

# Ecological Corridors: A Public Policy Model For Conserving Urban Streams In The City Of Porto Velho – Rondônia

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## **Abstract:**

The study investigates the irregular occupation of urban Permanent Preservation Areas (PPAs) in Porto Velho, focusing on residents' perceptions and proposing ecological corridors (linear parks) as a public policy solution. With significant socio-environmental deficits, the city struggles with the impacts of unregulated urban growth, resulting in environmental degradation and risk to residents living along urban streams. These areas face issues like pollution, loss of riparian vegetation, and inadequate urban planning, exacerbating socio-environmental conflicts. Drawing on legislative frameworks such as the National System of Conservation Units (SNUC), the research highlights the potential of ecological corridors to restore ecosystems, enhance biodiversity, and improve the urban environment. Through participatory watershed management, this study suggests a three-step methodological approach: diagnosis of physical and socio-environmental characteristics, prognosis based on the gathered data, and planning for ecological corridor implementation. Surveys reveal widespread occupation and degradation of PPAs, with 71% of respondents recognizing their poor condition and 63% highlighting their importance for urban resilience. Despite the challenges, the majority support preserving these green areas, which offer both ecological and social benefits. This research underscores the critical role of ecological corridors in balancing urban development with environmental sustainability and proposes actionable strategies to address the socio-environmental challenges of Porto Velho.

**Key Word:** Urban Permanent Preservation Areas, Ecological Corridors, Linear Parks.

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Date of Submission: 03-12-2024

Date of Acceptance: 13-12-2024

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## **I. Introduction**

The Urban quality is strongly linked to the presence of open spaces in Brazilian cities, defined as spaces without buildings, regardless of their size or use. Among these, Permanent Preservation Areas (PPAs) are essential for the environmental context of a city. These spaces can be connected to form an integrated network of urban pathways, becoming the most significant public spaces, especially in cities embedded in the Amazon ecosystem.

In the last decade, Porto Velho has undergone significant urban transformations, marked by rapid population growth and disorderly land occupation, accompanied by unprecedented environmental impacts, particularly on urban streams. The municipality has taken coordinated action to curb and prevent further environmental degradation. However, more tailored public policies for the local ecosystem are still necessary.

According to Law N°. 9.985/2000, which established the National System of Conservation Units - SNUC, ecological corridors are segments of natural or semi-natural ecosystems that connect conservation units, allowing for gene flow and biota movement. Their purpose includes facilitating species dispersion, recolonizing degraded areas, and maintaining populations that require larger areas for survival.

In urban settings, these ecosystem segments also help maintain water bodies and improve the quality of life for surrounding communities when properly maintained and protected. The expansion of agricultural areas, urban sprawl due to population growth, and industrial and housing projects have significantly altered natural landscapes. This has led to the fragmentation of native vegetation, necessitating preservation of the remaining fragments. Corridors act as links between different environments or forest fragments, serving as pathways for the movement of isolated fauna and flora species, functioning as ecological stepping stones, and enabling gene flow among species, mitigating isolation caused by fragmentation. The objective of this work is to ensure the protection of green areas within the city, urban water sources, and the well-being of species (flora and fauna) affected by accelerated population growth and environmental changes.

## **II. Material And Methods**

Establishing ecological corridors requires procedures such as area selection, study and management, identification of ecological instruments, and collaboration with government institutions and civil society organizations. Herrmann et al. (2003) suggest that planning ecological corridors should occur at a regional level to optimize resources and maximize benefits.

Porto Velho, with a significant socio-environmental deficit, faces the enormous challenge of overcoming the social and environmental inequalities prevalent throughout its municipal territory, particularly in urban areas. These challenges are directly related to the occupation of risk areas, permanent preservation areas, and irregular or marginal areas within the city.

Direct or indirect interventions in urban streams, such as channeling and straightening watercourses, are merely palliative measures and often lead to other environmental and urban problems. Porto Velho's natural drainage system comprises a dense and complex network of streams, which have been subjected to intense anthropogenic activity over the years. The construction of improvised dwellings, landfills, urban waste dumping, and the discharge of untreated sewage have become commonplace.

Riparian or alluvial forests in urban areas have been continuously destroyed, primarily due to irregular housing, which is a leading cause of fragmentation and degradation of these ecosystems. According to Oliveira Filho et al. (1994), the devastation of riparian forests has contributed to sedimentation, increased water turbidity, destabilization of flood regimes, loss of perennality, and erosion of riverbanks, ultimately compromising local fauna.

The lack of planning and appropriate municipal public policies aimed at providing dignified housing and the absence of an efficient administrative structure for enforcement encourage the occupation of riverbanks and urban lagoons by illegal or irregular settlements. These occupations threaten vital water resources and pose a significant socio-environmental conflict for Brazilian cities, involving the preservation of the environment, economic exploitation of private property, and the right to housing.

Specially protected territorial spaces, according to Leuzinger (2002, p.93), encompass both public and private areas designated by federal, state, or municipal authorities to protect their environmental attributes. The creation of these protected spaces serves as a tool for achieving the environmental function of property.

The proposed creation of legally protected ecological corridors in urban areas, connecting Permanent Preservation Areas - PPAs, Environmental Protection Areas - APAs, Conservation Units - UC, neighborhoods, and human communities, is vital for sustaining a sustainable environment. The study incorporates integrated and participatory watershed management, which involves three distinct steps:

1. DIAGNOSIS of the watershed's physical, hydrological, infrastructural, and socioeconomic characteristics;
2. PROGNOSIS based on diagnostic information;
3. PLANNING actions for implementing urban ecological corridors.

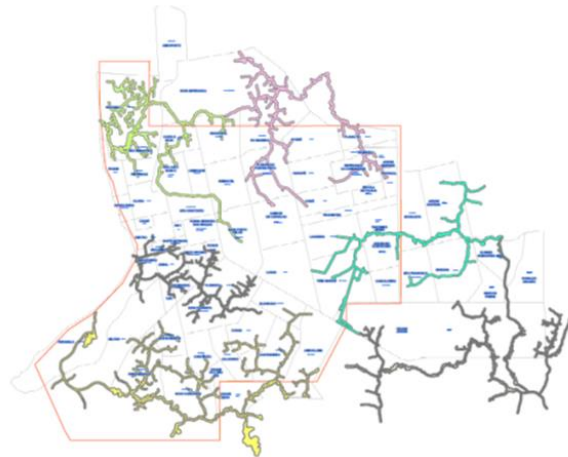
In Brazil, the delimitation and protection of Permanent Preservation Areas - APP were provided for in the Brazilian Forest Code, which was created in 1934 and reissued in 2012 through Federal Law 12.651, which instituted the New Brazilian Forest Code, which establishes general rules on the protection of vegetation, Permanent Preservation areas and Legal Reserve areas; forest exploitation, the supply of forest raw material, the control of the origin of forest products and the control and prevention of forest fires, and provides economic and financial instruments to achieve its objectives, he maintained the creation and permanence of APPs, but with modifications in the obligations to maintain riparian forests.

## **III. Result And Discussions**

From the neighborhoods analyzed in Porto Velho, it was observed that approximately 63% of them showed evidence of occupation within PPAs, with degradation occurring exponentially and little to no action taken to mitigate this situation.

Interviews considered factors such as residents' length of residency, the way streams and riparian forests are utilized, their awareness of the ecological and urban functions of watercourses, vegetation changes, and their understanding of the general concept of permanent preservation areas. These findings are summarized in the charts below.

**Figure 01: Map with the indication of the urban streams of the Porto Velho District headquarters.**



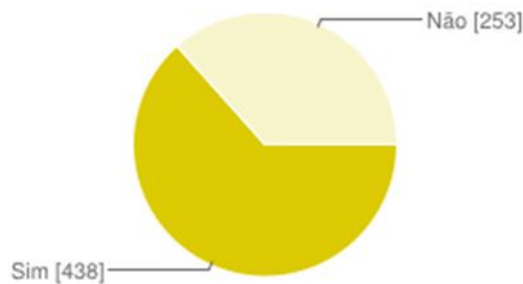
Source: Departamento de Gestão Urbana de Porto Velho, 2024

The presented map illustrates the network of urban streams in the municipality of Porto Velho, highlighting their wide distribution and interconnection across different areas of the urban perimeter. The lines represent the main watercourses, indicating potential Permanent Preservation Areas (PPAs) along their banks. The colored delimitations suggest study zones or priority regions for environmental preservation and recovery actions.

The analysis of the map underscores the strategic importance of ecological corridors in linking fragments of riparian vegetation, contributing to biodiversity conservation and the restoration of degraded areas. Furthermore, the irregular occupation near the watercourses, evidenced by the overlap of urban networks along the streams, emphasizes the urgency of public policies for sustainable management and PPA preservation.

When integrated into the study's proposals, this map serves as a planning tool, identifying critical areas for the implementation of linear parks and management policies that reconcile environmental preservation with sustainable urban development.

**Figure 02: Graphical representation of APP Occupations**



Source: prepared by the author

As shown in the figure, 63% of the interviewees indicated that the riparian forests of the City of Porto Velho are occupied in some way, mostly with residences that annually suffer from floods and floods, significantly affecting the life of the population installed there.

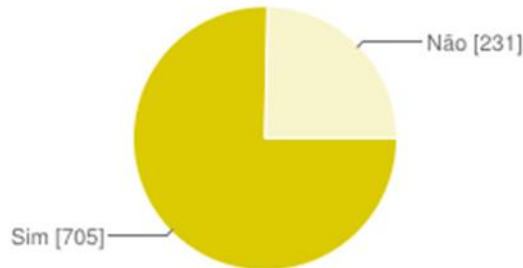
**Figure 03: Graphical representation of Preserved PPA**



Source: prepared by the author

The figure shows that 71% of the interviewees reported that these areas are degraded, with only the presence of weeds and garbage, or without any cover serving as a rubble deposit, and most of them were very concerned about the conditions of the same.

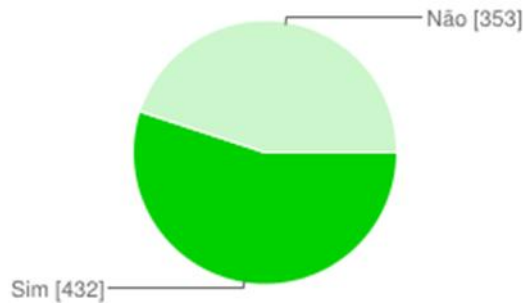
**Figure 04: Graphical representation of importance of PPA Preservation**



Source: prepared by the author

Although there are many occupations, the population sees that the preservation of these green spaces in the city is of great importance, both for the city and for the well-being of the population that lives in its vicinity, but this preservation must occur with popular participation and in a continuous and permanent way, not as it is done today by the public authorities that only guarantee the preservation of the area and leave them without any cleaning and care.

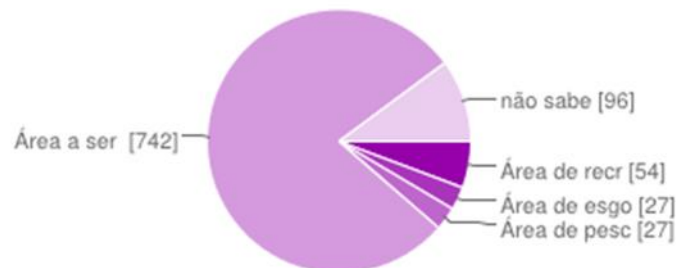
**Figure 05: Graphical representation of Importance of Stream Preservation**



Source: prepared by the author

Although a good part of the population finds an advantage in preserving the APP, this value decreases significantly when it is related to the stream itself as shown in figure 04, this is due to the poor conditions that the urban streams of the city are in and that today many of them are polluted without any condition and for the population it has lost its environmental and landscape functions, confusing itself with real open sewage networks.

**Figure 06: Graphical representation of Understanding of PPA Concept by Population**



Source: prepared by the author

The figure above shows that a part of the population still has great difficulty in understanding the concept of permanent preservation area, and those who refer to it as an area to be preserved, only have the understanding of preservation as a green area for the city, without any relationship with the source itself.

#### IV. Conclusion

Thus, it is necessary to develop municipal strategies for the recovery of urban riparian forests in the city of Porto Velho-RO, preserving biodiversity, as well as the endangered species of microfauna and the maintenance of the quality of life in the city is of fundamental importance for the survival of the City. And for this, the Municipal Master Plan created the figure of linear parks, which aims to preserve the areas bordering the streams with their respective urbanization, thus preventing the population from occupying them.

The research concludes that Porto Velho's urban development has led to significant degradation of PPAs, with widespread occupation contributing to environmental and social vulnerabilities. Restoring these areas through ecological corridors is essential to preserving biodiversity, mitigating risks, and improving quality of life. This requires integrated public policies that combine urban planning, community engagement, and strict enforcement of environmental laws.

The study thus recommends the need to prioritize the restoration of riparian vegetation to combat erosion and improve water quality; Implement participatory urban planning to ensure community involvement in the preservation of ecological areas; Strengthen enforcement mechanisms to prevent illegal occupation and degradation of protected areas; Establish partnerships between the public, private and civil sectors to finance and maintain ecological corridors, as well as effective environmental education on the ecological and social significance of permanent preservation areas

#### References

- [1]. Brasil. Lei Federal Nº 9.433, De 8 De Janeiro De 1997. Institui A Política Nacional De Recursos Hídricos, Cria O Sistema Nacional De Gerenciamento De Recursos Hídricos, Regulamenta O Inciso Xix Do Art. 21 Da Constituição Federal E Altera O Art. 1º Da Lei 8.001, De 13 De Março De 1990, Que Modificou A Lei 7.990, De 28 De Dezembro De 1989. Brasília, 1997. Disponível Em <[Https://Www.Planalto.Gov.Br/Ccivil\\_03/Leis/L9433.Htm](https://www.planalto.gov.br/ccivil_03/leis/L9433.htm)>. Acesso Em 01 Outubro De 2024.
- [2]. Brasil. Lei Federal Nº 9.985, De 18 De Julho De 2000. Regulamenta O Art. 225, § 1o, Incisos I, Ii, Iii E Vii Da Constituição Federal, Institui O Sistema Nacional De Unidades De Conservação Da Natureza E Dá Outras Providências. Disponível Em: <[Http://Www.Planalto.Gov.Br/Ccivil/Leis/L9985.Htm](http://www.planalto.gov.br/ccivil/leis/L9985.htm)>. Acesso Em: 10 De Outubro 2024.
- [3]. Brasil. Lei Nº. 12.651, De 25 De Maio De 2012. Que Dispõe Sobre A Proteção Da Vegetação Nativa; Altera As Leis Nºs 6.938, De 31 De Agosto De 1981, 9.393, De 19 De Dezembro De 1996, E 11.428, De 22 De Dezembro De 2006; Revoga As Leis Nos 4.771, De 15 De Setembro De 1965, E 7.754, De 14 De Abril De 1989, E A Medida Provisória No 2.166-67, De 24 De Agosto De 2001; E Dá Outras Providências. 2012. Disponível Em <[Https://Www.Planalto.Gov.Br/Ccivil\\_03/\\_Ato2011-2014/2012/Lei/L12651.Htm](https://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12651.htm)>. Acesso Em 10 Novembro De 2024.
- [4]. Herrmann, S., Et All. Threshold Values For Nature Protection Areas As Indicators For Bio-Diversity A Regional Evaluation Of Economic And Ecological Consequences. Agriculture, Ecosystems & Environment. 98, 493-506, 2003.
- [5]. Leuzinger, Márcia Dieguez. Criação De Espaços Territoriais Especialmente Protegidos E Indenização. In: Revista De Direito Ambiental, N. 25, Ano 7: Rt, Jan-Mar. 2002.
- [6]. Macedo, Silvio; Sakata, Francine. Parques Urbanos No Brasil. São Paulo: Edusp: Imprensa Oficial Do Estado, 2002.
- [7]. Magnoli, Miranda M. E. M. Espaços Livres E Urbanização: Uma Introdução A Aspectos Da Paisagem Metropolitana. Tese (Livro-Docência Em Arquitetura E Urbanismo), 1982. Faculdade De Arquitetura E Urbanismo, Universidade De São Paulo, São Paulo, 1982.
- [8]. Oliveira Filho, A.T.; Almeida, R.J.; Mello, J.M. Et Al. Estrutura Fitossociológica E Variáveis Ambientais Em Um Trecho De Mata Ciliar Do Córrego Dos Vilas Boas, Reserva Biológica Do Poço Bonito, Lavras (Mg). Revista Brasileira De Botânica, São Paulo, V. 17, P.67-84, 1994.
- [9]. Primack, R. B. E Rodrigues E. Biologia Da Conservação. Editora Planta, 2001
- [10]. Santos, Waldemir Lima Dos. O Processo De Urbanização E Impactos Ambientais Em Bacias Hidrográficas: O Caso Do Igarapé Judia-Acre-Brasil. Dissertação (Mestrado Em Ecologia E Manejo De Recursos Naturais). Universidade Federal Do Acre, 2007.
- [11]. Verdan, Tauã Lima. A Afirmação Jurisprudencial Do Princípio In Dubio Pro Nature No Cenário Jurídico Brasileiro. Portal E-Governo Publicações Eletrônicas, Santa Catarina, 2 Julho 2013. Disponível Em: <[Http://Www.Egov.Ufsc.Br](http://www.egov.ufsc.br)> Acesso Em 13 De Novembro De 2024.