

Headwather Recovery in Mindú Municipal Park: An Experience in Environmental Education

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Abstract

The main objective of the article was to highlight the importance of the spring to Mindu Municipal Park, as well as, propose solutions to the problems that were observed on the spot, the research aimed to demonstrate the activities aimed at spring recovery and revitalization of areas affected by degradation. The collections were performed three times a week over two months, from March to April 2018. Being possible to verify the conditions of the environment and how it was before the application of the Park's revitalization and maintenance activities. Being possible to delimit the first activities that will be applied to realize the restructuring and revitalization of the space. With the project initiative, more visitors were found in the Park, and with each step completed, awareness grew about the importance of environmental preservation. Therefore, encouraging visitors to participate in social and environmental activities is essential to sustain the site..

Keywords: environmental preservation; water body; forest park;

1. Introduction

Natural environments are fundamental for the development of tourism, and, no doubt, arouse fascination in people who seek contact with such spaces to recover their energy and relieve the stress of everyday life [1]. With 40.8 hectares of biodiversity, Mindu Municipal Park was created from a popular movement started in 1989, by the residents of the Parque Dez de Novembro neighborhoods as a way to protect the habitat of

the sauim (Bicolor Saguinus) [2].

The main body of water in the park, the iguapé do mindu, has been experiencing high levels of degradation over the years, where water quality is highly polluted. Water fulfills a fundamental function of connection, since, from the springs to the sea, through its hydrological cycle the water becomes various states of matter [3].

One way to protect the park's environment was the creation of protected areas that demand ecological studies on flora and fauna, land tenure, human occupation and economic activities in the area. Depending on the size of the area, the difficulty of access or the degree of human occupation, these studies may require a significant amount of time, labor and financial resources. [4].

Given the importance of environmental conservation, the main objective of the article was to highlight the importance of the spring to the Municipal Park of Mindu, as well as to propose solutions to the problems that were observed in loco, the research aimed to demonstrate the activities aimed at recovery of the spring. and revitalization of areas affected by degradation.

2. Theoretical Referential

2.1 Mindu Municipal Park

The Park located in the city of Manaus / AM, offers to its visitors the ecological knowledge, rich in biodiversity, adding mostly fauna and flora, and can be used not only for leisure but for various other activities that contemplate the use of nature, and through the parquet trails where The visitor can observe the characteristics of the place as the spring, thus having the opportunity to appreciate a specific water attraction. [5].

2.2 Educação Ambiental

The Ecological Corridors translate into uninterrupted forest physical spaces, linking Conservation Units (CUs), conceived to human occupation, and land use in its most diverse ways, aiming at the well-being of the population with regard to quality of life, the protection of biological diversity, the ecological rescue of the territorial region, the improvement of the climate, the retention of rainwater and the protection of water resources [6].

Among the many factors with different degrees of importance for the creation and maintenance of these protected spaces are: the maintenance of essential ecological processes; the refuge for species that cannot reproduce and survive in managed landscapes; the continuity of natural evolution; strengthening opportunities for the development of local communities; scientific investigation; education; training; recreation; tourism and provision of environmental goods and services [7].

In this context, Environmental Education aims to teach current and next generations the importance of preserving the environment. The biggest intention is to try to create awareness “how to enjoy the resources offered by nature, thus creating a new model of behavior, seeking a balance between man and the environment” [8].

The biggest challenge is to promote the change of habits, it is possible to transform behavior from the experience of seeing how harmful the action of the human being can be to nature. Recovering and keeping

springs alive and protected is a strategy for a future that has a better quality of life for the population aiming at environmental sustainability. Environmental awareness actions can be the beginning for recovery and revitalization for environmental sustainability, programs offered by SEMMA, make the population aim for a better quality of life while preserving the environment [9].

3. Methodology

3.1 Study Site

The research was carried out at Mindu Municipal Park, located at Perimetral Street, Parque 10 de Novembro neighborhood, South Central Manaus (Figure 1).



Figure 1. Mindu Municipal Park

Fonte: Google Earth, 2018.

The collections were performed three times a week over two months, from March to April 2018. The first collections allowed a survey of the initial conditions of the site, making it possible to plan the first activities of restructuring and revitalization of the space.

3.2 Data Processing

Study Approach Corroborates with Dray and Simonetti [5], of a qualitative nature destined to the restructuring of the spring in the Mindu Municipal Park, through actions carried out in loco, where it was verified the water quality, the animals that live there and if any form of illegal dumping occurs in the environment. The revitalization project had an exploratory-descriptive character, which is a strategy that allows a better understanding of the object of study and is characterized as being descriptive. deepening the knowledge on the subject.

4. Analysis and Discussion of Results

With the proposal of recovery of the spring was essential for the continued existence of the resident fauna

of the site, because the water works as an ecological drinking fountain, it is extremely necessary to preserve this good for fauna, flora and all biodiversity [10]. The planning actions that were worked on without loco have technical aspects are focused on the maintenance and conservation of the Mindu Municipal Park, which was created in 1943 in Manaus [1], where certain parameters of the situation were observed highlighting the predominance. Depending on the location, impacts can directly influence vegetation cover, as well as erosion in the soil [4].

Through technical visits, it was possible to characterize the environment, it was observed that the type of spring existing in the area is of the perennial type that have great tendency to erosive process, to avoid these impacts the natural vegetation is very important.

According to the observed scenario (Figure 2), the canal was clogged due to accumulated residues such as foliage, dry branches, sand and even urban solid residues, due to the expansion and thickening of vegetation and other natural components when they accumulate in a large amount of water they may obstruct it. causing him to look for other means of exiting the ground, changing the river flow.



Figure 2. Spring of Mindú Park with dry branches that obstructed the passage of water.

The actions were performed with the help of a shovel, hoe and wheelbarrow, removing the objects from the area and all the sediment that prevented the flow of water, the result after a few weeks was satisfactory, because a small course of water was reappearing (Figure 3).



Figure 3. Clearance of the Nanuente of Mindu Municipal Park.

Following the course of the spring about 20 meters ahead, it was noted the accumulation of sand, which

causes siltation on the site. To prevent siltation from clogging the flow of water, they were carried out with the aid of tools to remove sand and make way for water to flow (Figure 4).



Figure 4. Siltation in the source of Mindu Park.

The purpose of removing the artery was due to the obstruction of the water channel. The canal sprouts elsewhere or closes at once. Therefore, from the sediment that obstructed the place where water sprouted (Figure 4), it was removed to keep the drinking fountain of the park active [11].

To prevent siltation, the presence of riparian forest is essential, that is, a natural protection against siltation. Without it, the erosion of the banks takes land into the river, making it muddy and making it difficult for sunlight to enter, also known as gallery forest, lowland forest, vegetation or riparian forest. Species were introduced in areas where siltation occurred.

For application there was the use of species arranged on the ground, called Heliconia (Heliconiaceae), whose common name is caeté or banana tree (Figure 5) that bloom from September to February, the naturally occurring region are the states of Amazonas and Acre, especially in moist secondary and primary forests, on riverbanks, roadside and places with soggy soils.



Figure 5. Plant species arranged on site.

Following the flow at the end of the spring there was an old maintenance dam without any maintenance, it

was observed that the site was abandoned and without any care. Before starting the restoration actions, it was necessary to evaluate the location, since it was an area closer to the Stream do Mindu, in this space were found different types of solid residues (Figure 6), due to the extension of the Stream do Mindu, these residues have been seeping through the aquifer that ends up being dumped in various neighborhoods of the city of Manaus.

According to Figure 6, the residues that were removed with the cleaning of the area were pet bottles, plastic bags, plastic packaging. Through waste bags were deposited all the waste that was in the area affected by pollution.

During the period of collection of this material, partnerships were made with the sustainable turn that always promotes the day of environmental awareness, is an event open to the public to carry out environmental activities, one of them being the cleaning of the streams of Manaus, and Mindu is one of the places where the event occurs and the cleaning of the park. On the parquet there is a collection station for recyclable materials, and the final destination of some solid residues removed during the cleaning of the spring.



Figure 6. Floating solid waste in Mindu stream.

The intent to rebuild the containment was to ensure that the residues would not be dammed in the watercourse near the source path, but not by ensuring that, as the waste is deposited, it cannot cause the obstruction again (Figure 7). After cleaning the area, the dam was rebuilt using sandbags inside.



Figure 7. Construction of Mindu Park Containment.

Near the ground, the 100 mm PVC pipe (Figure 8) was allocated, whose function is to clean the spring [7]. The pipe can be closed or open, and it is possible to control the flow of water without damaging the Mindu Park natural drinking fountain during the dry season, which occurs during the months of August, September, October and November, while the December to July are the flooding months of the rivers [12] [13].



Figure 8. Containment exhaust pipe.

In the containment (Figure 9) 66 polypropylene bags with sand inside were used, creating a microfilter so that the water that comes out of the nascent and does not mix with the polluted water of the Mindu stream. The seedlings collected on site were planted on site improving the structural aspect and fixation of the soil and also highlighting the scenic beauty of the site.



Figure 9. Implementation of sandbags and planting of seedlings in containment.

The main function of the spring in Mindu Park is the survival of the fauna (Figure 10) that inhabit the place, such as the Agouti (*Dasyprocta*), the Coral Snake (*Micrurus Corallinus*), the Spider (*Araneae*), the Alligator (*Alligatoridae*), the Green Iguana (*Iguanaiguana*), and the endemic species considered the official mascot of the Municipality of Manaus / AM since 2005, the Sauim-of-collar (*Saguinusbicolorra*) being one of the most threatened primates in the world. Currently considered to be critically endangered by the Ministry of the Environment criteria, the main threat to collar sauim is the destruction of its habitat due to deforestation and forest fragmentation.



Figure 10. Fauna that lives in Mindu Municipal Park [1] [5].

5. Conclusion

The actions taken to restore the existing spring inside Mindu Municipal Park have a positive influence on the site, as it is known that water eye is still the main responsible agent for the fauna to have a place to quench its thirst. . The justifications for site degradation outweigh the anthropic impacts, also due to the low social participation of volunteers for environmental education practices.

With the initiative of the project, it was found the presence of more visitors in the Park, and at each completed stage, as they observe the area being restored, in reflection form gains more importance the preservation of an environment that is in the midst of urban area, and that provides the balance of nature with its ecological corridor. Therefore, encouraging visitors to participate in social and environmental activities is essential for the support of the place.

6. References

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