

Articles

Floristics, structure and diversity of tree communities of two Gallery Forests in the Federal District, Brazil

Florística, estrutura e diversidade das comunidades lenhosas de duas Matas de Galeria no Distrito Federal, Brasil

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ABSTRACT

Gallery Forests are narrow strips of tropical forests that occur along water courses. This vegetation type is common in Central Brazil and is extremely relevant for the biodiversity conservation, maintenance of ecological processes and water regulation. Therefore, the aim of this study was to evaluate the woody vegetation in two gallery forests in the Federal District, called Ribeirão gallery forest (RGF) and Pitoco gallery forest (PGF). Fifty plots of 10 m x 10 m were sampled in each forest, and all trees with DBH \geq 5 cm were measured. In each forest, we conducted analysis on phytosociological parameters, diameter and height distributions, and diversity indexes. We registered 1,571 woody individuals, belonging to 150 species, among which, 94 were recorded in the forest of Ribeirão (RGF) and 96 in the forest of Pitoco (PGF). Although only 40 species (26.7%) occurred in both forests, the Chao-Sorensen similarity index was 0.478, showing the high Beta diversity within these formations. The species richness of the two forests is above the average observed in other gallery forests in Brazil, with Shannon diversity index (H') equal to 3.86 for RGF and 3.96 for PGF, and the Pielou evenness index (J') equal to 0.85 and 0.87, respectively. The diametric distribution of both forests showed the reverse J-shaped pattern, suggesting communities with satisfactory regeneration. Floristic and structural distinctions both between and within forests, alongside the observed high richness, indicate great biological heterogeneity, in response to the different environmental conditions. This underscores the importance of maintaining ecological corridors to facilitate gene flow and species dispersal among different gallery forests.

Keywords: Cerrado; Ecology; Conservation; Phytosociology; Riparian zones

RESUMO

Matas de Galeria são faixas estreitas de florestas tropicais que ocorrem ao longo dos cursos d'água na região do Brasil central e são de extrema relevância para a conservação da biodiversidade, manutenção de processos ecológicos e regulação hídrica. Com o objetivo de caracterizar a vegetação lenhosa em dois trechos de matas de galeria no Distrito Federal, foi realizada amostragem em 1,0 ha, sendo 50 parcelas de 10 m x 10 m em cada trecho, onde foram mensuradas todas as árvores com DAP \geq 5 cm. Para cada mata foram realizadas análises fitossociológicas, investigados os padrões de distribuição diamétrica e hipsométrica e analisados os índices de diversidade. Foram mensurados 1.571 indivíduos lenhosos, pertencentes a 150 espécies, dentre as quais 94 foram registradas na mata do Ribeirão (MR) e 96 na mata do Pitoco (MP). Apenas 40 espécies (26,7%) ocorreram em ambas as matas. O índice de similaridade Chao-Sorensen foi igual a 0,478, evidenciando a elevada diversidade Beta destas formações. A riqueza de espécies das duas matas está acima da média observada em outras matas de galeria no Brasil, com índice de Diversidade de Shannon (H') igual a 3,86 para a MR e 3,96 para a MP, e a equabilidade de Pielou (J') igual a 0,85 e 0,87, respectivamente. A distribuição diamétrica de ambas as matas apresentou padrão de J invertido, sugerindo comunidades com regeneração satisfatória. Diferenças florísticas e estruturais entre e dentro das matas, bem como a elevada riqueza encontrada, sugerem grande heterogeneidade biológica, em resposta às distintas condições ambientais dentro de cada trecho, o que reforça a importância da manutenção de corredores ecológicos para facilitar o fluxo gênico e a dispersão de espécies entre as diferentes áreas de matas de galeria.

Palavras-chave: Cerrado; Ecologia; Conservação; Fitossociologia; Zonas ripárias

1 INTRODUCTION

Riparian zones are areas of water saturation where interactions between terrestrial and aquatic ecosystems occur. These areas, which include the vegetation associated with the margins and drainage of watersheds and micro-basins, play a fundamental role from both an ecological and hydrological point of view (Salemi *et al.*, 2016; Valera *et al.*, 2019). In the Cerrado biome, two types of forest formations associated with water courses stand out: gallery forests and ciliary forests. While gallery forests are forests associated with small watercourses, where the passage of water forms a gallery under the continuous canopy, ciliary forests are associated with larger watercourses, where the canopy does not fully cover the watercourse bed (Ribeiro & Walter, 2008).

Gallery forests are of great ecological importance, being responsible for several ecosystem services: they act as a physical barrier; they regulate the exchange

processes between aquatic and terrestrial ecosystems; and they have a fundamental relevance in soil conservation and the maintenance of water resources (Augusta *et al.*, 2018; Valera *et al.*, 2019). These forests also act as a refuge for understory species, in the face of current and predicted climate change, as they maintain high humidity and mild temperatures (Davis *et al.*, 2019). Furthermore, they are important repositories of biodiversity, function as ecological corridors for wildlife, and provide water, food and shelter for wild animals (Lenza *et al.*, 2015).

Gallery forests are ecosystems of high biodiversity, organized into two primary components: alpha and beta diversity. Despite their small territorial representation, about 5% of the total area of the Cerrado, gallery forests are very important in terms of species richness and diversity. Gallery forests have higher diversity indices than those estimated for other forest formations in Central Brazil (Ribeiro & Walter, 2008; Haidar *et al.*, 2013; Lenza *et al.*, 2015; Nóbrega *et al.*, 2020). This high diversity of species is associated with high environmental heterogeneity and geographical distance between areas (Eisenlohr & Oliveira Filho, 2015; Neves *et al.*, 2015). Considering the dispersion limit, nearby areas tend to be more floristically similar to each other when compared to geographically more distant areas.

The Cerrado has more than 12,000 species of vascular plants recorded and about 23% of them occur in gallery forests (Mendonça *et al.*, 2008). In these forests are found endemic species and those shared with the Amazonian and Atlantic forests, including the semideciduous montane forests of southeastern Brazil. For example, *Protium altissimum*, *Xylopia emarginata* and *Licania apetala* occur both in the Amazon Forest and gallery forests of the Cerrado, while *Terminalia glabrescens*, *Ocotea aciphylla* and *Myrcia tomentosa* occur in the Atlantic Forest and are also found in the gallery forests.

This study aimed to characterize the floristic and structure of tree communities of two gallery forests located in two distinct watersheds in the Federal District as well as to assess species diversity in comparison to other gallery forests in Central

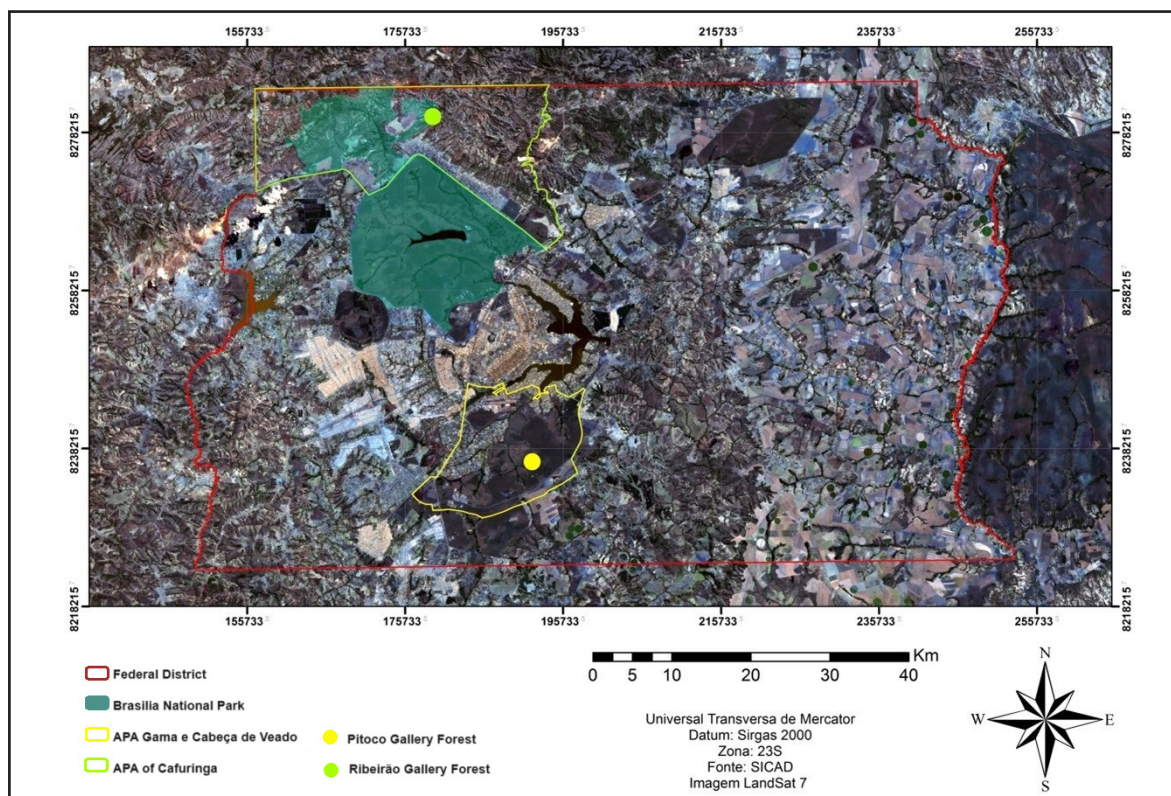
Brazil. This type of information can assist in decision-making regarding management and conservation actions for forest ecosystems, as well as serve as a foundation for strategies aimed at restoring gallery forests (Neves *et al.*, 2017; Nobrega *et al.*, 2020).

2 MATERIAL AND METHODS

2.1 Study area

The study was carried out in two gallery forests (Figure 1) located in different hydrographic regions (Tocantins-Araguaia and Paran) and Conservation Units of the Federal District, Brazil. These gallery forests are about 45 km apart and are characterized by distinct environmental conditions. Soil types and terrain slope are among the abiotic variables that clearly change among the forests studied.

Figure 1 – Location of the gallery forests studied in the Maranho (APA of Cafuringa) and Parano (APA do Gama e Cabea de Veado) basins. Federal District, Brazil



Source: Authors (2020)

2.1.1 Ribeirão Gallery Forest – Brasília National Park/APA of Cafuringa

The Environmental Protection Area (APA) of Cafuringa (Figure 1) is located to the northwest of the Federal District, between the coordinates 15° 30' and 15° 40' S and 47° 50' and 48° 12' W, in the Administrative Regions of Sobradinho and Brazlândia (SEMARH, 2005). The APA occupies 46,51 ha and was created with the objective of protecting and conserving the water resources and biodiversity of the Cerrado, in addition to ensuring a model of sustainable development for the Federal District (SEMARH 2005).

The altitude in the APA of Cafuringa region varies from 800 m to 1,400 m. The average annual temperature is around 22 °C and the average annual rainfall is around 1600 mm. The climate is characterized as tropical, according to the Köppen classification, with a concentration of rainfall in the summer period, between October and April, and with a dry season occurring in the winter, between May and September. In the region there are no significant variations in rainfall, however, the altimetric differences are responsible for variations in temperature, providing the occurrence of different climatic types, that is, Tropical (Aw), which is predominant, and Tropical Altitude (Cwa and Cwb) (SEMARH 2005).

The gallery forests in the APA of Cafuringa occur on seasonally floodable hydromorphic soils, cambisols, lithosols and oxisols. Part of the soil is developed under the influence of the water table (hydromorphic) and remains saturated in the rainy season. They contain organo-mineral surface horizons, with totally or partially decomposed organic matter. The soils, on flat or smooth undulating relief, are poorly developed and poorly drained. These environments are generally found in regions of slope rupture or in the slopes of rainwater which, due to the presence of vegetation, slowly flow into the stream (SEMARH, 2005).

A section of gallery forest of the Ribeirão (RGF), known locally as Monjolo, belonging to the Maranhão River basin, hydrographic region of Tocantins-Araguaia, was sampled in the APA of Cafuringa, and included in the polygonal expansion of the Brasília National Park, through Law No. 11,285/2006.

2.1.2 Pitoco Gallery Forest – Roncador Ecological Reserve/APA Gama e Cabeça de Veado

The Roncador Ecological Reserve - IBGE (RECOR) is located 35 km south of Brasília - Federal District, near the junction of DF 001 and BR 251 (km 0), at the geographic coordinates of 15° 56' S and 47° 53' W. The Reserve is bordered to the northeast and northwest by the Ecological Station of the Botanical Garden of Brasília (EEJBB) and to the southeast by the Água Limpa Farm (FAL-UnB). Together, RECOR, FAL-UnB and EEJBB form a continuous and protected area of the Cerrado and belong to the APA Gama e Cabeça de Veado, which occupies 10,000 ha in the Federal District (IBGE, 2004).

The local climate is “Tropical savannah” (AW) and “Temperate Rainy Dry Winter” (CWA), according to the Köppen classification, is characterized by the existence of two seasons: one rainy and hot, which lasts from October to April, and another, cold and dry, that extends from May to September. Records made at the climatological station in RECOR indicate an average rainfall of 1,453 mm year⁻¹, an average annual temperature of 22 °C and an average relative humidity of 67% (IBGE, 2004).

The altitude at RECOR ranges from 1,048 to 1,150 m. The terrains are basically made up of detrital-lateritic roofs of the Tertiary, laid in gentle relief, in the interfluves, and terraces of the Quaternary, formed along five watercourses that originate in the Reserve. The predominant soils are red-yellow oxisols, and there are also significant occurrences of dark red latosols, cambisols, organic soils, ultisols and hydromorphic soils (EMBRAPA, 2011).

The section of gallery forest in RECOR/APA Gama e Cabeça de Veado is located near the Pitoco stream. This stream rises in RECOR and flows into the Roncador, forming the Taquara, which flows into the Gama stream, one of the main contributors to the Paranoá Lake basin, of great contribution to the São Bartolomeu River basin, part of the hydrographic region of Paraná.

2.2 Vegetation survey

In each section, an area of 0.5 ha (50 m x 100 m) was sampled and subdivided into 50 plots of 100 m² (10 x 10 m), arranged contiguously and perpendicularly to the drainage line of the streams. In each plot, all the stems of woody individuals, including standing dead trees, with circumference at breast height (CAP) equal to or greater than 15.7 cm (DBH \geq 5 cm) were recorded. For each stem, the CAP and total height were measured using, respectively, a measuring tape and a stick graduated in meters, in case of stems up to 10 m. For larger trees, the total height was visually estimated.

The sampled trees were taxonomically identified to species level, when possible, and the families were classified according to the *Angiosperm Phylogeny Group IV* (APG IV) system, proposed by Chase *et al.* (2016). The botanical nomenclature conference was carried out using the databases of the *Missouri Botanical Garden "W3 Tropicos"* (<http://www.mobot.org>) and the List of Species of the Flora of Brazil (Forzza *et al.*, 2012), available in <http://floradobrasil.jbrj.gov.br>. The species not identified in the field were collected and pressed to obtain adequate botanical material for comparison purposes in the herbaria of the Brazilian Institute of Geography and Statistics - IBGE and of the University of Brasília (UnB), and for comparison with information available in the specialized literature.

2.3 Data analysis

Floristic analysis was performed using the species accumulation curve method, using the EstimateS program version 9.1.0 (Colwell, 2012). The potential richness was evaluated by the bootstrap estimator to calculate confidence intervals and to detect significant differences between the richness observed in the communities (Magurran, 2004).

Phytosociological parameters were used for quantitative characterization of ecological aspects of plant communities and evaluation of vegetation structure. The importance value index - IVI (Müeller-Dombois & Ellenberg, 1974) was calculated for

each species recorded in each gallery forest by calculating density, frequency and dominance (absolute and relative values).

To evaluate the distribution of tree diameters in each section, the interval between classes of 5 cm was considered for comparison with other studies (Silva Júnior, 2005; Amaral *et al.*, 2017). The distribution of trees in height classes was also used to evaluate the forest structure, as it allows diagnosing the tree dominance classes and the vertical stratification of the vegetation. For the distribution in height classes, an interval of 2 m was used, a standard adopted in vegetation studies for gallery forests in the Cerrado biome.

For each section, alpha diversity was determined by Shannon diversity and Pielou evenness indexes, using Microsoft Excel (2016). The Shannon diversity index (H') expresses the diversity in the community and its value in gallery forests is usually between 2.5 and 5.0. The higher the value of H' , the greater the floristic diversity of the community under study (Magurran, 2004). The Pielou evenness index (J') is derived from the Shannon diversity index (H'), and ranges from 0 to 1 and the closer to 1, the more homogeneous the distribution of species within the sample.

The beta diversity was represented by the dissimilarity, i.e., the inverse of the floristic similarity between the sections of gallery forest, using the quantitative index Chao-Sørensen (L_{abd}), modified by Chao *et al.* (2005). The estimate generated by this index includes the effect of species that were not found in the sampling, based on abundance data, as well as richness estimators, which are based on the occurrence of species in only one or both samples. The Chao-Sørensen index (L_{abd}) ranges from 0 to 1 and values greater than 0.5 indicate high similarity between communities (Chao *et al.*, 2005), and was obtained using the EstimateS 9.1.0 program (Colwell, 2012).

3 RESULTS

3.1 Composition and floristic richness

Considering the two sections, 150 species were recorded. After herbarium identification efforts and consultation with specialists, 121 species (80.6%) were

identified at the species level, seven (4.6%) were identified at the genus level, three (2%) at the family level, and 19 (12.6%) remained undetermined. The indeterminate species were analyzed and interpreted as morphologically distinct, thus contributing to the sum of the floristic richness of the sample. Unidentified species were represented by few individuals, that is, 9 (1.25%) in the RGF and 10 (1.46%) in the PGF, among which, four individuals were not collected in the RM (0.005%) and six in the PGF (0.011%) due to difficulties in obtaining adequate botanical material, especially in the case of very tall trees or without leaves at the time of measurement.

In the two sections of gallery forest, 1,571 trees with CAP \geq 15.7 cm were recorded, including dead standing trees, of which 761 were sampled in RGF and 810 in the PGF. The floristic richness found in the RGF was 94 species, distributed in 37 botanical families, while that found in the PGF was 96 species distributed in 38 families. Considering all species, 40 (26.6%) are common to both gallery forests.

The representativeness of the species in the sampling was considered satisfactory from the analysis of the rarefaction curves, considering that with a sampling effort of only 25 plots of 100 m² (50% of the sample), 75% and 77% of the species had already been included in the surveys in RGF and PGF, respectively. Species richness accounted for about 89% of the estimated potential richness (107 ± 3.9) by bootstrap for RGF and 88% (109 ± 4.6) for PGF. In addition to the high richness estimated for both gallery forests, the results suggest that the floristic sampling is representative in both communities, since more than 88% of the potential species were recorded in the sampling for both sections.

The richest botanical families in the RGF were Fabaceae, with 13 species, Myrtaceae (7), Vochysiaceae (6), Chrysobalanaceae and Rubiaceae (5). Together they accounted for 38% of the community's total richness. A total of 22 families, or 23% of the total richness in the RGF, presented only a single species. The number of individuals sampled per family revealed the Burseraceae family as the one with the highest species richness, with 18% of the total richness of this community, followed by Fabaceae (13%) and Chrysobalanaceae (9%). Considering all the families registered in RGF, 22 of them showed species richness lower than 1.3%.

In PGF, the families with the highest richness were Fabaceae (18), Lauraceae (7), Myrtaceae (7), Rubiaceae (5) and Annonaceae (4) and together represent about 32% of the total richness of the community. On the other hand, 18 families had only one species, and together they correspond to 18% of the richness in the PGF. Rubiaceae had the highest density of individuals (19%), followed by Fabaceae (10%) and Lauraceae (8%). A total of 15 families had tree density less than 1%.

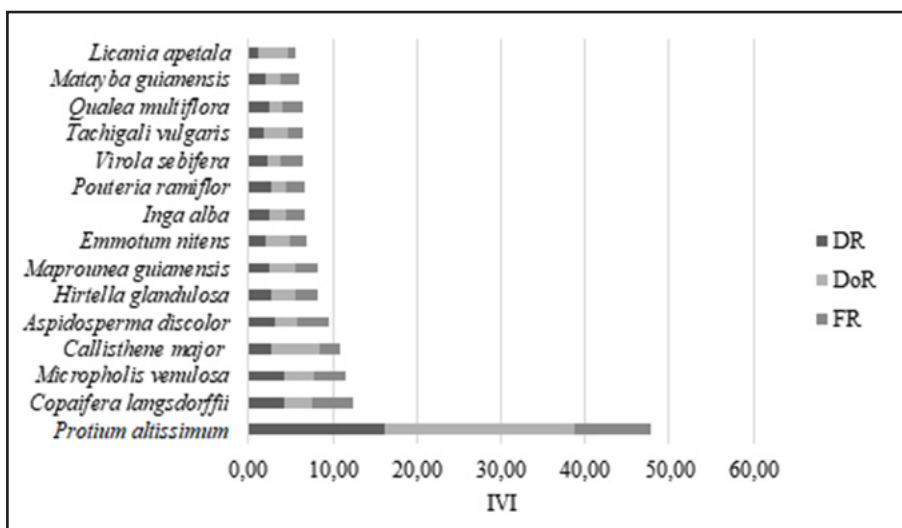
3.2 Phytosociological structure

The average tree density was estimated at 1,530 ind ha⁻¹ (\pm 160 ind ha⁻¹) and 1628 ind ha⁻¹ (\pm 154 ind ha⁻¹) for RGF and PGF, respectively. Regarding the basal area, the respective values were equal to 15.73 m² ha⁻¹ (\pm 2.48 m² ha⁻¹) and 31.45 m² ha⁻¹ (\pm 3.36 m² ha⁻¹). Standing dead trees occurred in 48% of the RGF plots and in 62% of the PGF plots. In the RGF, the density and dominance values of dead trees were equal to, respectively, 5.3% and 4.8% of the totals recorded in the community. In the PGF, these values were equal to 7.2% and 8.0%, respectively. For both forests, dead trees would occupy the second position in relation to the Importance Value Index (IVI), if they were considered for phytosociological purposes. Considering only the set of living trees, the density and dominance in the RGF were equal to 1440 ind ha⁻¹ and 15.04 m² ha⁻¹. In the PGF, density and dominance were equal to 1502 ind ha⁻¹ and 28.74 m² ha⁻¹, respectively.

In the RGF tree community, of the 94 species found, 23 presented 10 or more individuals in the sampling and together they added up to about 63% of the community density. A total of 36 species occurred with density between three and nine individuals and together corresponded to about 27% of the density. However, 35 species presented only one or two individuals in the sample, which corresponds to just over 5% of the total density. The 15 most representative species of the community corresponded to 52% of IVI, 53% of density and 57% of dominance. The families with the highest values of IVI in the RGF were Burseraceae, Fabaceae, Chrysobalanaceae, Vochysiaceae and Sapotaceae, together representing 53.70% of the total IVI.

In the RGF (Figure 2), the ecological importance (IVI) of *Protium altissimum* (1st) was highlighted in density, dominance and frequency, demonstrating high efficiency in colonization and development in that section of the forest. *Copaifera langsdorfii* (2nd) and *Micropholis venulosa* (3rd) stood out for their frequency and density, while *Callisthene major* (4th) stood out for their dominance. *Licania apetalata*, although it occurred with low density and frequency, stood out for its dominance, reaching the 15th position in IVI. *Callisthene major* and *Licania apetalata* were considered common in 21 gallery forests in the Federal District, while *M. venulosa* was considered occasional and *C. langsdorfii* was considered abundant, since it was present in more than 95% of the surveys. By contrast, *P. altissimum* was not found in any survey in the 21 forests (Silva Júnior, 2005).

Figure 2 – Relative density (DR), relative dominance (DoR) and relative frequency (FR) of the 15 species of greatest ecological importance for the Ribeirão gallery forest in the PNB / APA of Cafuringa, Distrito Federal, Brazil



Source: Authors (2020)

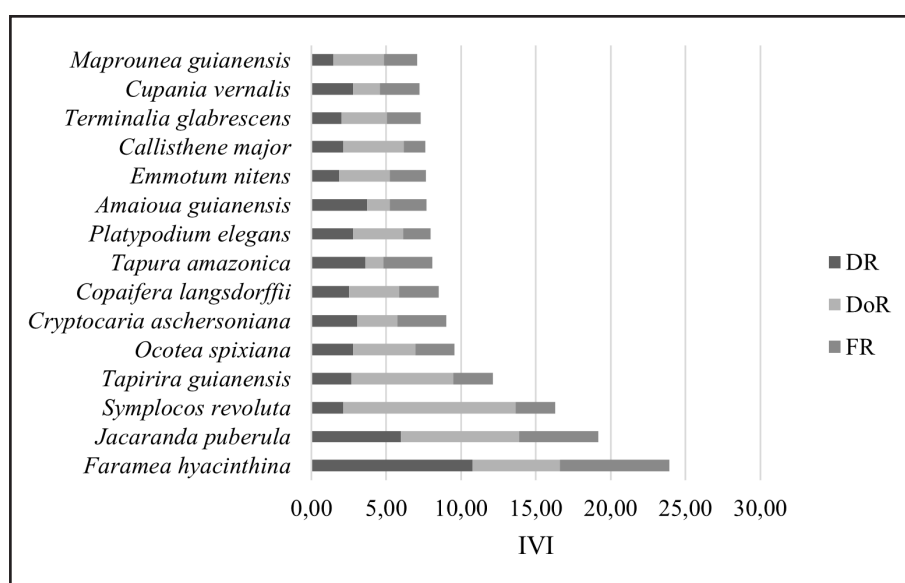
In where: The Importance Value Index is composed by the sum of the three parameters.

In the PGF community, of the 96 species sampled, 27 had 10 or more individuals, representing 71% of the community density; 33 species occurred with density between

three and nine individuals, i.e., about 22% of the total density, and 36 species presented only one or two individuals in the sample, and correspond to about 6% of the community density. The 15 most representative species of this community corresponded to 53% of IVI, 50% of density and 63% of dominance. The most important families were Rubiaceae, Fabaceae, Lauraceae, Bignoniaceae and Symplocaceae, together adding up to about 38% of IVI.

In PGF (Figure 3), *Faramea hyacinthina* reached the first position in IVI, due to the high density and frequency in the area. *Jacaranda puberula* (2nd) showed high values of density, dominance and frequency, while *Symplocos revoluta* (3rd) had low density and frequency, but its dominance (basal area) was high, which contributed to its prominence in ecological importance. *Tapirira guianensis* also showed a similar pattern of occurrence. *Tapura amazonica* (8th) and *Amaioua guianensis* (10th), notably understory species in this forest, showed high density and frequency, but low dominance.

Figure 3 – Relative density (DR), relative dominance (DoR) and relative frequency (FR) of the 15 species of greatest ecological importance for the Pitoco gallery forest in RECOR/ APA Gama e Cabeça de Veado, Federal District, Brazil



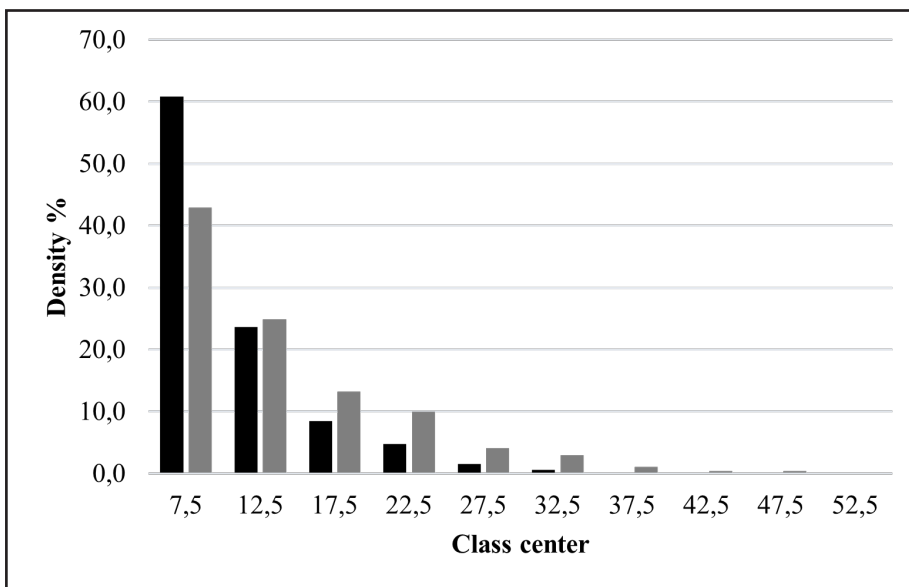
Source: Authors (2020)

In where: The Importance Value Index (IVI) is composed by the sum of the three parameters.

3.3 Distribution in diameter and height classes

Considering the two sections of gallery forest, most of the trees sampled (84.54% in the RGF and 67.8% in the PGF) occurred in the first two diameter classes, i.e., between 5-10 cm and 10-15 cm (Figure 4). In the RGF, the individuals with the highest DBH belonged to the species *Vochysia pyramidalis* (41.4 cm), *Podocarpus sellowii* (38.2 cm), *Callisthene major* (33.6 cm) and *Aspidosperma discolor* (33.2 cm), while in the PGF, the individuals belonged to *Symplocos revoluta* (51.9 cm), *Callisthene major* (46.3 cm), *Tapirira guianensis* (41.7 cm) and *Maprounea guianensis* (38.9 cm). These species with higher dominance in basal area (DBH \geq 30 cm) correspond to only 0.8% of individuals in the RGF and 4.9% in the PGF.

Figure 4 – Diametric distribution of tree communities in the Ribeirão gallery forests (dark bar), PNB / APA of Cafuringa, and the Pitoco gallery forest (gray bar), RECOR-IBGE / APA Gama e Cabeça de Veado, Federal District, Brazil



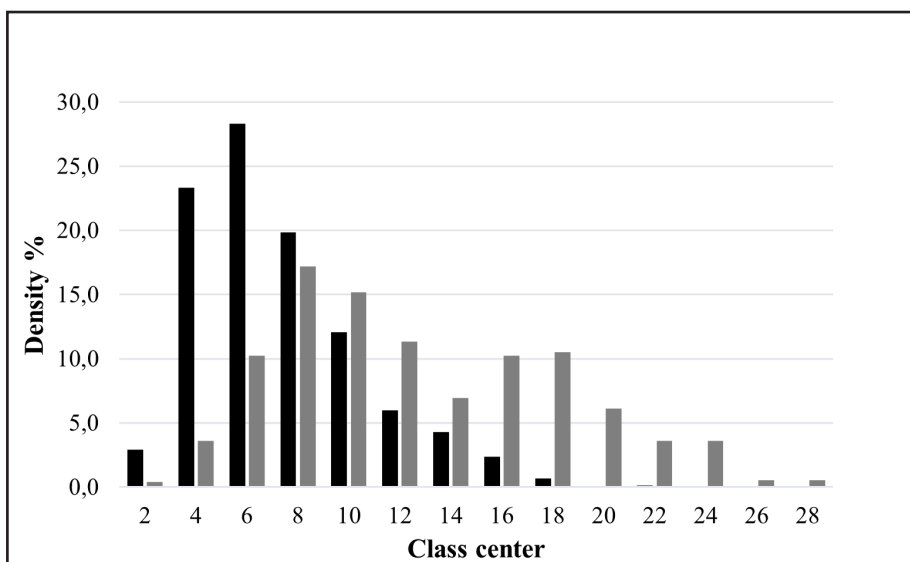
Source: Authors (2020)

In both forests, the communities showed distinct patterns of height distribution (Figure 5). In RGF, there were few individuals between 1 and 3 m in height (2.9%). Most of them were 3 to 11 m high (80%). In this forest there was an exponential decrease in the density of individuals in the later classes, with less than 1% of the individuals in

the community exceeding 17 m in height. The species with the highest heights were *Aspidosperma discolor* (22 m), *Podocarpus sellowii* (18), *Inga alba*, *Vochysia haenkeana* and *Vochysia pyramidalis* (17).

The PGF showed trees of greater height, with a greater concentration of individuals in two height intervals, generating distinct strata of vertical occupation of the space in the forest. About 53% of the individuals had heights ranging from 5 to 13 m, 27% ranged from 15 to 21 m, and 8.3% had heights larger than 21 m. Only 1% of the trees reached heights greater than 25 m and could be considered emergent, and 4% occurred in the first two height classes, i.e., between 1 and 5 m. *Symplocos revoluta* and *Emmotum nitens* reached the highest heights in this community (28 m), *Maprounea guianensis* reached 26 m, and *Jacaranda puberula* and *Inga cylindrica*, 25 m.

Figure 5 – Height distribution of tree communities in the gallery forest sections of Ribeirão (PNB / APA of Cafuringa) (black bar) and Pitoco (RECOR-IBGE / APA Gama e Cabeça de Veado) (gray bar), Federal District, Brazil



Source: Authors (2020)

3.4 Diversity and similarity

The Shannon diversity index (H') was 3.86 for the RGF and 3.96 for the PGF, and the Pielou evenness index (J') was 0.85 and 0.87, respectively. The floristic similarity

between the forests is low, since only 27% of the sampled species were common to both forests. The Chao-Sorensen similarity index was 0.478, indicating low similarity and high beta diversity among the communities. Among the 150 species recorded, 54 are exclusive to RGF and 56 to PGF. Only 40 species (27%) were common to both forests.

4 DISCUSSIONS

The tree communities of RGF and PGF have similar floristic richness, both in number of species (94 and 96 spp.) and families (37 and 38). However, they have high beta diversity. The observed values of richness are above average when compared to other gallery forests sampled in the Cerrado biome (Table 1). In general, the species and family richness within these gallery forests exhibits considerable variability. Dietzch *et al.* (2006) recorded 33 species in a section of flooded forest in the Canjerana Park, in the Federal District. On the other hand, Nóbrega *et al.* (2001) observed 186 species in a section of a gallery forest that included floodable and non-floodable zones. These results show that greater environmental heterogeneity favors the occurrence of different species, with specific environmental requirements, increasing richness in areas with greater environmental diversity.

Table 1 – Comparison of species richness, density (D), dominance in basal area (Do) and Shannon diversity index (H') among studies carried out in 29 gallery forests in the Cerrado biome. S.I. = Sample Intensity (ha)

Nº.	Reference	Year	Local	State	S.I. (ha)	Richness	D (ind ha ⁻¹)	Do (m ² ha ⁻¹)	H'
1	Present study	2024	Ribeirão - PNB/APA of Cafuringa	DF	0,5	94	1530	15,73	3,86
2			Pitoco - RECOR-IBGE	DF	0,5	98	1628	31,46	3,96
3	Lenza <i>et al.</i>	2015	Bacaba*	MT	0,07	45	1800	33,3	-
4	Arcela <i>et al.</i>	2014	Ribeirão- PNB	DF	0,86	94	1675	31,5	-

To be continued ...

Table 1 – Conclusion

Nº.	Reference	Year	Local	State	S.I. (ha)	Richness	D (ind ha ⁻¹)	Do (m ² ha ⁻¹)	H'
5	Haidar <i>et al.</i>	2013	Ecol Station. of Águas Emendadas	DF	0,48	118	2317	33,15	3,99
6	Abreu <i>et al.</i>	2012	P. N. Chapada dos Guimarães	MT	1,08	168	1276	26,39	4,37
7	Matos & Felfili	2010	P. N. Sete Cidades	PI	0,56	75	1146	26,55	3,53
8			P. N. Chapada dos Veadeiros	GO	0,3	46	1357	12,87	3,34
9			Alto Paraiso 1	GO	0,3	53	797	25,87	3,63
10	Felfili <i>et al.</i>	2007	Alto Paradise 2	GO	0,3	41	672	24,08	3,07
11			Alto Paraiso 3	GO	0,3	54	875	23,03	3,57
12			Vila Propício 1	GO	0,3	74	1253	24	3,51
13			Vila Propício 2	GO	0,3	36	914	24,62	3,17
14	Dietzsch <i>et al.</i>	2006	Canjerana - IV	DF	0,28	68	1421	25,5	3,67
15			Canjerana - II	DF	0,28	33	1475	31,3	2,57
16	Silva Júnior	2005	Pitoco - RECOR-IBGE	DF		99	1971	38,8	3,86
17	Silva Júnior	2004	Taquara - RECOR-IBGE	DF		110	1573	38,5	4,25
18	Marimon <i>et al.</i>	2002	High Bacaba**	MT	0,47	74	1023	20,44	3,84
19			Middle Bacaba	MT	0,47	86	962	22,28	4,08
20			Low Bacaba	MT	0,47	77	1351	23,46	3,57
21	Nóbrega <i>et al.</i>	2001	Cabeça de Veado- JBB	DF	1,84	186	1376	32,27	4,45
22	Sampaio <i>et al.</i>	2000	Riacho Fundo	DF	1,58	150	1574	26	4,15
23			Açudinho	DF	0,78	126	1159	30	4,25
24	Felfili	1997	Capetinga- FAL	DF	0,3	81	982	21,4	3,5
25			Ribeirão do Gama	DF	3,2	103	1350	41,2	3,9
26			APA Gama e Cabeça de Veado	DF	0,3	84	1417	36,38	3,9
27	Felfili <i>et al.</i>	1994	Brasilia National Park - PNB	DF	0,3	67	1645	32,73	3,4
28			Paracatu	MG	0,3	70	1364	19,77	3,6
29			Patrocínio	MG	0,3	141	1531	29,69	4,1
30			Silvânia	GO	0,3	111	1248	27,76	4

Source: Authors (2020)

In where: *DBH inclusion limit ≥ 3.0 cm; **DBH inclusion limit ≥ 15.0 cm; 250 quadrant points (variable area); ***It is important to note that diversity estimates were made for areas with different sampling intensities and that species richness and diversity do not vary linearly with the sampled area.

In the Ribeirão gallery forest, a high density of individuals of the Vochysiaceae family was recorded, which may be related to the edaphic conditions, characterized by more alluvial soils. Species of this family have mechanisms that allow the accumulation and use of aluminum, which confers better performance in the occupation of sites on dystrophic soils with a high concentration of this element in the soil (Haridasan, 2005).

Fabaceae was the most representative family in terms of number of individuals and species, corroborating the observations made in surveys conducted in non-flooded gallery forests (Lenza *et al.*, 2015; Matos & Felfili, 2010). The high diversity and abundance of Fabaceae individuals may be associated with the ability of some species of this family to fix nitrogen (Haridasan, 2005; Batterman *et al.*, 2013; Menge *et al.*, 2019). Nitrogen-fixing species account for about 10% of the total abundance of trees and basal area in Neotropical forests. In addition, the greater seed mass and greater capacity to tolerate shade, and the occurrence of small and numerous leaflets may confer a more efficient use of nutrients by the plants of this family (Batterman *et al.*, 2013; Gei *et al.*, 2018). Silva Júnior (2001), analyzing data compiled from 21 gallery forests in the Federal District, found that this family stood out in most surveys as it had the greater number of species.

The density of individuals in both forests (RGF and PGF) is within the limits found in the literature for gallery forests, i.e., between 962 ind ha⁻¹ (Marimon *et al.*, 2002) and 2,317 ind ha⁻¹ (Haidar *et al.*, 2013). Regarding the dominance, the values observed in the two forests are also within the limit found in the literature, however, when compared with the other studies, the RGF presented the second lowest dominance value, superior only to the study by Felfili *et al.* (2007).

The low dominance in the RGF must be related to the high slope found at the site. Very steep areas do not support very large trees due to the instability of the terrain (Gonçalves *et al.*, 2018; Wang *et al.*, 2019). In these areas of greater slope, the substrate develops on shallow soil. In addition, the high runoff and leaching of nutrients and organic matter may reflect a smaller increase, both in diameter and height, for the community in general. These results corroborate the average height of the trees in this forest, which was also relatively low.

The Shannon diversity obtained for both forests is considered high (Table 1), which reinforces the importance of conserving these environments of expressive diversity. The values found in this study are above the average and close to the median of the values found in other studies carried out in gallery forests of the Cerrado. In these studies, the highest diversity values were recorded in areas that contained sections of floodable and non-floodable forest, and this favored the increase in species diversity.

Protium altissimum is among the most representative species in the RGF community. However, this species seems to be not common in the region, as it was absent in 21 gallery forests in the Federal District, according to a study conducted by Silva Júnior *et al.* (2001). Nevertheless, this species was found in two sections of non-flooded gallery forest in Nova Xavantina, MT (Marimon *et al.*, 2002), which is in a transition zone between the Cerrado and the Amazon Forest. The Burseraceae family is very common in humid tropical forests in the Amazon, with several species, some of which are considered hyperdominant in terms of number of individuals (ter Steege *et al.*, 2013) and of great importance in the global carbon cycle (Fauset *et al.*, 2015).

The prominence of Burseraceae botanical family in the gallery forests of the Cerrado may reinforce the role of the forests of the central plateau of Brazil, in the connection with the domains of adjacent tropical forests: the Amazon and the Atlantic Forest. The forests of Central Brazil are part of the evolutionary process of small mammals, which also occur in the Amazon and Atlantic Forest, but which made use of the habitats of gallery forests and dry forests of the Cerrado (Costa, 2003).

The main species found in PGF were also highlighted by Silva Júnior *et al.* (2001), who classified *Faramea hyacinthina* and *Tapura amazonica* as common in gallery forests in the Federal District; *Symplocos revoluta* and *Amaioua guianensis* as occasional; *Jacaranda puberula* as rare and *Tapirira guianensis* as abundant. However, these species did not occur in the studied area of the RGF, suggesting the importance of this forest as a priority area for conservation. Studies that prove the ecological importance of one or more species in a community and under specific environmental conditions can contribute to the selection of species that will form the initial structure of vegetation in plans for the recovery of degraded areas.

The negative exponential curve (commonly called reverse J-shaped) of the diameter distribution of both forests suggests the regenerative potential of communities with a higher concentration of young individuals. The density of individuals in the first diameter class of the RGF was about 20% higher than that observed in the PGF. It suggests that RGF is a more dynamic community, with high recruitment due to the probable higher occurrence of disturbances as the fall of tall trees on steep slopes on shallower soils. In addition, in the RGF few trees were found in the largest diameter classes, while the PGF had around 15% more individuals than the RGF, with diameters greater than 15 cm. In gallery forests, trees rarely exceed 100 cm in diameter (Silva Júnior, 2005).

The expressive density, dominance and frequency of dead trees in the upper stratum, in both forests studied, suggests the occurrence of recent disturbances that affected the structure of their tree communities. According to Ribeiro & Walter (2008), gallery forests have trees with an average height between 20 and 30 meters and tree cover that varies between 70% and 95% and this provides the existence of a differentiated microclimate within these forests, even during the dry season. The relative humidity of the air is higher, and the temperature is milder when compared to other more open phytophysionomies of the Cerrado. The maintenance of large individuals in tree communities can be fundamental for regulating water flow, possibly buffering the effects of surface evaporation, as well as favoring water recharge in the soil through the root network (Augusta *et al.*, 2018; Li *et al.*, 2018; Valera *et al.*, 2019).

The gallery forests of the Cerrado biome have about 2,450 vascular species, of which 759 are arboreal (Mendonça *et al.*, 2008). However, this species richness has a unique characteristic: few species contribute most of the density and basal area, and most species occur locally and occur at very low densities (Lenza *et al.*, 2015). These results highlight the importance of using quantitative data that include, in addition to species composition, information on community structure, such as density, basal area or biomass.

The high diversity among the tree communities studied was compatible with the pattern found in Central Brazil. In this region, gallery forests are the richest, most diverse and heterogeneous phytophysionomies, with low levels of similarity between them. These results corroborate previous studies in the Federal District, where low floristic similarity was observed between 21 surveys carried out in gallery forests (Silva Júnior *et al.*, 2001).

The APA of Cafuringa is a region of high diversity, probably due to the rough variations in relief (~500 m). Drainage classes and edge effect are variables strongly correlated with species distribution and abundance. The richness and diversity found in these areas are associated with the diversity of environments, characterized by differences between soils, relief and the edge effect in the transition bands. These statements corroborate several studies in which diversity is associated with environmental gradients, geographical distances, and climate factors (Neves *et al.*, 2015).

Given the importance of the riparian zone and its processes, it is emphasized that the remaining fragments must be protected, and, when necessary, recovered, to ensure the functioning of the ecosystem, the maintenance of water resources, the conservation of local flora and fauna, the viability of ecological corridors between different fragments, among others. It is also important to note that only 15 species were examined for the size and conditions of their populations and categorized with a lower degree of concern, according to the criteria of the IUCN Red List of Threatened Species. However, the other species in the present study, about 90% of the total, have not yet been evaluated.

The scarcity of tree communities' data reinforces the importance of descriptive flora studies in gallery forests. It is noteworthy the scarcity of data and surveys on the composition and structure of vegetation in this region, which are more concentrated in other Conservation Units of the Federal District.

5 CONCLUSIONS

The high richness and diversity of tree species in the gallery forests studied show the high complexity of these environments, used as refuges for different species associations and development of ecological processes. Despite presenting similar levels of richness, the variation in the tree structure was marked between the two gallery forests, suggesting a strong influence of environmental factors on the development of each community. In addition, the high beta diversity observed among the communities highlights the importance of these environments for the conservation of the Brazilian biodiversity.

The information generated for the gallery forests in the present study serves as basis for the management of the Conservation Units in which are inserted, especially about the data generated for the APA of Cafuringa, which, although it is considered the “last natural frontier of the Federal District”, still presents itself as an area of phytosociological information gap for the region of the Federal District.

REFERENCES

- ARCELA, V. **Relação fatores ambientais, composição florística e estrutura em mata de galeria, Parque Nacional de Brasília, Brasil**. Dissertação de Mestrado. Programa de Pós-Graduação em Botânica. Instituto de Ciências Biológicas. Universidade de Brasília – UnB. 2014. 60p.
- AUGUSTA, M.; ROSOT, D.; CAROLINE, J.; BATISTA, N.; CORDEIRO, M.; MARIA, Y.; OLIVEIRA, M. de; FRANCISCON, L.; CLERICI, N.; VOGT, P.; VELOSO, J.; FREITAS, D. Riparian forest corridors: A prioritization analysis to the Landscape Sample Units of the Brazilian National Forest Inventory. **Ecological Indicators**, v. 93, p. 501–511, 2018.
- BATTERMAN, S. A.; WURZBURGER, N.; HEDIN, L. O. Nitrogen and phosphorus interact to control tropical symbiotic N₂ fixation: a test in *Inga punctata*. **Journal of Ecology**, v. 101, p. 1400–1408, 2013.
- CHAO, A.; CHAZDON, R.L.; COLWELL, R.K.; SHEN, T.J. A new statistical approach for assessing compositional similarity based on incidence and abundance data. **Ecology Letters**, v. 8, p. 148-159, 2005.
- CHASE, M.W. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. **Botanical Journal of the Linnean Society**, v. 181, p. 1-20, 2016.

COLWELL, R.K.; CHAO, A.; GOTELLI, N.J.; LIN, S.Y.; MAO, C.X.; CHAZDON, R.L.; LONGINO, J.T. Models and estimators linking individual-based and sample-based rarefaction, extrapolation, and comparison of assemblages. **Journal of Plant Ecology**, v. 5, p. 3-21, 2012.

COSTA, L.P. The historical bridge between the Amazon and the Atlantic Forest of Brazil: a study of molecular phylogeography with small mammals. **Journal of Biogeography**, v. 30, p. 71-86, 2003.

DAVIS, K.T.; DOBROWSKI, S.Z.; HOLDEN, Z.A.; HIGUERA, P.E.; ABATZOGLOU, J.T. Microclimatic buffering in forests of the future: the role of local water balance. **Ecography**, v. 42, p. 1-11, 2019.

DIETZSCH, L.; REZENDE, A. V.; PINTO, J. R. R.; PEREIRA, B. A. S. Caracterização da flora arbórea de dois fragmentos de Mata de galeria do Parque Canjerana, DF. **Cerne**, v. 12, n. 3, p. 201-210, 2006.

EISENLOHR, P. V.; OLIVEIRA-FILHO, A. T. Revisiting Patterns of Tree Species Composition and their Driving Forces in the Atlantic Forests of Southeastern Brazil. **Biotropica**, v. 47, n. 6, p. 689-701, 2015.

EMBRAPA. **O novo mapa de solos do Brasil legenda atualizada escala 1:5.000.000**. Embrapa Solos, Rio de Janeiro, 2011.

FELFILI, J. M.; MENDONÇA, R. C.; WALTER, B. M. T.; SILVA JÚNIOR, M. C.; NÓBREGA, M. G. G. FAGG, C. W.; SEVILHA, A. C.; SILVA, M. A. Flora fanerogâmica das Matas de galeria e Ciliares do Brasil Central. In: RIBEIRO, J. F.; FONSECA, C. E. L.; SOUSA-SILVA, J. C. (eds.). **Cerrado: caracterização e recuperação de Matas de galeria**. Planaltina (DF): Embrapa Cerrados. p. 195-263, 2001.

FELFILI, J. M.; REZENDE, A. V.; SILVA JÚNIOR, M. C (org.). **Biogeografia do bioma cerrado: vegetação e solos da Chapada dos Veadeiros**. Brasília: Editora Universidade de Brasília / FINATEC, 2007. 256 p.

FAUSET, S.; JOHNSON, M.O.; GLOOR, M.; BAKER, T.R.; ABEL, M.; BRIENEN, R.J.W.; FELDPAUSCH, T.R.; LOPEZ-GONZALEZ, G.; YADVINDER MALHI, H. T. S.; NIGEL, C.A.; PITMAN, C. B.; ENGEL, J.; PE ´ TRONELLI, P.; ANDRADE, A.; CAMARGO, J. L. C.; LAURANCE, S. G.W.; LAURANCE, W. F.; CHAVE, J.; ALLIE, E.; NÚÑEZ VARGAS, P.; TERBORGH, J. W.; RUOKOLAINEN, K.; SILVEIRA, M.; AYMARD, G. A.; ARROYO, L.; BONAL, D.; RAMIREZ-ANGULO, H.; ARAUJO-MURAKAMI, A.; NEILL, D.; HE ´ RAULT, B.; DOURDAIN, A.; TORRES-LEZAMA, A.; MARIMON, B. S.; SALOMÃO, R. P.; COMISKEY, J. A.; RÉJOU-MÉCHAIN, M.; TOLEDO, M.; LICONA, J. C.; ALARCÓN, A.; PRIETO, A.; RUDAS, A.; MEER, P. J. Van Der; KILLEEN, T. J.; MARIMON JUNIOR, B.; POORTER, L.; BOOT, R. G.A.; STERGIOS, B.; TORRE, E. V.; COSTA, F. R.C.; LEVIS, C.; SCHIETTI, J.; SOUZA, P.; GROOT, N.; ARETS, E.; MOSCOSO, V. C.; CASTRO, W.; CORONADO, E. N. H.; PEÑA-CLAROS, M.; STAHL, C.; BARROSO, J.; TALBOT, J.; VIEIRA, I.C.G.; HEIJDEN, G.; THOMAS, R.; VOS, V. A.; ALMEIDA, E. C.; DAVILA, E. A.; ARAGÃO, L.E.O.C.; ERWIN, T. L.; MORANDI, P. S.; OLIVEIRA, E. A. de; VALADÃO, VALADÃO, M.B.X.; ZAGT, R. J.; HOUT, P.; LOAYZA, P. A.; PIPOLY, J. J.; WANG, O.; ALEXIADES, M.; CERÓN, C. E.; HUAMANTUPA-CHUQUIMACO, I.; DI FIORE, A.; PEACOCK, J.; CAMACHO, N. C. P.; UMETSU, R. K.; CAMARGO, P. B. de; BURNHAM, R. J.; HERRERA, R.; QUESADA, C. A.; STROPP, J.; VIEIRA, S. A.; STEININGER, M.; RODRÍGUEZ, C. R.; RESTREPO, Z.; MUELBERT, A. E.; PICKAVANCE,

S. L. L. G. C.; PHILLIPS, O.L. Hyperdominance in Amazonian forest carbon cycling. **Nature Communications**. v. 6, p. 6857, 2015.

FORZZA, R.C.; BAUMGRATZ, J.F.A.; BICUDO, C. E. M.; CANHOS, D. A. L.; CARVALHO JR., A. A.; COELHO, M. A. N.; COSTA, A. F.; COSTA, D. P.; HOPKINS, M. G.; LEITMAN, P. M.; LOHMANN, L. G.; LUGHADHA, E. N.; MAIA, L. C.; MARTINELLI, G.; MENEZES, M.; MORIM, M. P.; PEIXOTO, A. L.; PIRANI, J. R.; PRADO, J.; QUEIROZ, L. P.; SOUZA, S.; SOUZA, V. C.; STEHMANN, J. R.; SYLVESTRE, L. S.; WALTER, B. M. T.; ZAPPI, D. C. **New Floristic List Highlights Conservation Challenges**. 2012.

GEI, M.; ROZENDAAL, D.M.A.; POORTER, L. et al. Legume abundance along successional and rainfall gradients in Neotropical forests. **Nature Ecology & Evolution**, v. 2, p. 1104–1111, 2018. <https://doi.org/10.1038/s41559-018-0559-6>

GONÇALVES, N.B.; NETTESHEIM, F.C.; CONDE, M.M.S. Tree community variation in a tropical continental island according to slope aspect and human interference. **Anais da Academia Brasileira de Ciências**, 90, p. 17–30, 2018.

Haidar, R. F.; FELFILI, J. M.; VALE, G. D.; BRANDÃO, M. M. V.; CARNEIRO, D. C.; LOBO, R. N.; AMARAL, A. G.; SILVEIRA, I. M. Florística, estrutura e diversidade da mata de galeria da Estação Ecológica de Águas Emendadas ESEC-AE. Brasil Central. **Heringeriana**, v. 7, n. 1, p. 33-50, 2013.

HARIDASAN, M. Competição por nutrientes em espécies arbóreas do cerrado. In: SCARIOT, A.; FELFILI, J. M.; SOUZA-SILVA, J. C. (eds.) **Cerrado: Ecologia, Biodiversidade e Conservação**. Ministério do Meio Ambiente, Brasília, 2005. 439p.

IBGE. **Reserva Ecológica do IBGE: ambiente e plantas vasculares**. Rio de Janeiro, IBGE, 2004.

LENZA, E.; SANTOS, J.O.; MARACAHIPES-SANTOS, L. Species composition, diversity, and vegetation structure in a gallery forest- cerrado sensu stricto transition zone in eastern Mato Grosso, Brazil. **Acta Botanica Brasilica**, v. 29, n. 3, p. 327–338, 2015.

LI, K.; CHI, G.; WANG, L.; XIE, Y.; WANG, X.; FAN, Z. Identifying the critical riparian buffer zone with the strongest linkage between landscape characteristics and surface water quality. **Ecological Indicators**, v. 93, p. 741–752, 2018.

MAGURRAN, A.E. **Measuring biological diversity**. Oxford, Blackwell Publishing Company, 2004.

MARIMON, B. S.; FELFILI, J. M.; LIMA, E. S. Floristic and phytosociology of the gallery forest of the Bacaba stream, Nova Xavantina, Mato Grosso, Brazil. **Edinburgh Journal of Botany**, v. 59, n. 2, p. 303-318, 2002.

MATOS, M.Q.; FELFILI, J.M. Florística, fitossociologia e diversidade da vegetação arbórea nas matas de galeria do Parque Nacional de Sete Cidades (PNSC), Piauí, Brasil. **Acta Botanica Brasilica**, v. 24, n. 2, p. 483-496, 2010.

MENDONÇA, R. C.; FELFILI, J. M.; WALTER, B. M. T.; SILVA-JÚNIOR, M. C.; REZENDE, A. B.; FILGUEIRAS, T. S.; NOGUEIRA, P. E.; FAGG, C. W. Flora vascular do Bioma Cerrado: checklist com 12.356 espécies. In: SANO, S. M.; ALMEIDA, S. P.; RIBEIRO, J. F. (orgs.). **Cerrado: Ecologia e Flora**. v.2. Brasília: Embrapa Cerrados, 2008.

MENGE, D.N.L.; CHISHOLM, R.A.; DAVIES, S.J.; ABU SALIM, K.; ALLEN, D.; ALVAREZ, M.; BOURG, N.; BROCKELMAN, W.Y.; BUNYAVEJCHEWIN, S.; BUTT, N.; CAO, M.; CHANTHORN, W.; CHAO, W.C.; CLAY, K.; CONDIT, R.; CORDELL, S.; SILVA, J.B. da; DATTARAJA, H.S.; ANDRADE, A.C.S. de; OLIVEIRA, A.A. de; DEN OUDEN, J.; DRESCHER, M.; FLETCHER, C.; GIARDINA, C.P.; SAVITRI GUNATILLEKE, C. V.; GUNATILLEKE, I.A.U.N.; HAU, B.C.H.; HE, F.; HOWE, R.; HSIEH, C.F.; HUBBELL, S.P.; INMAN-NARAHARI, F.M.; JANSEN, P.A.; JOHNSON, D.J.; KONG, L.S.; KRÁL, K.; KU, C.C.; LAI, J.; LARSON, A.J.; LI, X.; LI, Y.; LIN, L.; LIN, Y.C.; LIU, S.; LUM, S.K.Y.; LUTZ, J.A.; MA, K.; MALHI, Y.; MCMAHON, S.; MCSHEA, W.; MI, X.; MORECROFT, M.; MYERS, J.A.; NATHALANG, A.; NOVOTNY, V.; ONG, P.; ORWIG, D.A.; OSTERTAG, R.; PARKER, G.; PHILLIPS, R.P.; ABD. RAHMAN, K.; SACK, L.; SANG, W.; SHEN, G.; SHRINGI, A.; SHUE, J.; SU, S.H.; SUKUMAR, R.; SUN, I.F.; SURESH, H.S.; TAN, S.; THOMAS, S.C.; TOKO, P.S.; VALENCIA, R.; VALLEJO, M.I.; VICENTINI, A.; VRŠKA, T.; WANG, B.; WANG, X.; WEIBLEN, G.D.; WOLF, A.; XU, H.; YAP, S.; ZHU, L.; FUNG, T. Patterns of nitrogen-fixing tree abundance in forests across Asia and America. **Journal of Ecology**, v. 107, p. 2598–2610, 2019.

MÜLLER-DOMBOIS, D.; ELLEMBERG, H. Aims and methods for vegetation ecology. John Wiley & Sons, New York, USA, 1974. NEVES, D. M.; DEXTER, K. G.; PENNINGTON, R. T.; BUENO, M. L.; OLIVEIRA FILHO, A. T. Environmental and historical controls of floristic composition across the South American Dry Diagonal. **Journal of Biogeography**, 2015.

NEVES, D.M.; DEXTER, K.G.; PENNINGTON, R.T.; VALENTE, A.S.M.; BUENO, M.L.; EISENLOHR, P. V.; FONTES, M.A.L.; MIRANDA, P.L.S.; MOREIRA, S.N.; REZENDE, V.L.; SAITER, F.Z.; OLIVEIRAFILHO, A.T. Dissecting a biodiversity hotspot: The importance of environmentally marginal habitats in the Atlantic Forest Domain of South America. **Diversity and Distributions**, v. 23, p. 898–909, 2017.

NÓBREGA, M. G. G.; RAMOS, A. E.; SILVA JÚNIOR, M. C. **Composição florística e estrutura na mata de galeria do Cabeça-de-veado no Jardim Botânico de Brasília, DF**. Brasília: Boletim do Herbário Ezechias Paulon Heringer, v. 8, p. 44- 65, dez., 2001.

NÓBREGA, R. L. B.; ZIEMBOWICZ, T.; TORRES, G. N.; GUZHA, A. C.; AMORIM, R. S. S.; CARDOSO, D.; JOHNSON, M. S.; SANTOS, T. G.; COUTO, E.; GEROLD, G. 2020. Ecosystem services of a functionally diverse riparian zone in the Amazon–Cerrado agricultural frontier. **Global Ecology and Conservation**, v. 21, p. 1-15. <https://doi.org/10.1016/j.gecco.2019.e00819>

OLIVEIRA-FILHO, A.T.; RATTER, J.A. Study of the origin central brazilian forests by the analysis of plant distribution patterns. **Edinburgh Journal of Botany**, v. 52, n. 2, p. 1-54, 1995.

REZENDE, A. V. Importância das Matas de galeria: manutenção e recuperação. In: Ribeiro, J. F. **Cerrado: Matas de galeria**. Planaltina: EMBRAPA-CPAC, p. 1-15, 1998.

RIBEIRO, J.F. & WALTER, B.M.T. 2001. As Matas de galeria no contexto do bioma Cerrado. In: Ribeiro, J. F.; Fonseca, C. E. L. da; Souza Silva, J. C. **Cerrado: caracterização e recuperação de Matas de galeria**. Planaltina: Embrapa Cerrados, p. 143-191.

RIBEIRO, J.F.; WALTER, B.M.T. As Principais Fitofisionomias do Bioma Cerrado. p.151-212. In: SANO, S.M.; ALMEIDA, S.P.; RIBEIRO J.F. (Eds.). **Cerrado: ecologia e flora**. v.1. Planaltina: Embrapa Cerrados. 2008.

SALEMI, L.F.; RAFAELA, S.; LINS, M.; RAVAGNANI, E.D.C.; FROSINI, S.; FERRAZ, D.B.; MARTINELLI, L.A. Past and present land use influences on tropical riparian zones: an isotopic assessment with implications for riparian forest width determination. **Biota Neotropica** v. 16. 2016.

SEMARH. **APA de Cafuringa**: a última fronteira natural do DF. Brasília: Secretaria do Meio Ambiente e Recursos Hídricos. 545p. 2005.

SILVA JÚNIOR, M. C. Comparação entre Matas de galeria no Distrito Federal e a efetividade do Código Florestal na proteção de sua diversidade arbórea. **Acta Botanica Brasilica**. v. 15, n. 1, p. 139- 146, 2001.

SILVA JÚNIOR, M. C. Fitossociologia e estrutura diamétrica na mata de galeria do Pitoco, na Reserva Ecológica do IBGE, DF. **Cerne**, v. 11, n. 2, p. 147-158, 2005.

TER STEEGE, H.; PITMAN, N. C. A.; SABATIER, D.; BARALOTO, C.; SALOMÃO, R. P.; GUEVARA, J. E.; PHILLIPS, O. L.; CASTILHO, C. V.; MAGNUSSON, W. E.; MOLINO, J.-F.; MONTEAGUDO, A.; NÚÑEZ VARGAS, P.; MONTERO, J. C.; FELDPAUSCH, T. R.; CORONADO, E. N. H.; KILLEEN, T. J.; MOSTACEDO, B.; VASQUEZ, R.; ASSIS, R. L.; TERBORGH, J.; WITTMANN, F.; ANDRADE, A.; LAURANCE, W. F.; LAURANCE, S. G. W.; MARIMON, B. S.; MARIMON, B.-H.; GUIMARÃES VIEIRA, I. C.; AMARAL, I. L.; BRIENEN, R.; CASTELLANOS, H.; CÁRDENAS LÓPEZ, D.; DUIVENVOORDEN, J. F.; MOGOLLÓN, H. F.; MATOS, F. D. D. A.; DÁVILA, N.; GARCÍA-VILLACORTA, R.; STEVENSON DIAZ, P. R.; COSTA, F.; EMILIO, T.; LEVIS, C.; SCHIETTI, J.; SOUZA, P.; ALONSO, A.; DALLMEIER, F.; MONTOYA, A. J. D.; FERNANDEZ PIEDADE, M. T.; ARAUJO-MURAKAMI, A.; ARROYO, L.; GRIBEL, R.; FINE, P. V. A.; PERES, C. A.; TOLEDO, M.; AYMARD C., G. A.; BAKER, T. R.; CERÓN, C.; ENGEL, J.; HENKEL, T. W.; MAAS, P.; PETRONELLI, P.; STROPP, J.; ZARTMAN, C. E.; DALY, D.; NEILL, D.; SILVEIRA, M.; PAREDES, M. R.; CHAVE, J.; LIMA FILHO, D. D. A.; JØRGENSEN, P. M.; FUENTES, A.; SCHÖNGART, J.; CORNEJO VALVERDE, F.; DI FIORE, A.; JIMENEZ, E. M.; PEÑUELA MORA, M. C.; PHILLIPS, J. F.; RIVAS, G.; VAN ANDEL, T. R.; VON HILDEBRAND, P.; HOFFMAN, B.; ZENT, E. L.; MALHI, Y.; PRIETO, A.; RUDAS, A.; RUSCHELL, A. R.; SILVA, N.; VOS, V.; ZENT, S.; OLIVEIRA, A. A.; SCHUTZ, A. C.; GONZALES, T.; TRINDADE NASCIMENTO, M.; RAMIREZ-ANGULO, H.; SIERRA, R.; TIRADO, M.; UMAÑA MEDINA, M. N.; VAN DER HEIJDEN, G.; VELA, C. I. A.; VILANOVA TORRE, E.; VRIESENDORP, C.; WANG, O.; YOUNG, K. R.; BAIDER, C.; BALSLEV, H.; FERREIRA, C.; MESONES, I.; TORRES-LEZAMA, A.; URREGO GIRALDO, L. E.; ZAGT, R.; ALEXIADES, M. N.; HERNANDEZ, L.; HUAMANTUPA-CHUQUIMACO, I.; MILLIKEN, W.; PALACIOS CUENCA, W.; PAULETTO, D.; VALDERRAMA SANDOVAL, E.; VALENZUELA GAMARRA, L.; DEXTER, K. G.; FEELEY, K.; LOPEZGONZALEZ, G.; SILMAN, M. R. Hyperdominance in the Amazonian Tree Flora. **Science**, v. 342, n. 6156, 2013.

VALERA, C.A.; CRISTINA, T.; FILHO, M.; FARIAS, R.; CAROLINE, F.; FERNANDES, S.; ANT, F.; PACHECO, L. The Buffer Capacity of Riparian Vegetation to Control Water Quality in Anthropogenic Catchments from a Legally Protected Area: A Critical View over the Brazilian New Forest Code. **Water**, v. 11, 2019.

WANG, S.; QI, G.; KNAPP, B.O. Topography affects tree species distribution and biomass variation in a warm temperate, secondary forest. **Forests**, v. 10, p. 1–16, 2019.

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