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Articles

Floristic characterization of the soil seed bank in a riparian forest

Caracterização florística do banco de sementes do solo de uma floresta ripária

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ABSTRACT

The Atlantic Forest has been subjected to intense anthropogenic pressures driven by deforestation. To enhance the natural regeneration of these areas, understanding the soil seed bank (SSB) dynamics is essential. This study aimed to perform a floristic characterization of the species within the SSB of a riparian forest in Southern Brazil. A 100 x 100 m plot was established parallel to the riverbanks, subdivided into 100 sampling units (10 x 10 m each), of which 33 were randomly selected for SSB collection. The samples were transported to a nursery at the Federal University of Santa Maria and placed in a greenhouse for seedling emergence. Emerging seedlings were identified and counted for floristic analysis. The following ecological indices were calculated: Shannon diversity (*H'*), Pielou evenness (*J'*), and Simpson dominance (*D*). A total of 66 species distributed across 29 botanical families were recorded, with Asteraceae exhibiting the highest species richness. The predominant life form was herbaceous (66.89%), followed by lianas, shrubs, trees, and epiphytes. Regarding seed dispersal, while a majority of individuals remained unidentified (59.87%), anemochory was the predominant syndrome among the identified specimens.

Keywords: Species diversity; Species richness; Natural regeneration

RESUMO

A Mata Atlântica tem sido submetida a intensas pressões antrópicas impulsionadas pelo desmatamento. Para promover a regeneração natural dessas áreas, é essencial compreender a dinâmica do banco de sementes do solo (BSS). Este estudo teve como objetivo realizar uma caracterização florística das espécies presentes no BSS de uma mata ciliar no sul do Brasil. Uma parcela de 100 × 100 m foi estabelecida paralelamente às margens do rio, subdividida em 100 unidades amostrais (10 × 10 m cada), das quais 33 foram selecionadas aleatoriamente para a coleta do BSS. As amostras foram transportadas para um viveiro da Universidade Federal de Santa Maria e colocadas em casa de vegetação para a emergência das plântulas. As plântulas emergentes foram identificadas e contadas para a análise florística. Os seguintes índices ecológicos foram calculados: diversidade de Shannon (*H'*), equitabilidade de Pielou (*J'*) e dominância de Simpson (D). Um total de 66 espécies, distribuídas em 29 famílias botânicas, foram registradas, sendo Asteraceae a família com maior riqueza de espécies. A forma de vida predominante foi herbácea (66,89%), seguida por lianas, arbustos, árvores e epífitas. Em relação à dispersão de sementes, embora a maioria dos indivíduos tenha permanecido não identificada (59,87%), a anemocoria foi a síndrome predominante entre os espécimes identificados.

Palavras-chave: Diversidade de espécies; Riqueza de espécies; Regeneração natural

1 INTRODUCTION

The Brazilian Atlantic Forest is recognized as a global biodiversity hotspot, harboring a high number of endemic species and providing essential ecosystem services (Resende et al., 2024). However, this biome is subject to intense anthropogenic pressures, primarily driven by deforestation, which has left less than a quarter of its original cover (Amaral et al., 2025).

Given this scenario, forest ecosystem restoration has gained significant prominence, aiming to recover the ecological integrity of degraded environments (Sousa et al., 2020) and reestablish natural ecological succession processes (Costa et al., 2020). In this context, understanding the mechanisms underlying forest ecosystem recovery is essential, particularly in areas subjected to environmental degradation and intensive natural resource exploitation (Souza et al., 2021).

Among the processes involved in forest regeneration, the soil seed bank (SSB) dynamics play an essential role, representing a reservoir of viable seeds capable of giving rise to new plant communities in both primary and secondary forests (Souza et al., 2021). Generally, the SSB is defined as the assemblage of viable seeds present within the soil, on its surface, or associated with the litter layer, including species originating from local vegetation or dispersed from adjacent areas (Duarte et al., 2022).

Natural regeneration is directly linked to the composition and dynamics of the SSB. In this context, floristic characterization studies of the SSB represent a fundamental tool for diagnosing the degree of environmental disturbance in an area and inferring the potential for vegetation recovery (Costa et al., 2020). Furthermore, analyzing aspects such as dispersal syndromes, life forms, and regenerative strategies is essential for understanding the mechanisms of species restoration and colonization within the SSB (Duarte et al., 2022).

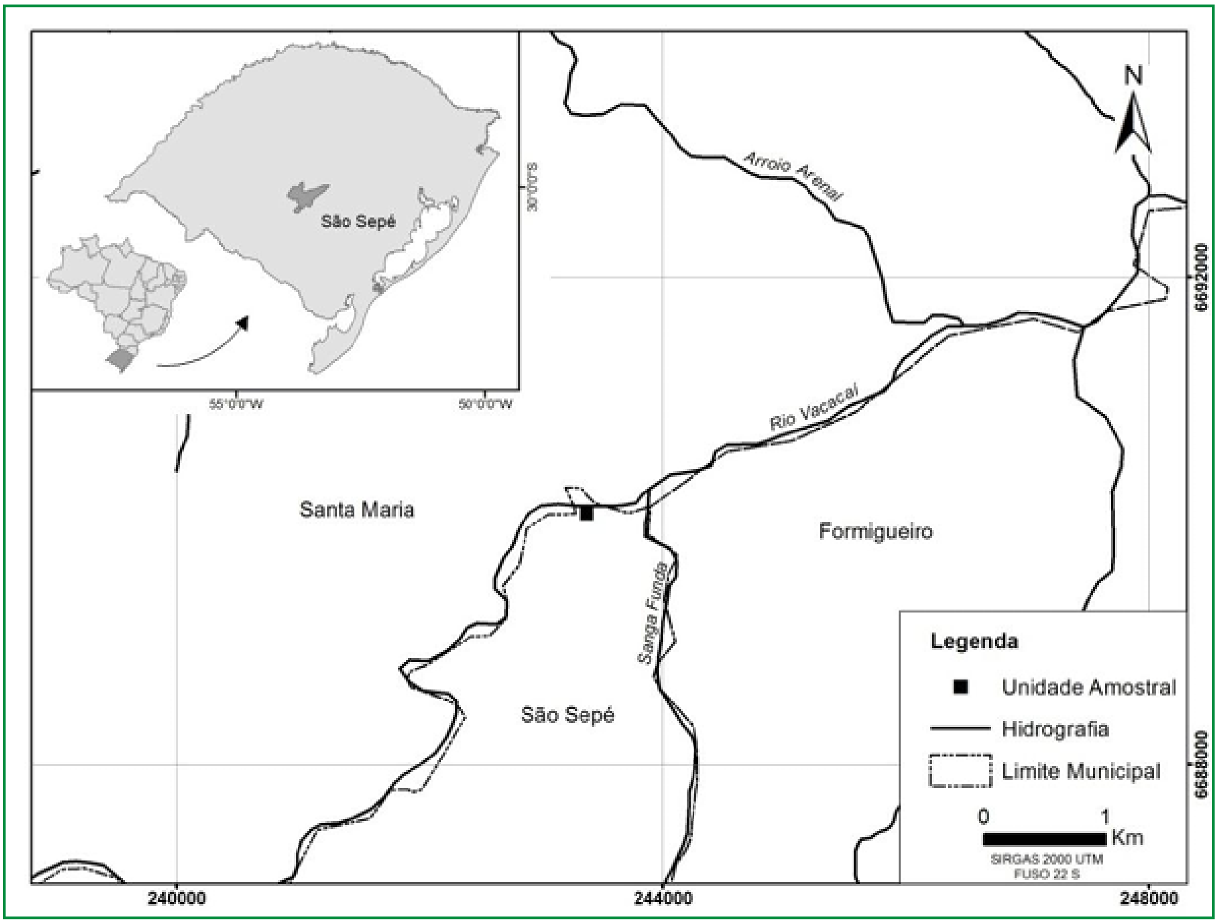
Despite advances in the understanding of natural regeneration, knowledge gaps remain regarding the ecological characterization of seed banks in specific forest formations, such as riparian seasonal forests. In this context, the objective of this study was to: (i) determine the richness and diversity of plant species present in the SSB of a riparian seasonal forest area; and (ii) characterize the life forms, regenerative strategies, and dispersal syndromes of the emerging species.

2 MATERIALS AND METHODS

2.1 Study Area

The area of this study is a forest remnant located on the banks of Vacacaí River, in the municipality of São Sepé, Rio Grande do Sul state, Brazil (Figure 1). Vacacaí River is predominantly located in an alluvial plain - a place of alluvial deposits, with an average altitude ranging from 50 to 60 m (Sartori, 2009).

Figure 1 – Location of the municipality of São Sepé in the state of Rio Grande do Sul, and detail of the Vacacaí River drainage network, where the study area is located



Source: Authors (2026)

On the banks of Vacacaí River, soils associated with floodplains predominate, such as Haplic Planosol, Haplic Gleysol, and Fluvisol, and the relief can be considered flat, forming true fluvial terraces (Dalmolin; Pedron, 2009; Sartori, 2009). The vegetation of Vacacaí River floodplain consists of floristic elements originating from the Seasonal Forest, generally associated with places with difficult drainage, caused mainly by the small slope of the river (Veloso; Rangel Filho; Lima, 1991). For the classification of the phytophysiognomy, the nomenclature proposed by Oliveira-Filho (2009) was used, adopting the term Subtropical Riparian Deciduous Seasonal Forest, in which there is a direct influence of water on the forest fragment, but in a clearly seasonal way, and elevations of the river or the water table may occur.

Figure 2 – Vacacaí River floodplain. Photograph taken on July 15, 2013, during the peak of the winter season

Source: Figueira (2014)

2.2 Data Collection

A plot measuring 100 m x 100 m was established parallel to the riverbank. This plot was subdivided into 100 sampling units of 10 m x 10 m, of which 33 were systematically selected for the soil seed bank (SSB) collection. In the center of each selected sampling unit, using a template measuring 25 cm x 25 cm x 5 cm, a sample of the soil seed bank (SSB) was collected.

At the Forest Nursery of the Federal University of Santa Maria, the samples were placed in the greenhouse (150 micron agricultural film) in trays measuring 50 cm x 30 cm. Each tray received a bottom layer of 3 cm of commercial substrate and vermiculite and a second layer with the collected sample. The trays were properly identified, and the emerged seedlings, whose identification was doubtful, were transplanted to larger containers, aiming at their development for later recognition. Three control trays were included and randomly distributed among the others.

The data collection was carried out on April 24th, 2013, and the establishment of the experiment in the Forest Nursery occurred on the following day. The experiment was conducted for 8 months (from April to December), with weekly monitoring. The trays were irrigated daily, as needed, in order to maintain the adequate moisture conditions, a methodology adapted from (Caldato et al., 1996).

The species identification was carried out through consultations with specific literature, comparison with herbarium material (Herbarium of the Department of Forest Sciences, UFSM), and with the assistance of specialists. The delimitation of families will follow the Angiosperm Phylogeny Group IV system (APG IV et al., 2016).

2.3 Floristics and Diversity of Species

The following phytosociological parameters were calculated: Absolute Density (AD), Relative Density (RD), Absolute Frequency (AF), and Relative Frequency (RF) of the species found. The Shannon-Wiener diversity index (H'), which analyzes how a species is distributed in the ecosystem, and Pielou's evenness index (J), which refers to the pattern (similarity or divergence) in which the number of individuals is distributed among the species, were also calculated.

2.4 Characteristics of the Species

The species were identified according to their life form, regeneration strategies, and seed dispersal.

I - Life form: Trees (woody plant with a height greater than or equal to 5 m, with a well-defined main trunk); Shrubs (woody plant less than 5 m tall, branching from the base); Herbaceous (non-lignified plant, including grasses) and lianas/vines (plant with a sarmentous habit), according to the methodology proposed by (Araujo et al., 2004);

II - Regeneration strategies: Pioneer (species whose seeds only germinate in clearings, receiving direct radiation for at least part of the day); Non-pioneer (species whose seeds can germinate in the shade); and Intermediate (seedlings found under the canopy, but which can also be found in open environments), according to (Swaine; Whitmore, 1988);

III - Dispersal: Zoochorous (seed dispersal through animals); Anemochorous (seed dispersal by wind) (Pijl, 1982), with classifications carried out through bibliographic research and field observations (Budke et al., 2005; Lindenmaier; Budke, 2006).

3 RESULTS AND DISCUSSIONS

A total of 299 individuals were observed, distributed among 66 species and 29 botanical families (Table 1). Of this total, eight individuals were classified as morphotypes, that is, differentiated based on morphology, without precise species identification.

Table 1 – Floristic composition of the soil seed bank in a riparian forest

Species	Nº	AD	RD (%)	AF (%)	RF (%)
Gamochaeta sp. 2	30	250.00	10.03	90.91	10.03
Poaceae 3	27	225.00	9.03	81.82	9.03
Commelina sp.	25	208.33	8.36	75.76	8.36
Pluchea sagittalis (Lam.) Cabrera	16	133.33	5.35	48.48	5.35
Eclipta prostrata (L.) L.	14	116.67	4.68	42.42	4.68
Casearia sylvestris Sw.	13	108.33	4.35	39.39	4.35
Solanum americanum Mill.	13	108.33	4.35	39.39	4.35
Acalypha multicaulis Müll. Arg.	12	100.00	4.01	36.36	4.01
Mikania cordifolia (L.f.) Willd.	12	100.00	4.01	36.36	4.01
Cyperaceae	10	83.33	3.34	30.30	3.34
Ludwigia sp.	9	75.00	3.01	27.27	3.01
Condylocarpon sp.	7	58.33	2.34	21.21	2.34
Scoparia sp.	7	58.33	2.34	21.21	2.34
Asteraceae 4	6	50.00	2.01	18.18	2.01
Conyza bonariensis (L.) Cronquist	5	41.67	1.67	15.15	1.67
Gamochaeta sp.4	5	41.67	1.67	15.15	1.67
Lantana sp.	5	41.67	1.67	15.15	1.67
Poaceae 1	5	41.67	1.67	15.15	1.67
Conyza sp.	4	33.33	1.34	12.12	1.34
Ficus sp.	4	33.33	1.34	12.12	1.34
Gamochaeta sp. 3	4	33.33	1.34	12.12	1.34

To be continued ...

Table 1 – Continuation

Species	Nº	AD	RD (%)	AF (%)	RF (%)
Asteraceae 3	3	25.00	1.00	9.09	1.00
Facelis retusa (Lam.) Sch. Bip.	3	25.00	1.00	9.09	1.00
Hydrocotyle bonariensis Lam.	3	25.00	1.00	9.09	1.00
Mollugo verticillata L.	3	25.00	1.00	9.09	1.00
NI 2	3	25.00	1.00	9.09	1.00
Alternanthera sp.	2	16.67	0.67	6.06	0.67
Heliotropium sp.	2	16.67	0.67	6.06	0.67
Hypochaeris chillensis (Kunth) Britton	2	16.67	0.67	6.06	0.67
Ipomoea sp.	2	16.67	0.67	6.06	0.67
NI 1	2	16.67	0.67	6.06	0.67
Oxalis sp.	2	16.67	0.67	6.06	0.67
Pfaffia tuberosa (Spreng.) Hicken	2	16.67	0.67	6.06	0.67
Polygonum sp.	2	16.67	0.67	6.06	0.67
Psychotria carthaginense Jacq.	2	16.67	0.67	6.06	0.67
Rhipsalis sp.	2	16.67	0.67	6.06	0.67
Soliva sessilis Ruiz & Pav.	2	16.67	0.67	6.06	0.67
Asteraceae 1	1	8.33	0.33	3.03	0.33
Asteraceae 2	1	8.33	0.33	3.03	0.33
Baccharis trimera (Less.) DC.	1	8.33	0.33	3.03	0.33
Boraginaceae Juss.	1	8.33	0.33	3.03	0.33
Cestrum sp.	1	8.33	0.33	3.03	0.33
Cuphea sp.	1	8.33	0.33	3.03	0.33
Cyperaceae 2	1	8.33	0.33	3.03	0.33
Erechtites valerianifolius (Link ex Spreng.) DC.	1	8.33	0.33	3.03	0.33
Eupatorium sp.	1	8.33	0.33	3.03	0.33
Gamochaeta sp. 1	1	8.33	0.33	3.03	0.33
Guettarda uruguensis Cham. & Schltdl.	1	8.33	0.33	3.03	0.33
Hygrophila sp.	1	8.33	0.33	3.03	0.33
Hypochaeris radicata L.	1	8.33	0.33	3.03	0.33
Inga sp.	1	8.33	0.33	3.03	0.33
Iresine diffusa Humb. & Bonpl. ex Willd.	1	8.33	0.33	3.03	0.33
NI 3	1	8.33	0.33	3.03	0.33
NI 4	1	8.33	0.33	3.03	0.33
NI 5	1	8.33	0.33	3.03	0.33
NI 6	1	8.33	0.33	3.03	0.33
NI 7	1	8.33	0.33	3.03	0.33
NI 8	1	8.33	0.33	3.03	0.33

To be continued ...

Table 1 – Conclusion

Species	Nº	AD	RD (%)	AF (%)	RF (%)
Poaceae 2	1	8.33	0.33	3.03	0.33
Portulaca grandiflora Hook.	1	8.33	0.33	3.03	0.33
Pouteria gardneriana (A.DC.) Radlk.	1	8.33	0.33	3.03	0.33
Senecio brasiliensis (Spreng.) Less.	1	8.33	0.33	3.03	0.33
Senecio heterotrichius DC.	1	8.33	0.33	3.03	0.33
Sisyrinchium sp.	1	8.33	0.33	3.03	0.33
Triodanis perfoliata subsp. *biflora* (Ruiz & Pav.) Lammers	1	8.33	0.33	3.03	0.33
Xanthium strumarium L.	1	8.33	0.33	3.03	0.33
	299	2,491.67	100	906.06	100

Source: Authors (2026)

The richness of species and the botanical families found in this study is greater than that recorded in other research on semi-deciduous seasonal forests: (Costa et al., 2020), in restoration areas in Semi-deciduous Seasonal Forest located in the municipalities of Ivinhema, Jateí and Caarapó (MS state); Arêas et al. (2022), restoration area of Dense Ombrophilous Forest in Seropédica (RJ state); Duarte et al. (2022), in an area of High-Montane Mixed Ombrophilous Forest located in 'São Joaquim' National Park in the municipality of Urubici (SC state); Scherer and Jarenkow (2006), in a seasonal slope forest in 'Itapuã' State Park, in the municipality of Viamão (RS state); Longhi et al. (2005), in a Seasonal Deciduous Forest located in the municipality of Santa Teresa (RS state); and Araujo et al. (2004), in a fragment of riparian forest located in Cachoeira do Sul (RS state).

The high species richness observed can be attributed to the ecological corridor function performed by riparian forests, which interconnect distinct ecosystems and favor the flow and the deposition of propagules along watercourses. In addition, the characteristic water dynamics of the riparian environment may have contributed significantly to the input and maintenance of a wide range of species in the riparian forest, reflecting the heterogeneity of the area.

For Nilsson et al. (2010), hydrochory is one of the main mechanisms for maintaining gene flow and floristic heterogeneity among plant fragments, not only in seed transport but also in the conservation of population diversity and genetics, allowing species from adjacent habitats to colonize areas subject to periodic disturbances, such as floods and fluctuations in the water table. Hoppenreijs et al. (2025) highlighted the direct influence of hydrological dynamics on seed deposition and recruitment patterns. The authors showed that seasonal flow fluctuations constitute the main factor in seed deposition and recruitment in riparian environments. Therefore, the high floristic richness presented in this study may be related to the regeneration potential observed in riparian environments.

Regarding the floristic composition, the Asteraceae botanical family presented the greatest species richness (23 spp.), followed by Amaranthaceae and Poaceae (three spp.), and by Cyperaceae, Rubiaceae, and Solanaceae (two spp.). These families represent 53% of the total species richness observed (Table 1), while the other 23 families were represented by only one species each.

The high richness of families such as Asteraceae, Poaceae, Amaranthaceae, and Cyperaceae is a recurring pattern in the SSB of forest environments, especially those subject to disturbances or in early successional stages (Araujo et al., 2004; Le Stradic et al., 2015). These families are typically formed by pioneer herbaceous and shrubby species, which have a high capacity for seed production, efficient dispersal (anemochoric or autochoric), and rapid germination, which gives them an adaptive advantage to establish themselves quickly after disturbance events.

The Asteraceae, Poaceae, and Cyperaceae families also stood out for their species richness in the study by Costa et al. (2020), who evaluated the SSB in distinct restoration areas of Semideciduous Seasonal Forest. These families are important components of the vegetation and generally exhibit rapid germination and a high percentage, due to their ability to produce viable seeds to establish themselves in the environment quickly (Le Stradic et al., 2015). Regarding the Solanaceae family, Scherer and Jarenkow (2006) reported that it presented the greatest richness in a seasonal forest in 'Itapuã' State Park, in Viamão (RS state).

The prominence of the Asteraceae, Poaceae, and Cyperaceae families was also observed in the SSB of Semideciduous Seasonal Forest restoration areas (Costa et al., 2020), reinforcing the pioneer/successional character of the propagule reservoir. In the regional context, studies in areas of Riparian Seasonal Deciduous Forest in Rio Grande do Sul state, such as that of Araujo et al. (2004) in Cachoeira do Sul, also highlight the importance of these families. Although Scherer and Jarenkow (2006) found the Solanaceae family with high richness in a slope Seasonal Deciduous Forest in Viamão (RS state), the result of this study suggests a Seasonal Deciduous Forest community more strongly influenced by herbaceous species, possibly due to the dynamics of the riparian floodplain environment and/or the presence of adjacent open areas.

The most abundant species were, firstly, *Gamochaeta sp.* 2 (AD = 250.00 and RD = 10.03%), followed by Poaceae 3 (AD = 225.00 and RD = 9.03%), *Commelina sp.* (AD = 208.33 and RD = 8.36%), *Pluchea sagittalis* (AD = 133.33 and RD = 5.35%) and *Eclipta sp*. (AD = 116.67 and RD = 4.68%). These five species also presented the highest absolute and relative frequencies (Table 1).

The community of emergent species from the seed bank presented a Shannon diversity index (H') of 3.56, indicating high floristic diversity in the studied area. Pielou's evenness (J) was 0.85, suggesting that individuals are relatively well distributed among the species, without a strong predominance of a single one. Simpson's dominance index (D = 0.04) reinforces this interpretation, showing low dominance and, therefore, a balanced community structure.

Among the species studied, the predominant growth habit was herbaceous (66.89%), followed by lianas (16.72%), shrubby plants (8.70%), trees (7.02%), and finally, epiphytic plants (0.67%) (Table 2). The marked predominance of the herbaceous habit corroborates the richness of the botanical families Asteraceae, Poaceae, and Cyperaceae (Table 1), which are mostly composed of herbaceous species, with rapid growth and high seed production.

The high dominance of herbaceous plants was also recorded in other studies carried out in the SSB of fragmented forests (Arêas et al., 2022; Costa et al., 2020; Duarte et al., 2022). Herbaceous plants proliferate rapidly in areas where clearings occur, as is the case in riparian forests in impacted environments (Araujo et al., 2004).

On the other hand, the low contribution of arboreal plants (7.02%) in the seed bank is an indicator of low potential for the regeneration of mature forest structure. This lack of woody propagules, also recorded in fragmented forests in other regions of Brazil (Arêas et al., 2022; Costa et al., 2020; Duarte et al., 2022), is frequently associated with the degradation of the surrounding matrix. The dominance of non-arboreal species in the seed bank is directly linked to the influence of surrounding areas, such as pastures and agricultural crops (Cielo-Filho; Souza, 2016), which act as constant sources of invasive seeds, "contaminating" the seed bank of the riparian forest.

Table 2 – Life form, dispersal syndrome, and successional and regenerative strategies of the species found in the soil seed bank

Species	Life form	Dispersal syndrome	Regenerative strategies
Acalypha multicaulis Müll. Arg.	shrub	NI	pioneer
Alternanthera sp.	herbaceou	NI	NI
Asteraceae 1	herbaceou	NI	NI
Asteraceae 2	herbaceou	NI	NI
Asteraceae 3	herbaceou	NI	NI
Asteraceae 4	herbaceou	NI	NI
Baccharis trimera (Less.) DC.	herbaceou	anemochorous	pioneer
Boraginaceae Juss.	herbaceou	NI	NI
Casearia sylvestris Sw.	tree	zoochorous	pioneer
Cestrum sp.	shrub	zoochorous	NI
Commelina sp.	liana	NI	NI
Condylocarpon sp.	liana	anemochorous	NI
Conyza bonariensis (L.) Cronquist	shrub	anemochorous	pioneer
Conyza sp.	herbaceou	anemochorous	pioneer
Cuphea sp.	herbaceou	NI	pioneer
Cyperaceae	herbaceou	NI	NI

To be continued ...

Table 2 – Conclusion

Species	Life form	Dispersal syndrome	Regenerative strategies
Cyperaceae 2	herbaceou	NI	NI
Eclipta prostrata (L.) L.	herbaceou	NI	pioneer
Erechtites valerianifolius (Link ex Spreng.) DC.	herbaceou	anemochorous	pioneer
Eupatorium sp.	herbaceou	anemochorous	intermediate
Facelis retusa (Lam.) Sch. Bip.	herbaceou	NI	NI
Ficus sp.	tree	zoochorous	NI
Gamochaeta sp. 1	herbaceou	anemochorous	pioneer
Gamochaeta sp. 2	herbaceou	anemochorous	pioneer
Gamochaeta sp. 3	herbaceou	anemochorous	pioneer
Gamochaeta sp. 4	herbaceou	anemochorous	pioneer
Guettarda uruguensis Cham. & Schltdl.	shrub	zoochorous	intermediate
Heliotropium sp.	herbaceou	NI	pioneer
Hydrocotyle bonariensis Lam.	herbaceou	NI	non-pioneer
Hygrophila sp.	herbaceou	NI	NI
Hypochaeris chillensis (Kunth) Britton	herbaceou	anemochorous	pioneer
Hypochaeris radicata L.	herbaceou	anemochorous	pioneer
Inga sp.	tree	zoochorous	pioneer
Ipomoea sp.	liana	anemochorous	NI
Iresine diffusa Humb. & Bonpl. ex Willd.	herbaceous	NI	non-pioneer
Lantana sp.	shrubs	zoochorous	pioneer
Ludwigia sp.	herbaceous	NI	NI
Mikania cordifolia (L.f.) Willd.	liana	anemochorous	NI
Mollugo verticillata L.	herbaceous	NI	pioneer
NI 1	trees	NI	NI
NI 2	liana	NI	NI
NI 3	herbaceou	NI	NI
NI 4	liana	NI	NI
NI 5	herbaceou	NI	NI
NI 6	herbaceou	NI	NI
NI 7	herbaceou	NI	NI
NI 8	herbaceou	NI	NI
Oxalis sp.	herbaceou	NI	intermediate
Pfaffia tuberosa (Spreng.) Hicken	herbaceou	NI	NI
Pluchea sagittalis (Lam.) Cabrera	herbaceou	NI	pioneer
Poaceae 1	herbaceou	NI	NI
Poaceae 2	herbaceou	NI	NI
Poaceae 3	herbaceou	NI	NI
Polygonum sp.	herbaceou	NI	pioneer
Portulaca grandiflora Hook.	herbaceou	NI	NI

To be continued ...

Table 2 – Conclusion

Species	Life form	Dispersal syndrome	Regenerative strategies
Pouteria gardneriana (A.DC.) Radlk.	tree	zoochorous	NI
Psychotria carthaginense Jacq.	shrub	zoochorous	non-pioneer
Rhipsalis sp.	epiphytic	NI	NI
Scoparia sp.	herbaceou	NI	pioneer
Senecio brasiliensis (Spreng.) Less.	herbaceou	anemochorous	pioneer
Senecio heterotrichius DC.	herbaceou	anemochorous	pioneer
Sisyrinchium sp.	herbaceou	anemochorous	pioneer
Solanum americanum Mill.	herbaceou	zoochorous	pioneer
Soliva sessilis Ruiz & Pav.	herbaceou	NI	NI
Triodanis perfoliata subsp. *biflora* (Ruiz & Pav.) Lammers	herbaceou	NI	NI
Xanthium strumarium L.	herbaceou	NI	pioneer

Source: Authors (2026)

Furthermore, the high predominance of the herbaceous layer can become an obstacle to succession. Costa et al. (2020) highlight that this dense herbaceous and grassy cover can generate intense competition for light and nutrients, acting as a physical barrier that limits the establishment and recruitment of seedlings of tree and shrub species, delaying or diverting the forest regeneration process.

Regarding seed dispersal, it was not possible to identify it for most of the individuals recorded (179 individuals, or 59.87%). However, among the individuals identified (120 individuals, or 41.13% of the total), 79 showed anemochoric dispersal (65.83%) and 41 showed zoochoric dispersal (34.17%) (Table 2). As for regeneration strategies, 142 individuals (47.49% of the total) could not be identified. For the remaining species, 135 individuals were recorded as pioneer plants (45.15%), 18 as non-pioneer plants (6.02%), and 4 as intermediate plants (1.34%) (Table 2).

4 CONCLUSIONS

The Soil Seed Bank showed high species and botanical family richness, results superior to those observed in studies conducted in Seasonal Forest and Ombrophilous Forest areas. The community of emergent species in the SSB demonstrated high floristic diversity (H'), good evenness (J), and low species dominance (D'). However, a prevalence of herbaceous plants, pioneer habit, and predominantly anemochory dispersal syndrome was observed.

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