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Floristic composition and structure of the tree community in a sustainable use conservation unit

This study aimed to analyze the floristic composition and horizontal structure tree species of vegetation which will undergo total suppression to make way for a transmission line for the "Luz Para Todos" Program, that will benefit 1,200 families approximately installed in Resex Cajari. 14.8 ha of forest were sampled systematically, allocating 74 plots of 20 m x 100 m, with all trees with DBH ≥ 9 cm, except palm and lianas. 2,798 individuals belonged to 39 botanical families and were distributed in 150 species. The families with larger species were Fabaceae with 36, Malvaceae with 10, and Annonaceae with 8. The most significant importance value species were Swartzia polyphylla, Hevea brasiliensis, and Virola surinamensis. The estimate of the total volume of wood was about 4,500 m3. The rare species should have a replacement immediately in close areas after the suppressions. The studied vegetation has a high diversity and high floristic richness, typical attributes of a protected Amazon Forest in a good state of conservation. The results reinforce the importance of phytosociological studies to support sustainable management actions and prevent the extinction of rare and low-abundance species.

Palavras-chave: Amazon; Phytosociology; Rainforest; Resex Cajari.

Composição florística e estrutura da comunidade arbórea em uma unidade de conservação de uso sustentável

Este estudo objetivou avaliar a composição florística e a estrutura horizontal de espécies arbóreas de uma vegetação que sofrerá supressão total para dar lugar a passagem de uma linha de transmissão do Programa Luz para Todos, que beneficiará aproximadamente 1.200 famílias instaladas na Reserva Extrativista do Rio Cajari. Para isso, foram amostrados 14,8 hectares de áreas vegetacionais alocando sistematicamente 74 parcelas de 20 m x 100 m, sendo mensuradas todas as árvores com DAP ≥ 9 cm, exceto palmeiras e cipós. Foram encontrados 2.798 indivíduos, pertencentes a 39 famílias botânicas e distribuídos em 150 espécies. As famílias com maior número de espécies foram Fabaceae com 36, Malvaceae com 10 e Annonaceae com 8. As espécies com os maiores índices de importância foram Swartzia polyphylla, Hevea brasiliensis e Virola surinamensis. O volume total estimado de madeira foi de ~4.500 m3. As espécies raras devem ter sua reposição em áreas próximas imediatamente após as supressões destas. A vegetação estudada possui alta diversidade e alta riqueza florística, atributos típicos de uma floresta amazônica protegida em bom estado de conservação. Os resultados reforçam a importância dos estudos fitossociológicos para subsidiar ações de manejo florestal sustentável e prevenir a extinção de espécies raras e de baixa abundância.

Keywords: Amazônia; Fitossociologia; Floresta tropical; Resex Cajari.

Topic: **Ciências Florestais**

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INTRODUCTION

Tropical rainforests, while not fully depleted, play a fundamental role in regulating the planet's climate, in addition to maintaining and conserving a significant portion of the existing biological diversity due to their own characteristics. For Steege et al. (2013), the Brazilian Amazon has one of the highest biodiversity among tropical forests, with little botanical knowledge of their species.

Therefore, the study of biodiversity in primary natural vegetation environments and their interactions is the first step towards the conservation, maintenance, and sustainability of the existing biological diversity in the background (HUSCH et al., 2003; COLMANETTI et al., 2016; FREITAS et al., 2015). In this context, in the forestry area, studies of floristic composition, phytosociology, and forms of use are primary paths to be followed towards sustainability and preservation of forest resources (ASSIS et al., 2017).

According to Francez et al. (2007), the description of the vegetation structure and the floristic composition are among the main tools available for evaluating the potential of a forest and defining management strategies. With technological evolution and the need to expand the scope of use of forest resources, inventories have become more complex and informative, increasing the level of detail of the information to be obtained, such as the indication of use and employability of non-timber and timber forest products from each species.

On the other hand, the basis for developing an extractive reserve must be focused on the continuous production of the forest, aiming to provide products and services to its inhabitants, especially humans. Thus, knowing in-depth how the forest produces and renews its resources is an essential step through studies of floristic composition.

In this context, the Cajari River Extractive Reserve – RESEX Cajari, located in Amapá, Brazil, is an environmental protection unit in the category in which the exploration of renewable natural resources is allowed, provided that their continuity is ensured.

With the arrival of the Luz Para Todos Project at Resex Cajari, a program that deploys electricity 24 hours a day to rural communities, benefits and quality of life came to extractivists; however, in a previous phase, the Basic Environmental Plan (PBA) was presented. In this sense, floristic studies were proposed, which are of fundamental importance to support criteria for suppression of vegetation under transmission lines and suggest ways of using and employing the material to be removed.

Therefore, this study aims to analyze the floristic composition and the horizontal structure of the arboreal vegetation of Resex Cajari, which suffered total suppression in the stretches through which the transmission line of the aforementioned social program will pass.

MATERIAL AND METHODS

Study area

The study was carried out in the Cajari River Extractive Reserve Sustainable Use Conservation Unit, in the southern region of Amapá, between the municipalities of Mazagão, Laranjal do Jari and Vitória do Jari,

where the following stretches were inventoried: Alto Cajari (along the BR 156 and community access branches) with latitude 00º33'03.0" and longitude 052º12'11.8"; Médio Cajari (from Santa Clara community to Vila Paraíso) with latitude 00°29'57.4" and longitude 52°04'40.1" and Baixo Cajari (from Santa Ana community to Ajuruxi Lake), with latitude of 00°49'20.5" and longitude 051°44'04.9", through which the transmission line of the Federal Government's Luz Para Todos Program will pass.

According to Koppen's classification, the predominant climate in the region is of type Af in the region close to the North Channel and Am in the Center/North of Resex (ALVARES et al., 2013), that is, tropical rainy with a well-defined dry period, characterized by an average annual temperature of 27.5°C, relative humidity of 85%, rainfall of 2,400mm, with lower water availability in the period from September to November (VILHENA et al., 2018). The primary soils identified in the region are Yellow Latosol, Yellow Podzolic, Ultisols, and Low Humic Glei (RABELO, 2004).

The vegetation formation in the studied area was classified and characterized in the following Physiognomic-Ecological Classification System: dense rainforest, also known as tropical rain forest; alluvial dense ombrophilous forest, also known as riverine formation or riparian forest, alluvial open ombrophilous forest and dense submontane ombrophilous forest[1].

Regarding sampling, the forest inventory consisted of allocating 74 sample plots distributed systematically, which is suggested for these occasions according to Pellico Neto and Brena (1993) and Queiroz (1998). Each plot with an area of 2,000 m2 (20 m x 100 m), with a distance between the plots of 3 km, making a total of 14.8 hectares of the sampled area.

Data collection

In the data collection, were registered from the species' vernacular names. The inclusion limit of arboreal individuals in the sample was of diameter at breast height (DBH= 9 cm) measured at 1.30 m from the ground for individuals without buttresses and 0.5 m above the buttresses. The total and commercial heights of each tree were also recorded, following the recommendations of Batista et al. (2014). Palm trees and vines were not inventoried as they were considered of little use after the suppression. The species were identified in the field by regionally known vernacular names, and the procedures for collection and botanical identification followed the same by Freitas et al. (2018).

Data analysis

Regarding data analysis, the sampling intensity was calculated based on the parameter number of species, according to Husch et al. (1982), which is estimated by the graph of the collector curve (species/area) generated by the R software (R DEVELOPMENT CORE TEAM, 2019). To assess the representativeness of the total number of species, a sampling error of 15% with a probability level of 95% was considered. Diametric distribution, amplitude and number of classes were calculated according to the procedures recommended

[1] http://biblioteca.ibge.gov.br/colecao_digital_publicacoes.php

by Higuchi[2].

For species richness, Shannon-Weaver diversity (H'), Simpson dominance (D), Pielou evenness (J), Jentsch Mixing Quotient (QM), and Morisita similarity index were estimated according to Brower and Zar (1984) and Magurann (2013). The spatial distribution pattern (z) was analyzed by the ratio between the variance (S2) and the mean (M) of the number of trees per sampling unit. The phytosociological parameters of the horizontal structure were estimated according to Souza and Soares (2013). Finally, the volume of commercial bole with the bark of standing trees of the i-th species (Vci) was estimated using a form factor equal to 0.7 (Batista et al. 2014). Subsequently, the data were tabulated and analyzed using Microsoft Office Excel 2016 and R software.

RESULTS

The sampling intensity was tested by the species-area curve (Figure 1), frequently used in phytosociological surveys. In the forest area sampled in the Rio Cajari Extractive Resex in southern Amapá, 2,798 individuals with DBH ≥ 9 cm were found, 7 identified at the genus level and 143 at the species level distributed in 39 families. Of the 150 species found, 33 had up to 2 individuals, 13 (8.6%) had 2 individuals, and 20 (13.3%) had only one individual (Table 1).

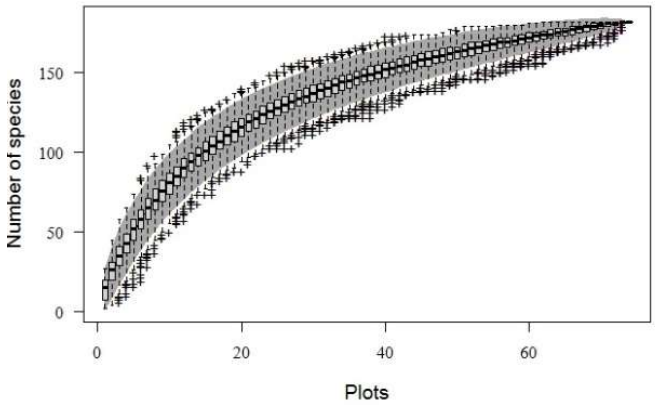

Figure 1: Species-area curve, considering arboreal individuals with DBH ≥ 9 cm, inventoried in 14.8 ha in the Cajari River Extractive Reserve, Amapá, Brazil.

Table 1: Families, species and number of individuals per species inventoried in 14.8 hectares in the Cajari River Extractive Reserve, Amapá, Brazil.

Family	Species	Nº of Individuals
Anacardiaceae	*Anacardium occidentale* L.	17
	Antrocaryon amazonicum (Ducke) B.L. Burtt & A.W. Hill	2
	Mangifera indica L.	8
	Spondias mombin L.	91
	Tapirira guianensis Aubl.	13
Annonaceae	*Annona hypoglauca* Mart.	2
	Duguetia spixiana Mart.	1
	Duguetia surinamensis R.E.Fr.	11
	Guatteria poeppigiana Mart.	10
	Onychopetalum amazonicum R.E.Fr.	13
	Rollinia mucosa (Jacq.) Baill.	4
	Xylopia amazonica R.E.Fr.	1
	Xylopia sp	10

[2] https://d1wqtxts1xzle7.cloudfront.net/34526723/apostila_biometria_1-with-cover-page-v2.pdf?Expires=1660851052&Signature=Wpr9Mr385-cCPTvDI-1Ey2oPIxGmeoKBFqNQd6WVWTGZdJWo-v3g7GzwtWPWlrhEFxD2cDpgA6PaAj1iofYFdD4gMA0uQRA87CQgPyFMLMuHqooGNtT0LUvwfIuG1pSU1IE2lw5HssMM6ZlqB678lLo56N8o6GjdkLl9u-VamLLS1WUG-6nj91F6SP~oyRjzqDfImfPjVFIMBm-JhoQADuDc0rgTGlurSzQEi7OMt7mtFvR4PwvXiTdL9jbbGe8hns7couYi1NGNL6vuAt6JJvB86KOcK8Ju9tXOAPns05ZVvuruTCajpMk4raAY6hMfYILUa68YkuadRabJVyYCtw__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

Apocynaceae	*Himatanthus articulatus* (Vahl) Woodson	21
	Malouetia tamaquarina (Aubl.) A.DC.	1
	Rauvolfia pentaphylla Ducke	7
Araliaceae	*Schefflera morototoni* (Aubl.) Maguire, Steyerm. & Frodin	13
Bignoniaceae	*Handroanthus serratifolius (*Vahl) S.O.Grose	15
	Jacaranda copaia (Aubl.) D.Don	22
	Tabebuia aurea (Silva Manso) Benth. & Hook. f ex S. Moore	18
Burseraceae	*Protium* sp	27
	Protium unifoliolatum Engl.	10
	Trattinnickia rhoifolia Willd.	19
Calophyllaceae	*Caraipa grandifolia* Mart.	13
Caryocaraceae	*Caryocar glabrum* (Aubl.) Pers.	72
	Caryocar villosum (Aubl.) Pers.	8
Celastraceae	*Maytenus* sp	3
Chrysobalanaceae	*Hirtella hebeclada* Moric. ex DC.	4
	Licania guianensis (Aubl.) Griseb.	24
	Licania heteromorpha Benth.	11
	Licania kunthiana Hook.f.	17
	Licania macrophylla Benth.	20
	Licania micrantha Miq.	2
	Parinari campestris Aubl.	24
Clusiaceae	*Calophyllum brasiliense* Cambess.	10
	Garcinia madruno (Kunth) Hammel	1
	Symphonia globulifera L.f.	4
Combretaceae	*Terminalia guyanensis* Eichler	4
Dilleniaceae	*Curatella americana* L.	11
Euphorbiaceae	*Glycydendron amazonicum* Ducke	1
	Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.	166
	Hura crepitans L.	6
	Sapium argutum (Müll.Arg.) Huber	10
Fabaceae	*Albizia pedicellaris* (Dc.) L.Rico	17
	Andira parvifolia Benth.	2
	Bowdichia virgilioides Kunth	9
	Campsiandra comosa var. laurifolia (Benth.) Cowan	27
	Clitoria racemosa Benth.	2
	Crudia oblonga Benth.	35
	Dinizia excelsa Ducke	5
	Diplotropis purpurea (Rich.) Amshoff	2
	Dipteryx odorata (Aubl.) Willd.	23
	Eperua falcata Aubl.	3
	Hymenaea courbaril L.	2
	Hymenolobium excelsum Ducke	4
	Inga edulis Mart.	61
	Inga sp	62
	Macrolobium acaciifolium (Benth.) Benth.	22
	Macrolobium angustifolium (Benth.) Cowan	10
	Mora paraensis (Ducke) Ducke	101
	Ormosia coutinhoi Ducke	1
	Ormosia sp	4
	Parkia multijuga Benth.	3
	Peltogyne catingae Ducke	7
	Pentaclethra macroloba (Willd.) Kuntze	127
	Pithecellobium pedicellare (DC.) Benth.	9
	Plathymenia foliolosa Benth.	10
	Platymiscium filipes Benth.	37
	Pterocarpus amazonicus Huber	19
	Pterocarpus officinalis Jacq.	12
	Pterocarpus santalinoides DC.	11
	Schizolobium amazonicum Ducke	16
	Swartzia cardiosperma Benth.	61
	Swartzia corrugata Benth.	1
	Swartzia polyphylla DC.	181
	Tachigalia paniculata Aubl.	15
	Vatairea guianensis Aubl.	75
	Vouacapoua americana Aubl.	1
	Zygia inaequalis (Willd.) Pittier	2
Goupiaceae	*Goupia glabra* Aubl.	2
Hernandiaceae	*Hernandia guianensis Aubl.*	11
Humiriaceae	*Sacoglottis guianensis* Benth.	5
	Sacoglottis sp	5
Hypericaceae	*Vismia guianensis* (Aubl.) Pers.	17
Lauraceae	*Licaria brasiliensis* (Nees) Kosterm.	9

	Mezilaurus itauba (Meisn.) Taub. ex Mez	6
	Mezilaurus mahuba (A. Samp.) van der Werff	18
	Nectandra amazonum Ness	15
	Ocotea sp	8
	Persea americana Mill.	7
	Sextonia rubra (Mez) van der Werff	5
Lecythidaceae	*Allantoma lineata* (Mart. ex O.Berg) Miers	7
	Eschweilera coriacea (DC.) S.A.Mori	4
	Eschweilera pedicellata (Rich.) S.A.Mori	4
	Gustavia augusta L.	22
	Gustavia hexapetala (Aubl.) Sm.	20
	Lecythis lurida (Miers) S.A.Mori	19
	Lecythis pisonis Cambess.	1
Malpighiaceae	*Byrsonima crassifolia* (L.) Kunth	22
Malvaceae	*Apeiba glabra* Aubl.	15
	Apeiba macropetala Ducke	1
	Ceiba pentandra (L.) Gaertn.	3
	Guazuma ulmifolia Lam.	16
	Pachira aquatica Aubl.	64
	Patinoa paraensis (Huber) Cuatrec.	3
	Pseudobombax munguba (Mart. & Zucc.) Dugand	1
	Quararibea guianensis Aubl.	2
	Sterculia speciosa K. Schum	4
	Theobroma speciosum Willd. Ex Spreng.	1
Melastomataceae	*Miconia prasina* (SW.) DC.	3
	Mouriri grandiflora DC.	45
Meliaceae	*Carapa guianensis* Aubl.	98
	Cedrela odorata L.	7
	Trichilia paraensis C. DC.	1
	Trichilia surinamensis (Miq.) C. DC.	14
Moraceae	*Artocarpus altilis* (Parkinson ex F.A.Zorn) Fosberg	3
	Artocarpus heterophyllus Lam.	1
	Bagassa guianensis Aubl.	1
	Ficus adhatodifolia Schott	14
	Naucleopsis caloneura (Huber) Ducke	33
Myristicaceae	*Virola michelii* Heckel	5
	Virola surinamensis (Rol. ex Rottb.) Warb.	168
Myrtaceae	*Eugenia gomesiana* O.Berg	5
	Myrcia atramentifera Barb. Rodr.	2
	Myrcia bracteata (Rich.) DC.	15
	Syzygium malaccense (L.) Merr. & L.M.Perry	8
Ochnaceae	*Ouratea hexasperma* (A. St.-Hil.) Baill.	3
Olacaceae	*Minquartia guianensis* Aubl.	4
Polygonaceae	*Triplaris weigeltiana* (Rchb.) Kuntze	18
Rubiaceae	*Calycophyllum spruceanum* (Benth.) Hook.f. ex K.Schum. (Benth.) Hook. f. ex K. Schum.	80
	Chimarrhis barbata (Ducke) Bremek.	18
	Coussarea albescens (DC.) Müll.Arg.	1
	Genipa americana L.	4
Rutaceae	*Metrodorea flavida* K. Krause	25
	Zanthoxylum rhoifolium Lam.	2
Salicaceae	*Casearia arborea* (Rich.) Urb.	32
Sapotaceae	*Manilkara huberi* (Ducke) Standl.	1
	Manilkara paraensis (Huber) Standl.	4
	Micropholis venulosa (Mart. & Eichler ex Miq.) Pierre	2
	Pouteria bilocularis (H.J.P.Winkl.) Baehni	1
	Pouteria macrophylla (Lam.) Eyma	1
	Pouteria sagotiana (Baill.) Eyma	1
	Sarcaulus brasiliensis (A. DC.) Eyma	28
Simaroubaceae	*Simarouba amara* Aubl.	18
Tiliaceae	*Apeiba burchellii* Sprague	6
Urticaceae	*Cecropia concolor* Willd.	22
	Cecropia palmata Willd.	28
Vochysiaceae	*Erisma bicolor* Ducke.	10
	Qualea albiflora Warm.	19
	Salvertia convallariodora A. St.-Hil.	4
Σ 39	**150**	**2,798**

Table 2 presents the phytosociological and structural parameters of the forest community at Resex Cajari. The estimated total tree density was 189.05 ind. ha^{-1}, with a basal area of 18.75 m^2 ha^{-1} and an

estimated total volume of 4,488 m^3.

The distribution of the number of individuals in diametric classes with an amplitude of 11 cm shows the distribution in a reverse "J" shape, which is a characteristic of tropical natural forests due to their high heterogeneity (Figure 2). Of the 150 species surveyed, the 20 species with the highest importance value represent about 60% of the density of individuals (Table 3).

Table 2: General parameters, structural and diversity indices for individuals with DBH ≥ 9 cm sampled in Sustainable Use Conservation Unit, Resex Cajari, Amapá.

Parameters	**Value**
Number of individuals	2,798
Families	39
Richness	150
Density (nº ind. ha^{-1})	189.05
Basal área (m^2 ha^{-1})	18.75
Total Volume (m^3)	4,488
Spatial Distribution (Morisita)	1.302
Shannon-Wiener	4.234
Equability	0.845
Simpson	0.024
1 - D	0.976
Jentsch (QM)	1:18

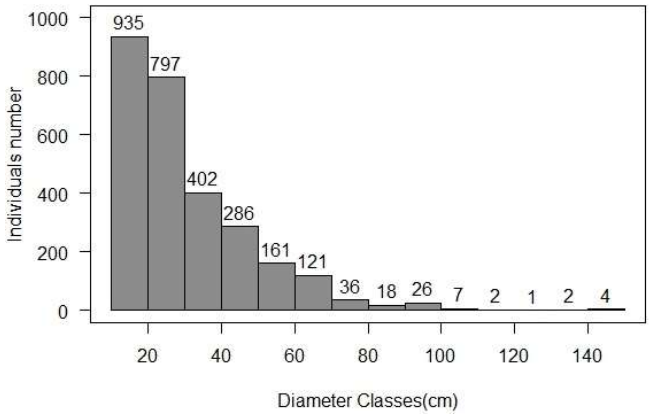

Figure 2: Diametric distribution of the number of individuals by diameter class of 15 cm amplitude in the Cajari River Resex, AP, Brazil.

DISCUSSION

The sampling of the tree community showed a tendency to stabilize the curve between plots 69 and 72, i.e., with no new species between plots. In this sense, it was found that 46 samples of 20m x 100m are satisfactory to represent the number of species in the inventoried area.

Admitting up to 15% error, the 74 allocated plots were sufficient to represent the floristic composition of the studied area, considering that, in natural forests, the tendency to stabilization is adequate to describe the vegetation, indicating that the sampling effort was satisfactory (LONGHI et al., 1999).

As for the floristic composition, in the same southern region of Amapá in the Extractive Reserve for Sustainable Development of Rio Iratapuru (RDSI-AP) Pereira et al. (2011), evaluating individuals with DBH ≥ 10 cm, recorded 623 individuals distributed in 101 species considering a sampling of 11 plots of 0.1 ha, results different from those obtained in Resex Cajari, regarding species richness.

Table 3: Estimate of the relative phytosociological parameters of the horizontal structure of the 20 main species occurring on 14.8 hectares in the Cajari River Extractive Reserve, classified by importance value (IV).

Species	RD	RF	RDo	IV	CV
Swartzia polyphylla	6.47	2.33	10.99	19.79	17.46
Hevea brasiliensis	5.93	3.39	8.60	17.92	14.53
Virola surinamensis	5.99	2.76	5.83	14.58	11.83
Mora paraensis	3.60	1.80	7.99	13.39	11.60
Spondias mombin	3.25	2.54	5.31	11.10	8.56
Pentaclethra macroloba	4.53	2.65	2.44	9.62	6.98
Carapa guianensis	3.50	3.08	3.01	9.59	6.51
Caryocar glabrum	2.57	1.69	4.68	8.94	7.25
Vatairea guianensis	2.67	2.01	1.94	6.62	4.62
Swartzia cardiosperma	2.18	2.01	2.05	6.24	4.23
Pachira aquatica	2.29	1.69	2.20	6.18	4.48
Calycophyllum spruceanum	2.86	1.27	1.96	6.09	4.82
Naucleopsis caloneura	1.18	1.81	2.58	5.57	3.76
Inga sp	2.22	2.02	1.13	5.37	3.35
Mouriri grandiflora	1.61	2.23	1.19	5.03	2.80
Inga edulis	2.18	1.28	1.27	4.73	3.45
Crudia oblonga	1.25	1.49	1.38	4.12	2.63
Campsiandra comosa	0.96	1.70	1.19	3.85	2.16
Casearia arborea	1.14	1.17	1.21	3.52	2.36
Platymiscium filipes	1.32	1.28	0.87	3.47	2.20
Parinari campestris	0.86	0.85	1.44	3.15	2.30
Macrolobium acaciifolium	0.79	0.85	1.30	2.94	2.08
Σ 20	-	-	-	-	-

*Relative density (RD), relative frequency (RF), relative dominance (RDo), importance value (IV) and coverage value (CV)

The families with the highest number of species were: Fabaceae (36), Malvaceae (10), Annonaceae (8), Chrysobalanaceae, Lauraceae, Lecythidaceae, and Sapotaceae (7). Together, these seven families represent 50.96% of the total number of individuals inventoried (Figure 2). In this sense, the work carried out by Vieira et al. (2015) in a forest area in the Amazon under a management regime found that the Fabaceae, Lecythidaceae, and Sapotaceae families are among the families that presented the highest number of species.

The ten species with the highest number of individuals were: *S. polyphylla* (181), *V. surinamensis* (168), *H. brasiliensis* (166), *P. macroloba* (127), *M. paraensis* (101), *C. guianensis* (98), *S. mombin L.* (91), *C. spruceanum* (80), *V. guianensis* (75) e *C. glabrum* (72), cumulatively these species represent 41.42% of the total individuals surveyed. Sardinha et al. (2017), when carrying out phytosociological studies in an Agroextractive Settlement in Amapá, they found that the species *Mora paraensis* (260), *Pentaclethra macroloba* (104) e *Calycophyllum spruceanum* (62) stood out among the species with a high number of individuals, common species also found in Resex Cajari.

The number of rare species with up to 2 individuals per hectare reached 21.9% was considered high because some species preferred in the timber market were included, such as *Hymenaea courbaril*, *Goupia glabra*, *Manilkara huberi*, *Lecythis pisonis*, *Bagassa guianensis* e *Vouacapoua Americana*, among others, which must be protected from suppression so that they can reproduce and increase local diversity (Table 1, Table 4).

The Shannon diversity index (H') of 4.23 nats ind.$^{-1}$ found in the study area indicates a high species diversity, being very close to those discovered by Batista et al. (2015) with a value of 4.61 and 4.52 by Vieira et al. (2015) in terra firme forest in Amapá, the latter author also identified 4.19 nats ind.$^{-1}$ in unmanaged terra firme forests in the Brazilian Amazon. According to Knight (1975), the Shannon diversity value is within

the expected ranges of 3.83 to 5.85 for tropical forests. The Pielou (J) evenness value found was 0.84, indicating no dominance of one or a group of species in the inventoried areas, referring to high floristic heterogeneity (Table 2).

Table 4: Estimate of the phytosociological parameters in the Cajari River Extractive Reserve, classified by importance value (IV).

Species	N	AD	RD	ADo	RDo	AF	RF	IV
Swartzia polyphylla DC.	181	12.23	6.47	2.06	10.99	29.73	2.34	6.60
Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.	166	11.22	5.93	1.61	8.6	43.24	3.4	5.98
Virola surinamensis (Rol. ex Rottb.) Warb.	168	11.35	6	1.09	5.83	35.14	2.77	4.87
Mora paraensis (Ducke) Ducke	101	6.82	3.61	1.5	7.99	22.97	1.81	4.47
Spondias mombin L.	91	6.15	3.25	1	5.31	32.43	2.55	3.7
Pentaclethra macroloba (Willd.) Kuntze	127	8.58	4.54	0.46	2.44	33.78	2.66	3.21
Carapa guianensis Aubl.	98	6.62	3.5	0.56	3.01	39.19	3.09	3.2
Caryocar glabrum (Aubl.) Pers.	72	4.86	2.57	0.88	4.68	21.62	1.7	2.98
Vatairea guianensis Aubl.	75	5.07	2.68	0.36	1.94	25.68	2.02	2.21
Swartzia cardiosperma Benth.	61	4.12	2.18	0.38	2.05	25.68	2.02	2.08
Pachira aquatica Aubl.	64	4.32	2.29	0.41	2.2	21.62	1.7	2.06
Calycophyllum spruceanum (Benth.) Hook. f. ex K. Schum.	80	5.41	2.86	0.37	1.96	16.22	1.28	2.03
Naucleopsis caloneura (Huber) Ducke	33	2.23	1.18	0.48	2.58	22.97	1.81	1.86
Inga sp	62	4.19	2.22	0.21	1.13	25.68	2.02	1.79
Mouriri grandiflora DC.	45	3.04	1.61	0.22	1.19	28.38	2.23	1.68
Inga edulis Mart.	61	4.12	2.18	0.24	1.27	16.22	1.28	1.58
Crudia oblonga Benth.	35	2.36	1.25	0.26	1.38	18.92	1.49	1.37
Campsiandra comosa var. laurifolia (Benth.) Cowan	27	1.82	0.96	0.22	1.19	21.62	1.7	1.29
Casearia arborea (Rich.) Urb.	32	2.16	1.14	0.23	1.21	14.86	1.17	1.18
Platymiscium filipes Benth.	37	2.5	1.32	0.16	0.87	16.22	1.28	1.16
Parinari campestris Aubl.	24	1.62	0.86	0.27	1.44	10.81	0.85	1.05
Macrolobium acaciifolium (Benth.) Benth.	22	1.49	0.79	0.24	1.3	10.81	0.85	0.98
Licaria brasiliensis (Nees) Kosterm.	27	1.82	0.96	0.1	0.56	17.57	1.38	0.97
Sarcaulus brasiliensis (A. DC.) Eyma	28	1.89	1	0.06	0.33	18.92	1.49	0.94
Protium sp	27	1.82	0.96	0.09	0.5	13.51	1.06	0.84
Dipteryx odorata (Aubl.) Willd.	23	1.55	0.82	0.22	1.16	6.76	0.53	0.84
Qualea albiflora Warm.	19	1.28	0.68	0.16	0.85	10.81	0.85	0.79
Nectandra amazonum Ness	20	1.35	0.71	0.07	0.38	16.22	1.28	0.79
Metrodorea flavida K. Krause	25	1.69	0.89	0.05	0.29	14.86	1.17	0.78
Licania guianensis (Aubl.) Griseb.	24	1.62	0.86	0.07	0.39	13.51	1.06	0.77
Lecythis lurida (Miers) S.A.Mori	19	1.28	0.68	0.1	0.55	13.51	1.06	0.76
Licania macrophylla Benth.	20	1.35	0.71	0.1	0.51	13.51	1.06	0.76
Cecropia concolor Willd.	22	1.49	0.79	0.05	0.29	14.86	1.17	0.75
Ficus adhatodifolia Schott	14	0.95	0.5	0.14	0.75	10.81	0.85	0.7
Albizia pedicellaris (Dc.) L.Rico	17	1.15	0.61	0.12	0.63	10.81	0.85	0.69
Cecropia palmata Willd.	28	1.89	1	0.06	0.34	9.46	0.74	0.69
Himathanthus articulata (Vahl.) Wood.	21	1.42	0.75	0.04	0.2	13.51	1.06	0.67
Trattinnickia rhoifolia Willd.	19	1.28	0.68	0.07	0.37	12.16	0.96	0.67
Erisma bicolor Ducke.	10	0.68	0.36	0.22	1.17	5.41	0.43	0.65
Handroanthus serratifolius (Vahl) S.O.Grose	15	1.01	0.54	0.16	0.88	6.76	0.53	0.65
Byrsonima crassifolia (L.) Rich.	22	1.49	0.79	0.03	0.18	12.16	0.96	0.64
Pterocarpus amazonicus Huber	19	1.28	0.68	0.05	0.28	12.16	0.96	0.64
Trichilia surinamensis (Miq.) C. DC.	14	0.95	0.5	0.06	0.34	13.51	1.06	0.63
Pterocarpus officinalis Jacq.	12	0.81	0.43	0.13	0.72	9.46	0.74	0.63
Tapirira guianensis Aubl.	13	0.88	0.46	0.06	0.33	13.51	1.06	0.62
Jacaranda copaia (Aubl.) D.Don	22	1.49	0.79	0.08	0.43	8.11	0.64	0.62
Licania heteromorpha Benth.	11	0.74	0.39	0.13	0.71	9.46	0.74	0.61
Myrcia bracteata (Rich.) DC.	15	1.01	0.54	0.04	0.22	13.51	1.06	0.61
Schizolobium amazonicum Ducke	16	1.08	0.57	0.1	0.54	8.11	0.64	0.58
Simarouba amara Aubl.	18	1.22	0.64	0.06	0.32	9.46	0.74	0.57
Chimarrhis barbata (Ducke) Bremek.	18	1.22	0.64	0.04	0.2	10.81	0.85	0.57
Caraipa grandiflora Mart.	13	0.88	0.46	0.14	0.77	5.41	0.43	0.55
Licania kunthiana Hook.f.	17	1.15	0.61	0.05	0.28	9.46	0.74	0.54
Hernandia guianensis Aubl.	11	0.74	0.39	0.07	0.38	10.81	0.85	0.54
Caryocar villosum (Aubl.) Pers.	8	0.54	0.29	0.13	0.7	8.11	0.64	0.54
Macrolobium angustifolium (Benth.) Cowan	10	0.68	0.36	0.1	0.51	9.46	0.74	0.54
Guazuma ulmifolia Lamarck	16	1.08	0.57	0.07	0.39	8.11	0.64	0.53
Vismia guianensis (Aubl.) Pers.	17	1.15	0.61	0.03	0.14	10.81	0.85	0.53
Apeiba glabra Aubl.	15	1.01	0.54	0.04	0.2	10.81	0.85	0.53
Tabebuia aurea (Silva Manso) Benth. & Hook. f ex S. Moore	18	1.22	0.64	0.03	0.18	9.46	0.74	0.52
Gustavia hexapetala (Aubl.) Sm.	20	1.35	0.71	0.03	0.18	8.11	0.64	0.51

Gustavia augusta L.	22	1.49	0.79	0.05	0.24	5.41	0.43	0.49
Calophyllum brasiliensis Cambess.	10	0.68	0.36	0.04	0.19	10.81	0.85	0.47
Tachigalia paniculata Aubl.	15	1.01	0.54	0.05	0.25	6.76	0.53	0.44
Terminalia guianensis Aubl.	4	0.27	0.14	0.13	0.71	5.41	0.43	0.43
Anacardium occidentale L.	17	1.15	0.61	0.03	0.16	5.41	0.43	0.4
Protium unifoliolatum Engl.	10	0.68	0.36	0.04	0.19	8.11	0.64	0.4
Pithecellobium pedicellare (DC.) Benth.	9	0.61	0.32	0.06	0.3	6.76	0.53	0.38
Triplaris surinamensis Cham.	17	1.15	0.61	0.04	0.21	4.05	0.32	0.38
Dinizia excelsa Ducke	5	0.34	0.18	0.12	0.62	4.05	0.32	0.37
Hymenolobium excelsum Ducke	4	0.27	0.14	0.12	0.65	4.05	0.32	0.37
Sapium argutum (Müll.Arg.) Huber	10	0.68	0.36	0.04	0.19	6.76	0.53	0.36
Sacoglottis guianensis Benth.	5	0.34	0.18	0.09	0.46	5.41	0.43	0.35
Onychopetalum amazonicum R.E.Fr.	13	0.88	0.46	0.03	0.17	5.41	0.43	0.35
Ocotea sp	8	0.54	0.29	0.02	0.09	8.11	0.64	0.34
Schefflera morototoni (Aubl.) Maguire, Steyerm. & Frodin	9	0.61	0.32	0.03	0.16	6.76	0.53	0.34
Pterocarpus santalinoides DC.	11	0.74	0.39	0.03	0.18	5.41	0.43	0.33
Hura crepitans Muell. Arg.	6	0.41	0.21	0.04	0.2	6.76	0.53	0.31
Duguetia surinamensis R. E. Fries	11	0.74	0.39	0.02	0.11	5.41	0.43	0.31
Peltogyne catingae Ducke	7	0.47	0.25	0.02	0.11	6.76	0.53	0.3
Apeiba burchelli Sprague	6	0.41	0.21	0.03	0.15	6.76	0.53	0.3
Xylopia sp	10	0.68	0.36	0.02	0.1	5.41	0.43	0.29
Plathymenia foliolosa Benth.	10	0.68	0.36	0.02	0.09	5.41	0.43	0.29
Cedrela odorata L.	7	0.47	0.25	0.03	0.18	5.41	0.43	0.29
Mangifera indica L.	8	0.54	0.29	0.05	0.25	4.05	0.32	0.28
Curatella americana L.	11	0.74	0.39	0.02	0.12	4.05	0.32	0.28
Bowdichia virgilioides Kunth	9	0.61	0.32	0.01	0.07	5.41	0.43	0.27
Manilkara paraensis (Huber) Standl.	4	0.27	0.14	0.1	0.54	1.35	0.11	0.26
Virola michelii Heckel	5	0.34	0.18	0.03	0.17	5.41	0.43	0.26
Syzygium malaccense (L.) Merr & Perry	8	0.54	0.29	0.05	0.27	2.7	0.21	0.26
Guatteria poeppigiana Mart.	10	0.68	0.36	0.03	0.14	2.7	0.21	0.24
Eugenia gomesiana O.Berg	5	0.34	0.18	0.02	0.1	5.41	0.43	0.24
Saccoglottis sp	5	0.34	0.18	0.02	0.09	5.41	0.43	0.23
Eschweilera pedicellata (Rich.) S.A.Mori	4	0.27	0.14	0.02	0.13	5.41	0.43	0.23
Allantoma lineata (Mart. ex O.Berg) Miers	7	0.47	0.25	0.02	0.11	4.05	0.32	0.23
Sterculia speciosa K. Schum	4	0.27	0.14	0.02	0.1	5.41	0.43	0.22
Minquartia guianensis Aubl.	4	0.27	0.14	0.04	0.2	4.05	0.32	0.22
Genipa americana L.	4	0.27	0.14	0.01	0.07	5.41	0.43	0.21
Mezilaurus itauba (Meisn.) Taub. ex Mez	6	0.41	0.21	0.04	0.2	2.7	0.21	0.21
Salvertia convallariodora St. Hill.	4	0.27	0.14	0	0.03	5.41	0.43	0.2
Ormosia sp	4	0.27	0.14	0.03	0.18	2.7	0.21	0.18
Symphonia globulifera L.f.	4	0.27	0.14	0.01	0.07	4.05	0.32	0.18
Eschweilera odora (Poepp.) Miers	4	0.27	0.14	0.01	0.03	4.05	0.32	0.17
Didymopanax morototoni (Aubl.) Decne. & Planch.	4	0.27	0.14	0.03	0.14	2.7	0.21	0.16
Ceiba pentandra (L.) Gaertn.	3	0.2	0.11	0.03	0.13	2.7	0.21	0.15
Maytenus sp	3	0.2	0.11	0	0.02	4.05	0.32	0.15
Rauvolfia pentaphylla Ducke	7	0.47	0.25	0.02	0.09	1.35	0.11	0.15
Persea americana L.	7	0.47	0.25	0.02	0.09	1.35	0.11	0.15
Parkia multijuga Benth.	3	0.2	0.11	0.02	0.12	2.7	0.21	0.15
Artocarpus incisa L.	3	0.2	0.11	0.02	0.11	2.7	0.21	0.14
Hirtella hebeclada Moric. ex DC.	4	0.27	0.14	0.01	0.05	2.7	0.21	0.13
Annona hypoglauca Mart.	2	0.14	0.07	0.02	0.09	2.7	0.21	0.13
Pseudobombax munguba (Mart. & Zucc.) Dugand	1	0.07	0.04	0.04	0.22	1.35	0.11	0.12
Clitoria racemosa Benth.	2	0.14	0.07	0.03	0.17	1.35	0.11	0.12
Miconia prasina (S.W.) DC.	3	0.2	0.11	0.01	0.03	2.7	0.21	0.12
Myrcia atramentifera Barb. Rodr.	2	0.14	0.07	0.01	0.06	2.7	0.21	0.11
Antrocaryon amazonicum (Ducke) B.L. Burtt & A.W. Hill	2	0.14	0.07	0.01	0.05	2.7	0.21	0.11
Zanthoxylum regnellianum Engl.	2	0.14	0.07	0.03	0.13	1.35	0.11	0.1
Diplotropis purpurea (Rich.) Amshoff	2	0.14	0.07	0.01	0.03	2.7	0.21	0.1
Pithecellobium inaequale (Willd.) Benth.	2	0.14	0.07	0	0.02	2.7	0.21	0.1
Eperua falcata Aubl.	3	0.2	0.11	0.02	0.09	1.35	0.11	0.1
Micropholis venulosa (Mart. & Eichler ex Miq.) Pierre	2	0.14	0.07	0	0.01	2.7	0.21	0.1
Rollinia mucosa (Jacq.) Baill.	4	0.27	0.14	0	0.02	1.35	0.11	0.09
Matisia paraensis Huber	3	0.2	0.11	0.01	0.06	1.35	0.11	0.09
Pouteria sagotiana (Baill.) Eyma	1	0.07	0.04	0.02	0.13	1.35	0.11	0.09
Apeiba macropetala Ducke	1	0.07	0.04	0.02	0.11	1.35	0.11	0.08
Glycydendron amazonicum Ducke	1	0.07	0.04	0.02	0.11	1.35	0.11	0.08
Ouratea hexasperma (St. Hil.) Baill.	3	0.2	0.11	0	0.03	1.35	0.11	0.08
Quararibea guianensis Aubl.	2	0.14	0.07	0.01	0.05	1.35	0.11	0.08
Manilkara huberi (Ducke) Standl.	1	0.07	0.04	0.02	0.09	1.35	0.11	0.08
Hymenaea courbaril L.	2	0.14	0.07	0.01	0.05	1.35	0.11	0.08
Triplaris weigeltiana (Rchb.) Kuntze	1	0.07	0.04	0.02	0.08	1.35	0.11	0.07
Swartzia corrugata Benth.	1	0.07	0.04	0.01	0.05	1.35	0.11	0.07

Andira parvifolia Benth.	2	0.14	0.07	0	0.01	1.35	0.11	0.06
Xylopia amazonica R.E.FR.	1	0.07	0.04	0.01	0.05	1.35	0.11	0.06
Goupia glabra Aubl.	2	0.14	0.07	0	0.01	1.35	0.11	0.06
Licania micrantha Miq.	2	0.14	0.07	0	0.01	1.35	0.11	0.06
Rheedia acuminata Planch. et Triana	1	0.07	0.04	0.01	0.04	1.35	0.11	0.06
Trichilia paraensis C. DC.	1	0.07	0.04	0.01	0.03	1.35	0.11	0.06
Pouteria biloculares Baehni	1	0.07	0.04	0	0.03	1.35	0.11	0.06
Ormosia coutinhoi Ducke	1	0.07	0.04	0	0.02	1.35	0.11	0.06
Lecythis pisonis Cambess.	1	0.07	0.04	0	0.02	1.35	0.11	0.05
Bagassa guianensis Aubl.	1	0.07	0.04	0	0.02	1.35	0.11	0.05
Vouacapoua americana Aubl.	1	0.07	0.04	0	0.02	1.35	0.11	0.05
Coussarea racemosa A. Rich.	1	0.07	0.04	0	0.01	1.35	0.11	0.05
Pouteria macrophylla (Lam.) Eyma	1	0.07	0.04	0	0.01	1.35	0.11	0.05
Duguetia spixiana Mart.	1	0.07	0.04	0	0.01	1.35	0.11	0.05
Malouetia tamaraquina (Aublet) A.D.C.	1	0.07	0.04	0	0	1.35	0.11	0.05
Artocarpus heterophyllus Lam.	1	0.07	0.04	0	0	1.35	0.11	0.05
Theobroma speciosum Willd. Ex Spreng.	1	0.07	0.04	0	0	1.35	0.11	0.05
Total	**2,798**	**-**	**100**	**-**	**100**	**-**	**100**	**100**

*N: number of individuals, AD: absolute density, RD: relative density, ADo: absolute dominance, RDo: relative dominance, AF: absolute frequency, RF: relative frequency and IV: importance value.

The Simpson dominance index found was 0.024, which can be considered very low, indicating a high environmental variation, leading to high species diversity in the studied area. The Jentsch mixture coefficient (QM) had a ratio of 1:18, that is, eighteen individuals on average for each species found in the inventory, showing a high floristic heterogeneity.

This can be explained when a small number of species presents a high number of individuals, decreasing the mixture coefficient. This situation is evident in the present work, when the 14 most abundant species represent 50.28% of the total individuals, without palm trees and vines. As for the spatial distribution pattern, the Morisita index indicated that the aggregated pattern prevailed for 50.2% of the recorded species.

Most individuals are distributed in the minor diameter classes (9-20 cm) and (20.1-30). Together these first two concentrates 61.89% of the total number of individuals in the sampled area (Figure 2), showing diameter distribution behavior similar to that verified by Freitas et al. (2018) in the same region studied. The presence of 60 individuals in diameter classes more significant than 80 cm indicates that the forest is not suffering substantial disturbances. It is also noteworthy, an average diameter of 30.69 cm, with greater and lesser amplitude recorded at 145.1 and 9.2 cm, respectively.

The 15 most abundant species with absolute density (AD ≥ 3 ind. ha^{-1}) together represent 51.84% of the total density. On the other hand, the 10 species with the largest basal area represent 53.6% of the total dominance (Table 3, Table 4).

The importance value (IV) reflects the importance of each species in the assessed environment. The 12 most important species, with IV>6, represent 43.41% of the total VI of the survey, and the species *S. polyphylla*, *H. brasiliensis*, *V. surinamensis*, *M. paraensis* e *S. mombin* exhibited values of IV>10 (Table 3).

As for species coverage, those with values greater than CV≥11 was: *S. polyphylla, H. brasiliensis, V. surinamensis, M. paraensis*, represent 27.71% of the total CV of the 14.8 hectares surveyed, demonstrating that there are no species with outstanding characteristics in relation to the others. The cover value (CV) showed the importance of species in the forest environment; it also allows establishing the structure of taxa and the different types and relating the distribution of species in the environment (FREITAS; MAGALHÃES, 2012).

The total volume presented by the survey was 4,488 m^3, with the 15 species with the highest volumetry corresponding to 63.28% of the total number. *S. polyphylla*, *H. brasiliensis*, *M. paraensis*, presented the highest volumetric indicators with 553.39 m^3, 400.62 m^3, and 346.79 m^3, respectively. Miranda et al. (2018) also highlighted *M. paraensis* for showing a high abundance of individuals in the floodplain forests of the Amazon estuary.

CONCLUSION

Considering that there will be the total suppression of all individuals in the easement strip, it is strictly necessary that all species considered rare have their replacement in nearby areas under the same conditions as the removals. The results reinforce the importance of phytosociological studies to support sustainable management actions and prevent the extinction of rare and low-abundance species.

Existing material of commercial value will be destined for the use of communities under SNUC/ICMBio/Resex Cajari regulations, as a form of concession and service, and may be used for: use in various constructions (house, shed, nursery for seedlings, fence, pole, and other rural buildings); as a direct fuel (firewood and coal) for agribusiness, diverse industries; drying ovens, manioc and chestnut flour factories and others.

Material without commercial value (antlers and leaves) must be distributed in areas outside the power transmission line band, serving as a temporary shelter for the fauna and being used in the form of compost. The studied vegetation has a high diversity and floristic richness, typical attributes of a protected Amazon Forest in a good state of conservation.

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