

# LÁBREA: URBAN AFFORESTATION IN A CITY IN THE DEFORESTATION ARC

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**Abstract:** Lábrea, Amazonas, Brazil officially has 64.4% of its public streets lined with trees. However, there is no information available on the qualitative and quantitative aspects of this afforestation. The aim of the study was to inventory the urban afforestation of Lábrea to quantify and qualify the municipal road afforestation. The census of arboreal vegetation on the public roads covered parking lots and areas for pedestrian traffic (sidewalks and curbs) on the streets of the neighborhoods that make up the urban area, being recorded geolocated images of individuals. A total of 507 individuals were counted, distributed in 38 species and 15 botanical families, planting trees in the city's public streets. The species ficus (Moraceae, *Ficus benjamina*) and jameiro (Myrtaceae, *Syzygium malaccense*) had the highest absolute density. Afforestation is concentrated in the Centro district (50 %). Disregarding the neighborhood, the most tree-lined street was October 22nd. The species are partially of native national origin (19 species, 50 %), of which 63% are Amazonian (12 species). In absolute terms, individuals are mostly of exotic origin (79 %). The individuals are in good structural condition, with type 1 phytosanitary status, located in sidewalks, conflicting or not with the electrical network (413 ind., 81 %) without conflicts with the pavement (402 ind., 79 %), outside the phenological period. Some common problems

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already reported also occur in the region. The low diversity of species in afforestation may indicate a certain loss in the quality of the urban physical and environmental structure.

**Keywords:** Floristic inventory; Urban afforestation; Southern Amazonas; Lábrea; Brazil.

## LÁBREA: ARBORIZAÇÃO URBANA EM UMA CIDADE NO ARCO DO DESMATAMENTO

**Resumo:** Lábrea-AM, oficialmente, apresenta 64,4% de suas vias públicas arborizadas. No entanto, não existem informações disponíveis sobre os aspectos qualitativos e quantitativos desta arborização. O objetivo do trabalho foi inventariar a arborização urbana de Lábrea para quantificar e qualificar a arborização viária municipal. O censo da vegetação arbórea das vias públicas abrangeu estacionamentos e áreas destinadas ao trânsito de pedestres (calçadas e meio-fio) das ruas dos bairros que compõem a zona urbana, sendo registradas imagens geolocalizadas dos indivíduos. Foram contabilizados 507 indivíduos distribuídos em 38 espécies e 15 famílias botânicas, arborizando as vias públicas da cidade. As espécies ficus (Moraceae, *Ficus benjamina*) e jameiro (Myrtaceae, *Syzygium malaccense*) apresentaram a maior densidade absoluta. A arborização está concentrada no bairro Centro (50 %). Desconsiderando o bairro, a rua mais arborizada foi 22 de outubro. As espécies são parcialmente de origem nativa nacional (19 espécies, 50 %), das quais 63 % são de ocorrência amazônica (12 espécies). Os indivíduos são majoritariamente de origem exótica (79 %). Os indivíduos estão em bom estado estrutural, com fitossanidade tipo 1, localizados em área de calçadas conflitando ou não com a rede elétrica (413 ind., 81 %), sem conflitar com o calçamento (402 ind., 79 %), fora de período fenológico. Alguns problemas comuns já reportados em outros trabalhos também ocorrem na região. A baixa diversidade de espécies na arborização pode indicar certo prejuízo na qualidade da estrutura física e ambiental urbana.

**Palavras-chave:** Inventário florístico; Arborização urbana; Sul do Amazonas; Lábrea; Brasil.

The afforestation can be defined as the group of planted trees that integrate the urban environment to the natural environment, influencing in the human being quality of life and making the urban areas more delightful (SIRVINSKAS, 1999). From the technical point of view, it can also be defined as the group of arboreal specimens that compose the vegetation localizes in urban area, established through an Afforestation Program that considers the characteristics of each region of the city (MANAUS, 2016).

In Brazil, the urban afforestation has been a concern of the environmentalists, once observed the benefits of this action to the society, among them: it relieves the climate issues through decreasing thermic ranges, improves the air quality, protects the soil against erosion, reduces the wind strength, decreases sound pollution, absorbs the atmosphere pollution, and acts as refuge to the fauna, thus promoting the expansion of biodiversity (SABADINI JUNIOR, 2017).

The Amazonic forest, worldwide known as shelter of great biodiversity, is in Brazil's North

region. Paradoxically, its cities, considering capitals and countryside cities, present the smallest percentage (36.7%) of wooded domiciles in the country (IBGE, 2010) and low richness and diversity of native species in the urban afforestation (VIEIRA; PANAGOPOULOS, 2020). The situation is worsened by the scientific ignorance on afforestation present in these cities or by the diminished scientific publicity of this information.

In this scenario, Amazonas stood out as one of the states with the smallest rates of scientific production related to the study on urban afforestation. This low representativeness was highlighted in studies about urban forests in cities located in the Brazilian Amazon, performed by Vieira and Panagopoulos (2020). These authors found only one scientific article available in international database or in specialized Brazilian magazine that referenced any city from Amazonas; Itacoatiara in this case.

Lábrea has the status of Centro Sub-regional of Purus. The city is at the right margin of Purus River. Its total area is composed by 53.99% of state and federal Units of Conservation (UCs); 22.93% of indigenous land; and 2.47% of settlements (WWF-BRASIL, 2017) that act as a green mosaic, resisting the advance of the expansion of the deforestation frontier. However, together with Boca do Acre and Apuí, also situated in the the Amazonas South Mesoregion, answer for 19.6% of the whole state's deforestation (AMARAL *et al.*, 2012).

Inserted in the deforestation arc, the South of Amazonas is an important and strategic region to stop the advance of deforestation in the Amazon, admittedly one of the main risk factors to the reduction of biodiversity in this biome. According to the Natural Environment Ministry, the most critical deforestation areas in Amazonas state are in Lábrea. Since 2008, Lábrea is in the "list of cities that deforest the Amazonic biome the most," as observed in MMA/Portaria n. 28, from January 24, 2008.

The pact "Agenda of commitments for the reduction of deforestation and burns, for the valorization of the forest and the local economy, and for the strengthening of citizenship," signed in 2009 by representatives of City, State and Federal Governments and other signatories (non-governmental entities and institutions of research and correlatives), brings, among its premises, the strengthening of the city environmental management, with governance and transparency, in accord to the guidelines of the National Environment Policy (BRASIL, 2009).

In this context, the city road afforestation, element that integrates green areas system, must receive special attention, once it can represent an expressive part of the total flora in one city (SENNA, 2002). Officially, Lábrea presents 64.4% of its public roads wooded (IBGE, 2017). However, there is no available information on qualitative and quantitative aspects of this afforestation.

The urban flora knowledge is part of a study program every city should be concerned to do, aiming at an afforestation plan that values landscape and ecological aspects, using mainly native species. In addition to benefits that directly influence the human being life, from the ecological point of view, urban afforestation is fundamental. Through it, the region's biological identity can be safeguarded, preserving or cultivating the vegetal species that appear in each specific region.

In the face of it, it is fundamental that citizens and governmental organs consider the whole natural capital of a city as part of the urban infrastructure, being managed in a planned and integrated way, in the same way that it happens with systems of sanitation, transport, energy etc. (SALVI *et al.*, 2011 *apud* GIRLING; KELLETT, 2005; WOLF, 2004). For this purpose, this research objectives were to inventory Lábrea's urban afforestation, aiming to quantify and qualify the municipal road afforestation.

## Methodology

The census of arboreal vegetation in Lábrea's public roads contemplated streets in the following neighborhoods: Bairro da Fonte, Barra Limpa, Centro, Nossa Senhora de Fátima, Pantanal, São José e Vila Falcão. The study was performed between October 2019 and March 2020, being considered urban tree every individual of arboreal size planted in parking lots and areas destined to pedestrian transit (sidewalks and curbs), irrespective of a minimum DBH, since a lot of individuals would be excluded from the survey, as seen in a preliminary inventory.

The census was performed through visual analysis, filling an inventory form, with the following information: Date of data collection and responsible; Location of the tree (street, neighborhood); Characteristics of the tree (common name, size, total height, phytosanitary and structural state); Characteristics of the species (natural occurrence, presence of flowers and fruits, type of fruits). Characteristics of the space (type of road: sidewalk, curb, parking lot; power grid, paving situation). Measurement of circumference at breast height of 1.30 m and treetop diameter was performed using a measuring tape. Individuals were identified with the help of specific bibliography and consultation to professionals in the bothanical area. One geolocated photo was registered of each individual with the help of the mobile application Open Camera, a tools that allows photographic registry with location and photo direction information, ideal to elaborate reports, statements, reviews, among others. The height of the individuals was estimated with the help of a mobile application called Intelligent tools (Ferramentas inteligentes), with an estimated error of  $\pm 10$  cm.

The qualitative and quantitative evaluation was done with the due adaptations to the methodology described by Kramer and Krupek (2012).

For the qualitative evaluation of the afforestation and diagnosis of the trees, the information related to the tree and the space was analyzed, information obtained through visual analysis of the species inventoried in the census, such as: species, size, inclination, pruning, phytosanitary state, power grid, type of road, paving, among others.

For the quantitative evaluation, the quantity of occurring species of each species registered in the afforestation of public roads for each neighborhood inventoried was counted. About the ecological characterization of the afforestation, for data analysis, the following parameter were calculated: a) richness of species; b) abundance of species; c) *Shannon-Wiener* diversity index; d) Simpson dominance index; and e) Jaccard Similarity index.

## Results and Discussion

507 individuals were counted, distributed in 38 species and 15 bothanical families, in the public roads of the city. Among the 15 families present, 46.7% was represented by only one species. The species ficus (Moraceae, *Ficus benjamina*) and jambeiro (Myrtaceae, *Syzygium malaccense*) presented the highest absolute density, having 152 and 131 inventoried individuals, respectively.

The inventory performed supports Vieira and Panagopoulos (2020) statement who, by studying Amazon's urban forests, related that *Ficus benjamina*, *Mangifera indica* and *Licania tomentosa* are the three most frequent species, representing almost 42% of the inventoried individuals. In this study only the species *Ficus benjamina* represented 30% of the inventoried individuals.

The urban afforestation in Brazil had its origin at the time of Colonial Brazil, with reported initiatives in Pernambuco and Rio de Janeiro (PAIVA; ALVES, 2002). In the North region of the

country, with the apogee of the Amazon rubber boom, Parisian characteristics were imported to the emerging cities, mainly in Belém and Manaus. Among these characteristics, the afforestation of public roads had emphasis with a merely aesthetic goal, following Haussmann's concept (GONÇALVES; PAIVA, 2013), where *Ficus benjamina* has been highlighted for being one of the most frequent species in the urban afforestation in several Brazilian cities.

Another interesting characteristic of the afforestation in Brazilian cities is the utilization of fruitful species, such as observed in this research. The second most frequent species was *Syzygium malaccense*. Even recognizing the possible negative impacts, surveys on urban afforestation have presented results that indicate the population preference for fruitful species, when there is a possibility to plant them (VIEIRA; PANAGOPOULOS, 2020) usually prevailing species that give juicy and palatable fruits to the human population, as the case of jambo tree and mango tree, contributing also to the diet and generating income to low-income families.

The total number of species (n=38) and families (n=15) can be considered low, comparing to similar studies. Kramer and Krupek (2012) obtained a total number of species (n=98) and families (n=43) higher than the ones found in this research, studying seven public squares in the city of Guarapua-va-PR. Lima Neto *et al.* (2007) obtained a total number of 23 arboreal species identifying arboreal plants in six public squares and 12 avenues and central seedbeds in the city of Aracaju-SE. Pires *et al.* (2007) identified 35 families in a diagnosis done in the city of Goiandira-GO. And Lindenmaier and Santos (2008) found 45 families in the survey of 21 squares in the city of Cachoeira do Sul-RS.

The afforestation is centered in the central neighborhood, with 251 individuals of 12 families and 22 species (Table 1), distributed on the streets Getúlio Vargas (58 ind.), Coronel Luiz Gomes (38 ind.), 14 de maio (29 ind.), Camilo Morato (26 ind.), Vile Roy (25 ind.), Travessa Nazaré (16 ind.), 22 de Outubro (14 ind.), Travessa Padre Monteiro (13 ind.), Marechal Deodoro (11 ind.), Travessa Santo Antônio (10 ind.), Luiz Falcão (6 ind.) and 24 de Agosto (5 ind.). It is probably due to the fact that this neighborhood is the oldest in the city.

**Table 1** – Inventory of the afforestation in the central neighborhood, Lábrea-AM

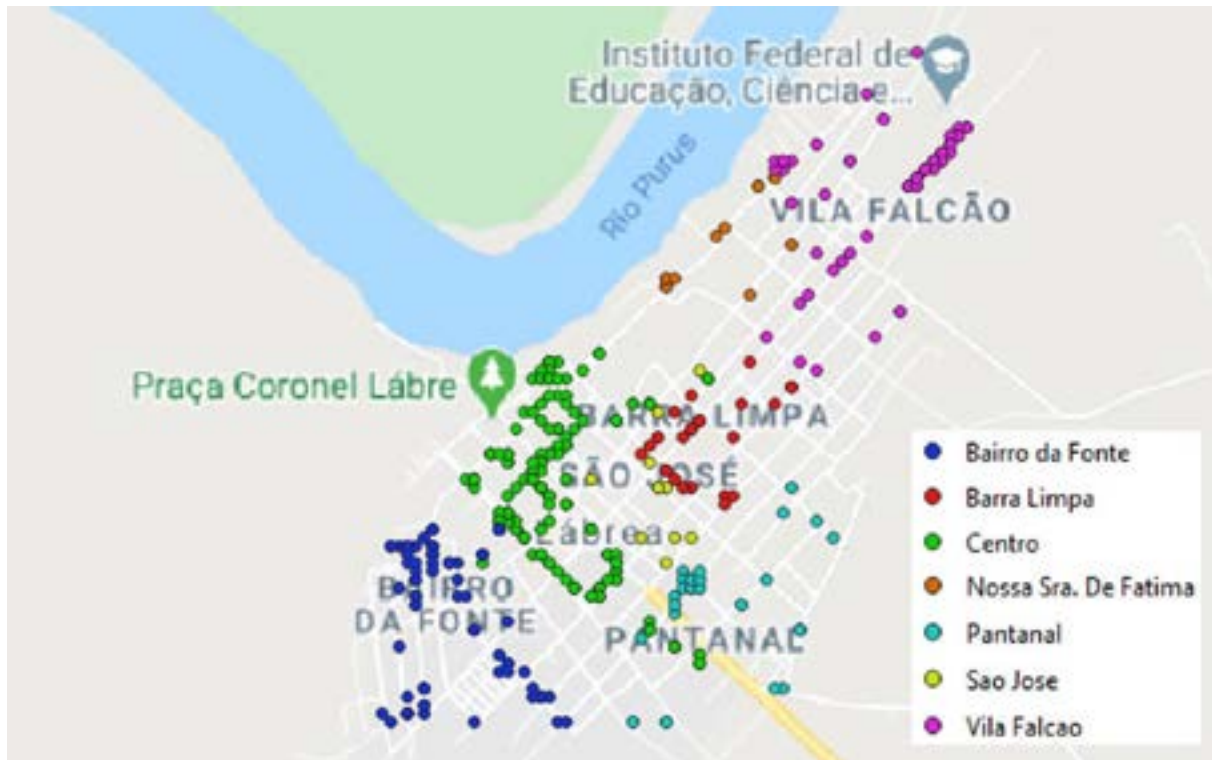
Family	N. of species	Common name	Scientific name	Number of individuals
Fabaceae	7	pau-pretinho	<i>Cenostigma tocantinum</i>	12
		acácia	<i>Acacia mangium</i>	3
		brasileirinho	<i>Erythrina variegata</i>	3
		canafístula	<i>Peltophorum dubium</i>	2
		cássia-do-sião	<i>Senna siamea</i>	1
		ingá-de-metro	<i>Inga edulis</i>	1
		marirana	<i>Senna silvestris</i>	1
Myrtaceae	3	jambeiro	<i>Syzygium malaccense</i>	42
		goiabeira	<i>Psidium guajava</i>	7
		azeitona roxa	<i>Syzygium cumini</i>	1
Bignoniaceae	2	ipê	<i>Handroanthus albus</i>	13
		ipê de jardim	<i>Tecoma stans</i>	2

Family	N. of species	Common name	Scientific name	Number of individuals
<i>Anacardiaceae</i>	2	cajeiro	<i>Anacardium occidentale</i>	3
		mangueira	<i>Mangifera indica</i>	5
<i>Moraceae</i>	1	figus	<i>Ficus benjamina</i>	129
<i>Cupressaceae</i>	1	pinheiro	<i>Thuja occidentalis</i>	10
<i>Chrysobalanaceae</i>	1	pajurá	<i>Couepia bracteosa</i>	6
<i>Combretaceae</i>	1	castanholeira	<i>Terminalia catappa</i>	6
<i>Annonaceae</i>	1	graviola	<i>Annona muricata</i>	1
<i>Bixaceae</i>	1	urucum	<i>Bixa orellana</i>	1
<i>Malpighiaceae</i>	1	lofântera	<i>Lophanthera lactescens</i>	1
<i>Rubiaceae</i>	1	noni	<i>Morinda citrifolia</i>	1
<b>Total</b>	<b>22</b>			<b>251</b>

Source: Research archive

Disregarding the neighborhood, the most afforested street was 22 de Outubro, with 84 individuals belonging to the seven botanical families, out of which Fabaceae was more present with 43 representatives of different species (pata-de-vaca: *Bauhinia variegata*, 25; acácia: *Acacia mangium*, 12; pau-pretinho: *Cenostigma tocantinum*, 4; ingá-de-metro, *Inga edulis*, 1; pau-brasil: *Paubrasilia echinata*, 1). In Kramer and Krupek's (2012) paper, the family Fabaceae stood out for its richness of species (n=12). According to the author, this can be a consequence of the great diversity of this family among the flowering plants. Getúlio Vargas Avenue was the second most afforested, with 60 individuals belonging to eight botanical families, from which Moraceae stands out with 45 individuals of ficus (*Ficus benjamina*).

The spatial distribution of the inventoried individuals can be observed in Picture 1.

**Picture 1** - Spatial distribution of the individuals among the neighborhoods in Lábrea-AM

Source: Research archive

The urban afforestation species of the public roads in Lábrea are partially from national native origin (19 species; 50%), from which 12 species are of Amazonic occurrence (63% of native species identified in the study). However, the individuals are mostly from exotic origin (399 ind.; 79%), which supports the results of Vieira and Panagopoulos (2020), when they state that in the urban afforestation of cities in the Brazilian Amazon, the exotic species are more frequent than the native ones. Still according to these authors, the most abundant species are the ones largely used as ornamental and coming from planting made by organs responsible for the administration of these public places. And this is the main reason we see so many exemplars of these species. The even highlight that the adherence to the use of native species can represent the lack of concern with conservation and regional flora.

Mostly, they achieved adult size (337 ind., 66%), present plant health type 1 (483 ind.; 95%), are in good structural state (470 ind.; 93%), located in sidewalks area with conflict (133 ind.; 26%) or not (280 ind., 55%) with the power grid and root system with conflict (105 ind., 21%) or not (402 ind., 79%) with paving. During the survey period, the individuals were out of the phenological period, in other words, without flowers or fruits (445 ind., 88%; 417 ind.; 82%, respectively).

Six sick individuals were identified: four jambo trees (one located in the Fonte neighborhood, Camilo Morato Street and three located in Centro, 14 de Maio street) and two pau-pretinhas located in Centro, Coronel Luiz Gomes Street. Twelve individuals suffered drastic pruning: cajueiro, central neighborhood, 22 de Outubro street (1); ficus, Fonte neighborhood, Walter Pires street (1); jambeiro, Fonte neighborhood, José Martinês street (2) and Monsenhor Inacio street (2). Central neighborhood, Vile Roy street (2). Pantanal neighborhood, Deocleciano Sampaio street (1). São José neighborhood, Luiz Falcão street (1) and Travessa Santo Antonio (1); mangueira, Fonte neighborhood, Francisco Cidronio street (1). Two ficus individuals are under the "embrace" of Apuí

in Fonte neighborhood, Monsenhor Inácio street (Picture 2).

**Picture 2** - Photographical registry geolocated using the Open Camera app. *Ficus* individual (*Ficus benjamina*) being embraced by apuí (*Ficus* sp.) in Fonte neighborhood, Monsenhor Inácio street



Source: Research archive

The qualitative parameters of the afforestation are summarized in Table 2.

**Table 2** – Qualitative parameters of the individuals that compose the urban afforestation

Qualitative parameters	Neighborhoods							Total
	Centro	Bairro da Fonte	Vila Falcão	Pantanal	Barra Limpa	Fátima	São José	
<b>Origin</b>								
Exotic	206	70	46	25	29	16	7	399
Native	45	8	31	10	6	1	7	108
<b>Size</b>								
Adult	177	56	35	22	27	14	6	337
Young	74	22	42	13	8	3	8	170



Qualitative parameters	Neighborhoods							Total
	Centro	Bairro da Fonte	Vila Falcão	Pantanal	Barra Limpa	Fátima	São José	
<b>Phytosanitary state</b>								
Type 1	247	74	69	34	34	13	12	483
Type 2	4	4	8	1	1	4	2	24
<b>Structural state</b>								
Good	236	75	70	31	34	11	13	470
Reasonable	13	3	4	4	1	2	0	27
Bad	2	0	3	0	0	4	1	10
<b>Type of road + conflict with power grid</b>								
Curb								
Absent	80	0	4	0	0	2	0	86
Present	3	0	5	0	0	0	0	8
<b>Sidewalk</b>								
Absent	86	76	49	25	32	2	10	280
Present	82	2	19	10	3	13	4	133
<b>Conflict with pavement</b>								
Absent	172	78	61	33	34	12	12	402
Present	79	0	16	2	1	5	2	105
<b>Phenology</b>								
Flowers								
Absent	232	78	63	29	22	9	12	445
Present	19	0	14	6	13	8	2	62
Fruits								
Absent	226	67	59	33	16	9	7	417
Present	25	11	18	2	19	8	7	90

Source: Research archive

The quantitative parameters of the afforestation individuals are listed in table 3. The highest percentage of individuals covers the range from 0.1 to 250 cm of circumference at breast height (473 ind., 93.3%). Treetop diameter presented the highest number of individuals between 100.1 to 1000 cm (461 ind., 90.9%). With respect to height, the individuals are distributed between 200.1 to 2000 cm (457 ind., 90.1%), with the height of the first bifurcation ranging between 0.1 to 200 cm (463 ind., 91.3%). The data supports the recent intensification of afforestation actions on behalf of the municipal manager organ, initiated in 2000.

**Table 3** - Quantitative parameters of the individuals that compose the urban afforestation

Quantitative parameters (cm)	Neighborhoods								
	Centro	Bairro da Fonte	Vila Falcão	Pantanal	Barra Limpa	Fátima	São José	Total	
Circumference at breast height	0,1-50	51	15	56	10	10	3	10	155
	50,1-100	57	22	11	14	12	3	0	119
	100,1-150	78	27	6	6	5	9	3	134
	150,1-200	43	9	3	3	4	2	1	65
	200,1 - 250	16	4	1	1	3	0	0	25
	250,1 - 300	3	0	0	0	1	0	0	4
	300,1 - 350	2	1	0	1	0	0	0	4
	350,1 - 400	0	0	0	0	0	0	0	0
	> 400,1	1	0	0	0	0	0	0	1
Treetop diameter	0,1 - 100	18	4	1	0	0	1	0	24
	100,1 - 200	19	7	12	8	1	3	0	50
	200,1 - 400	42	7	26	2	6	3	6	92
	400,1 - 600	86	25	21	9	6	2	3	152
	600,1 - 800	61	23	8	8	13	6	3	122
	800,1 - 1000	18	8	4	6	6	2	1	45
	> 1000,1	7	4	5	2	3	0	1	22
Height	0,1 - 100	4	1	0	0	0	0	0	5
	100,1 - 200	13	6	9	5	0	1	0	34
	200,1 - 400	29	10	15	4	5	4	7	74
	400,1 - 600	69	14	24	6	11	1	4	129
	600,1 - 800	81	10	14	4	6	6	0	121
	800,1 - 1000	24	15	2	2	8	2	0	53
	1000,1 - 2000	31	19	13	8	5	3	1	80
	> 2000,1	0	3	0	6	0	0	2	11
Height of 1st bifurcation	0,1 - 100	183	31	49	22	26	7	9	327
	100,1 - 200	54	30	27	8	6	7	4	136
	200,1 - 400	14	16	1	5	3	3	1	43
	> 400,1	0	1	0	0	0	0	0	1

Source: Research archive

In terms of ecological characteristics, it can be considered that the afforestation assessed does not have good condition in number, abundance and diversity of arboreal species. The families that presented more richness of species were Fabaceae (14 species), as identified in the study of Vieira and Panagopoulos (2020), followed by Myrtaceae, Malvaceae and Anacardiaceae (all rep-

resented by three species). In terms of neighborhoods, Centro and Vila Falcão presented more richness of species, with 22 and 17 species, respectively.

The two most abundant species (higher absolute density) are responsible for 56% of the total of occurring plants on the city's public roads [ficus (Moraceae, *Ficus benjamina*) and jameiro (Myrtaceae, *Syzygium malaccense*)], and the other 44% are distributed in the other 36 species. In terms of neighborhoods, Centro, Bairro da Fonte and Vila Falcão presented more abundance, with 251, 78 and 77 individuals, respectively. The numeric predominance of few species are negative points related to the environmental, and mainly phytosanitary quality (KRAMER; KRUPPEK, 2012). Still according to Kramer and Krupek (2012) apud Grey and Deneke (1978), there should be a maximum limit of 10 to 15%, for the frequency of individuals by species in a certain area. However, as happened in Kramer and Krupek's work (2012), a few species appear with an elevated abundance, most of them with few representatives.

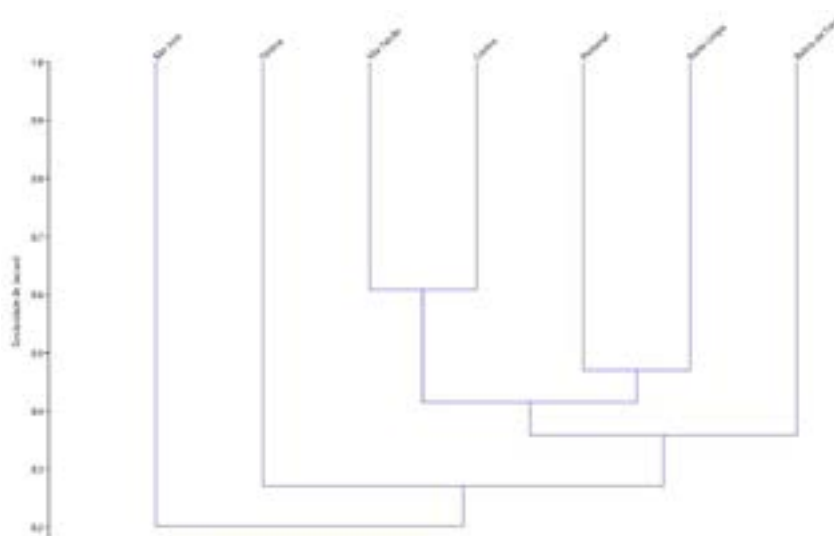
*Shannon-Wiener* diversity indexes by neighborhood were: Vila Falcão = 2,169; Pantanal = 2,102; Barra Limpa = 1,905; Centro = 1,837; São José = 1,636; Bairro da Fonte = 1,465; Bairro de Fátima = 1,395.

Simpson dominance indexes by neighborhood were: Pantanal = 0,8278; Barra Limpa = 0,8196; Vila Falcão = 0,8221; São José = 0,7449; Centro = 0,6983; Bairro de Fátima = 0,6644; Bairro da Fonte = 0,6078.

About Jaccard similarity index, Cluster Analysis, showed low similarity among the areas studied, showing the formation of 3 groups, one big group formed by the species present in the neighborhoods Centro, Vila Falcão, Pantanal, Barra Limpa and Bairro da Fonte; another formed by Fátima neighborhood and another distinct group formed by São José neighborhood (Picture 3), what shows high differentiation among neighborhoods in terms of the species composition.

As observed by Kramer and Krupek (2012), there were high values of richness (Centro and Vila Falcão) and diversity (Vila Falcão and Pantanal), associated to a high frequency of few species (Centro), and it has put the road afforestation in ecological conditions still far from ideal.

**Picture 3** - Jaccard Similarity Index Cluster Analysis of urban afforestation among neighborhoods



Source: Research archive

The floristic patterns of the afforestation are summarized in table 4.

**Table 4** - Quantitative parameter of the individuals that compose the urban afforestation

Quantitative parameters	Neighborhoods						
	Centro	Bairro da Fonte	Vila Falcão	Pantanal	Barra Limpa	Fátima	São José
Richness	22	12	17	12	9	6	7
Abundance	251	78	77	35	35	17	14
Simpson dominance	0,6983	0,6078	0,8221	0,8278	0,8196	0,6644	0,7449
Shannon-Wiener diversity	1,837	1,465	2,169	2,102	1,905	1,395	1,636
Jaccard similarity	0,5941	0,5894	0,7655	0,8459	0,8671	0,7783	0,8406

Source: Research archive

## Conclusion

The low diversity of species in Lábrea's afforestation can indicate a certain prejudice in the quality of the urban physical and environmental structure. Some common problems already related in studies also happen in the region, which are: the low quantity and abundance of species and elevated quantity of individuals of exotic origin species. In addition, such ecological characteristics were intermediary to related studies. To stimulate the use of native species of the region which, adapted to the environment where they appear, can help in the improvement of environmental and phytosanitary quality of the neighborhoods studied.

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