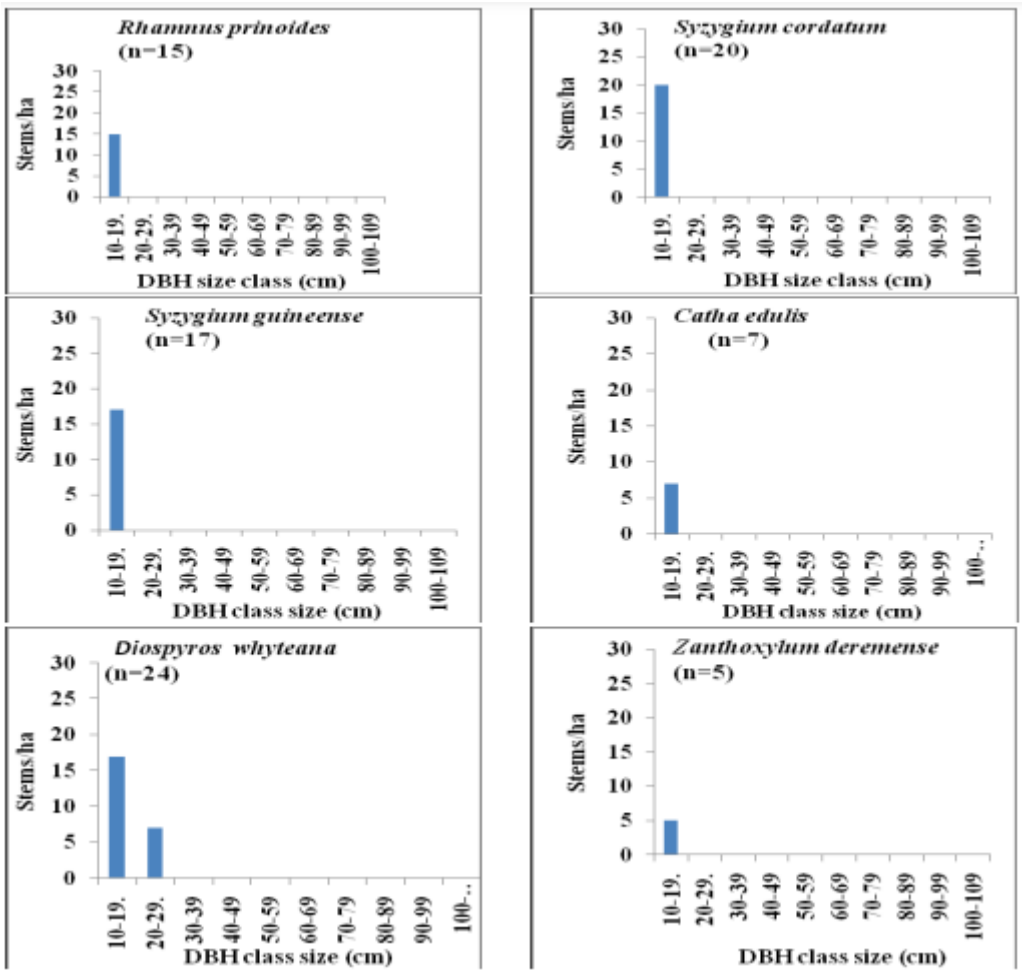

Figure 3: DBH size class distribution among dominant trees.

Prunus africana, myrica salicifolia, and allophylus abyssinicus were among the tree species with low recruitment and an interrupted pattern in the least affected locations. Many of these trees, as shown in Figure 4, had a DBH between 10 and 59 centimeters, with the exception of the Cassipourea malosana and Bersama abyssinica species, both of which showed a smooth inverted J-curve pattern, with a dense population of individuals in the smaller DBH size classes. Dombeya acutangula (Cav.) has a bell-shaped distribution, therefore seeing a few individuals in both the small and big DBH size classes suggests population instability (Figure 4).

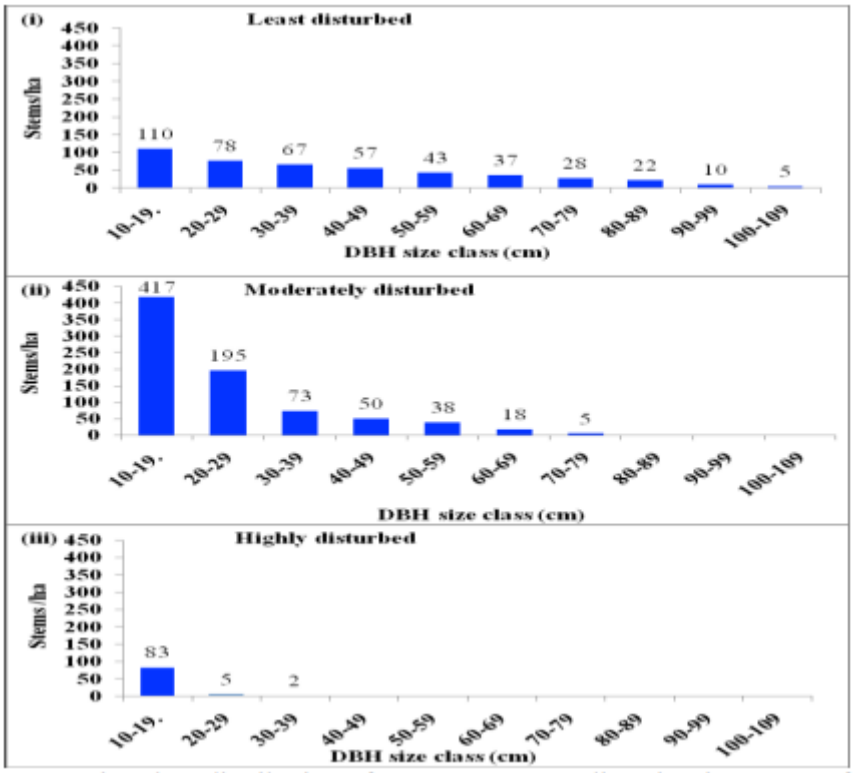

Figure 4: The DBH size class distribution of trees among sampling sites in Rungwe forest.

The plant communities within the forest

Using Two Way Indicator Species Analysis (TWINSPAN), we divided the world's plant communities into two groups, A and B, based on the similarities and differences in the plant species compositions of each group (Figure 5). The plant communities classified as A showed the lowest and intermediate levels of disturbance. Prunus africana and cassiopeia malosana were indicator plants for moderately disturbed habitats, whereas trema orientalis (L. Blume) and podocarpus latifolius were indication species for highly disturbed areas (Thunb.). Cluster B contains only severely disturbed site samples, and the indicator species Panicum trichocladum (K.Schum) is present solely in these communities. Shrubs and plants fared better than their woody counterparts in heavily disturbed plant communities. Maytenus acuminata, Rutidea orientalis, Rawsonia lucida, and Vernonia myriantha all thrived in this region and were common shrubs. According to the data on plant communities, species including Bidens pilosa L, Justicia flava, Panicum monticolum, and Setaria homonyma were most prevalent in Cluster B, indicating that herbs and grasses were the dominant flora in that area. Human activities have had a deleterious effect on Rungwe Mountain Forest Reserve, as shown by a 71.21% difference in species composition between community clusters A and B.

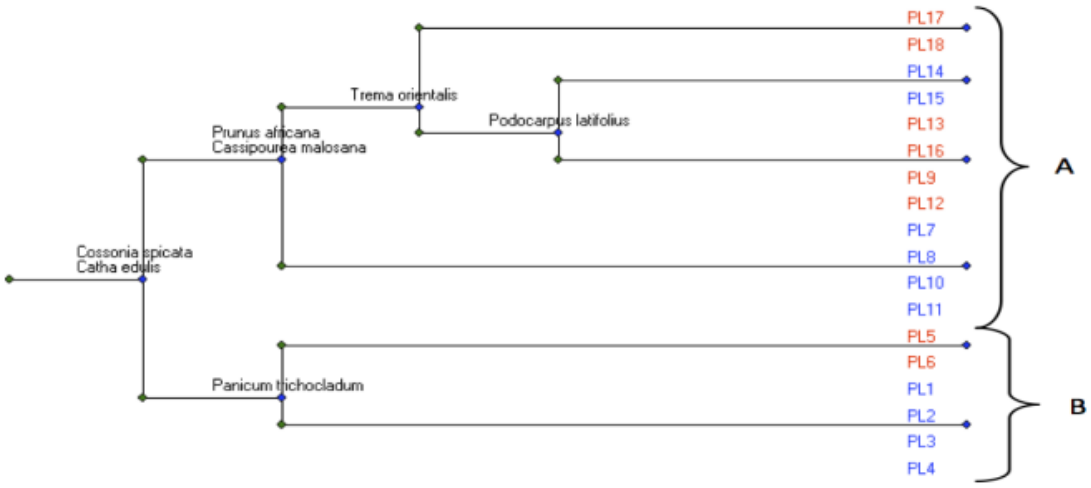

Figure 5: The clusters of plant samples from western parts in Rungwe forest

CONCLUSION

Anthropogenic activities have had varied degrees of influence on the plant communities identified in the western areas of Rungwe forest reserve. Heavy logging has led to a decline in tree density in areas that were already in poor condition. Extreme human disruption has allowed little trees to persist despite being of no utility to the surrounding population. But, after giant trees have been cut down, small trees will be a viable alternative. The Rungwe district council must step in to prevent further deforestation by ordering the tea factory's management to switch to cleaner energy sources like solar power and wind turbines from their current reliance on locally sourced fuel wood. As odonates are good bioindicators of both aquatic and terrestrial environments, we think they deserve more attention in studies aiming to explain urban ecosystems.

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