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Biology-Ecology

Native tree and arborescent species for Agroforestry Systems in the Uruguayan-Brazilian Pampa

Espécies arbóreas e arborescentes nativas para Sistemas Agroflorestais no Pampa Uruguaio-Brasileiro

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ABSTRACT

Tree species are vital to Agroforestry Systems (AFS), and selecting species that are suited to local conditions is essential for achieving this system's objectives. In this study we characterized the phytophysionomies present in the Uruguayan-Brazilian Pampa Ecoregion in order to identify the most suitable species to include in AFS. In this sense we aimed to answer the following questions: i) Do the *a priori* defined phytophysionomies have a different species composition compared to the ecoregion? ii) Which environmental variables are related to species composition variation? iii) Which species are indicators of different phytophysiognomies? iv) Which native species are key for AFS implementation in these phytophysiognomies? We analysed floristic and environmental data from 106 sites across five phytophysiognomies using Non-metric Multidimensional Scaling (nMDS) and Analysis of Similarity (ANOSIM) and the Indicator Species Analysis (IndVal). Results revealed significant differences in species composition between the phytophysiognomies, indicating that the predefined formations have distinct species assemblages. Indicator Species Analysis IndVal identified 136 species, of wich 27 were prioritised for AFS use, contributing to a total of 84 priority native species, including those with multipurpose uses. These findings highlight the importance of considering local phytophysiognomies when planning AFS with native species in this ecoregion.

Keywords: Pampa biome; Indicators species; Agroforestry homegardens; Restorative AFS, Silvopasture system

RESUMO

Espécies arbóreas são vitais para os Sistemas Agroflorestais (SAF), e a seleção das espécies adequadas às condições locais é essencial para atingir os objetivos desse sistema. Nesse estudo, as fitofisionomias presentes na Ecorregião do Pampa Uruguaio—Brasileiro foram caracterizadas a fim de identificar as espécies mais adequadas para uso em SAF. Assim, buscamos responder as seguintes questões: i) As fitofisionomias definidas *a priori* têm uma composição de espécies diferente em comparação com a ecorregião? ii) Quais variáveis ambientais estão relacionadas a variação na composição de espécies? iii) Quais espécies são indicadoras de diferentes fitofisionomias? iv) Quais espécies nativas são fundamentais para a implementação de SAFs nestas fitofisionomias? Analisamos os dados florísticos e ambientais de 106 locais em cinco fitofisionomias utilizando a Escala Multidimensional Não-Métrica (nMDS), a Análise de Similaridade (ANOSIM) e a Análise de Espécies Indicadoras (IndVal). Os resultados revelaram diferenças significativas na composição de espécies entre as fitofisionomias, indicando que as formações definidas *a priori* têm conjuntos de espécies distintos. A Análise de Espécies Indicadoras (IndVal) identificou 136 espécies, das quais 27 foram priorizadas para o uso do AFS, contribuindo para um total de 84 espécies nativas prioritárias, incluindo aquelas com múltiplos usos. Essas descobertas destacam a importância de considerar as fitofisionomias locais ao planejar o SAF com espécies nativas nessa ecorregião.

Palavras-chave: Bioma Pampa; Espécies indicadoras; Quintais agroflorestais; SAFs restaurativos; Sistema silvipastoril

1 INTRODUCTION

Agroforestry Systems (AFSs) encompass a wide range of land use practices that integrate ecological and economic objectives in agricultural and livestock productions (Nair, 1993; Ospina, 2003). Among the various AFS approaches, those that deliberately integrate perennial woody species (such as trees, shrubs, palms, and bamboos) with agricultural crops and/or livestock in a given spatial-temporal arrangement are the most widely adopted by the International Centre for Research in Agroforestry (ICRAF) (Lundgreen & Raintree, 1983; Atanga et al., 2014). Considering the three main components managed in an agroforestry system—perennial woody species, agricultural crops, and animals or pasture—Nair (1993) proposed the following classification: (1) Agrosilvopastoral systems, which include all three components; (2) Silvopastoral systems, which combine perennial woody plants with animals/pasture; and (3) Agrisilvicultural systems, which combine perennial woody plants with crops.

Perennial woody species are the essential components in AFSs, acting as catalysts to the system. Thus, the selection of suitable tree species to each AFS type is fundamental to achieve the objectives set when implementing or managing an agroecosystem. There is a recurring interest in the methodological approaches for key-species selection, as they tend to be varied and unsystematized (Fahad, et al., 2022; Lima et al., 2023). In general, these methods form two large groups: those that are participatory and those focused on ecological principles. Participatory methods are primarily based on traditional knowledge and values attributed by the local communities, using interviews, illustrated work sheets (Canosa et al., 2016), drawings and maps (Ferreira, 2014), or secondary data originally obtained by these approaches (Oliveira-Júnior & Cabreira, 2012). Methods based on ecological principles considers species characteristics in relation to ecological succession and forest stratification (Rebello & Sakamoto 2021), species natural distributions and their relationship with environmental filters (Wood & Burley 1991), or by selecting plant species through their functional traits (Moonen & Bàrberi 2008). In practice, a combination of both participatory and ecological principals approaches is common, and, in all cases, basic information about the species is essential.

In regions with limited experiences with AFSs, such as the ecoregion of the Uruguayan-Brazilian Pampa (sense Olson et al., 2001; modified by Sell, 2017), the lack of precise tree species information may limit agroecological transition initiatives. The Uruguayan-Brazilian Pampa, dominated by grasslands, has seen its natural forests being heavily pressured by agrarian systems, transforming vegetation remains into monocultures of soy, rice, and exotic tree species to support the commodity market (Miguel, 2009). Most arboreal monoculture systems found in the Uruguayan-Brazilian Pampa are of *Eucalyptus* spp., representing the first significant economic contribution of tree species in the ecoregion (De La Torre 2013). Eucalyptus plantations reduces water flow (Farley, et al. 2005), affects soil fertility (Yáñez Díaz et al. 2018), and modifies vegetation richness composition and coverage percentage (Milione, et al.

2024), promoting territorial conflicts that contributes to regional socio-environmental impacts (De La Torre, 2013). Implementing AFS with native species offers an alternative to eucalyptus monocultures. Thus, gathering information on native trees and its relationship with climatic variables is crucial to mitigate the agroecological transitions process, specially in the context of global change (Lima et al., 2023).

Studies that indicate tree species for ecological restoration projects or AFS at the regional scale are frequently restricted within country boundaries (e.g., Guarino et al., 2018). Within the Uruguayan-Brazilian Pampa ecoregion, previous documented forest formations diversities are either restricted to Uruguay (e.g., Paz & Bassagoda, 2002; Grela, 2004; Brazeiro et al., 2020) or to the Rio Grande do Sul state, in Southern Brazil (e.g., Vargas et al., 2022). Oliveira-Filho et al. (2015) is the main study which presented a broader context to this subject, analyzing both the Pampean and the Atlantic Forest. However, focused information on the Uruguayan-Brazilian Pampa Ecoregion is still lacking. Hence, the absence of studies that fully address this ecoregion while also considering its internal heterogeneity hinders integrated planning at the transnational level.

Ecological transition is a gradual process of transforming conventional agricultural systems into more sustainable and ecological practices (Altieri, 1995; Gliessman, 2005), being necessary in the face of the increasing conversion of ecosystems in the Uruguayan-Brazilian Pampa ecosystems. To apply this concept, uplifting technical information is required, guiding practical actions for seed collection, seedling production, and the design and implementation of AFS projects. Herein, we provide information on potentially important species, and their association with environmental variables, for the implementation of AFS projects in the Uruguayan-Brazilian Pampa. Using the information available in the *NeoTropTree* (NTT) database (Oliveira-Filho, 2017), we performed a general characterization of the studied region, elaborating a comprehensive species list for AFSs in the different phytophysiognomies within it. More specifically, we focused our study on addressing the following questions:

I. Do the forest formations defined *a priori* at a broader scale have a different species composition from that found in the Uruguayan-Brazilian Pampa Ecoregion?

II. What environmental variables are related to species composition differences within the study region?

III. Which species are the best indicators of the different phytophysiognomies?

IV. Which native species are potentially more important for the implementation of AFSs in the different phytophysiognomies within the Uruguayan-Brazilian Pampa Ecoregion?

2 METHODS

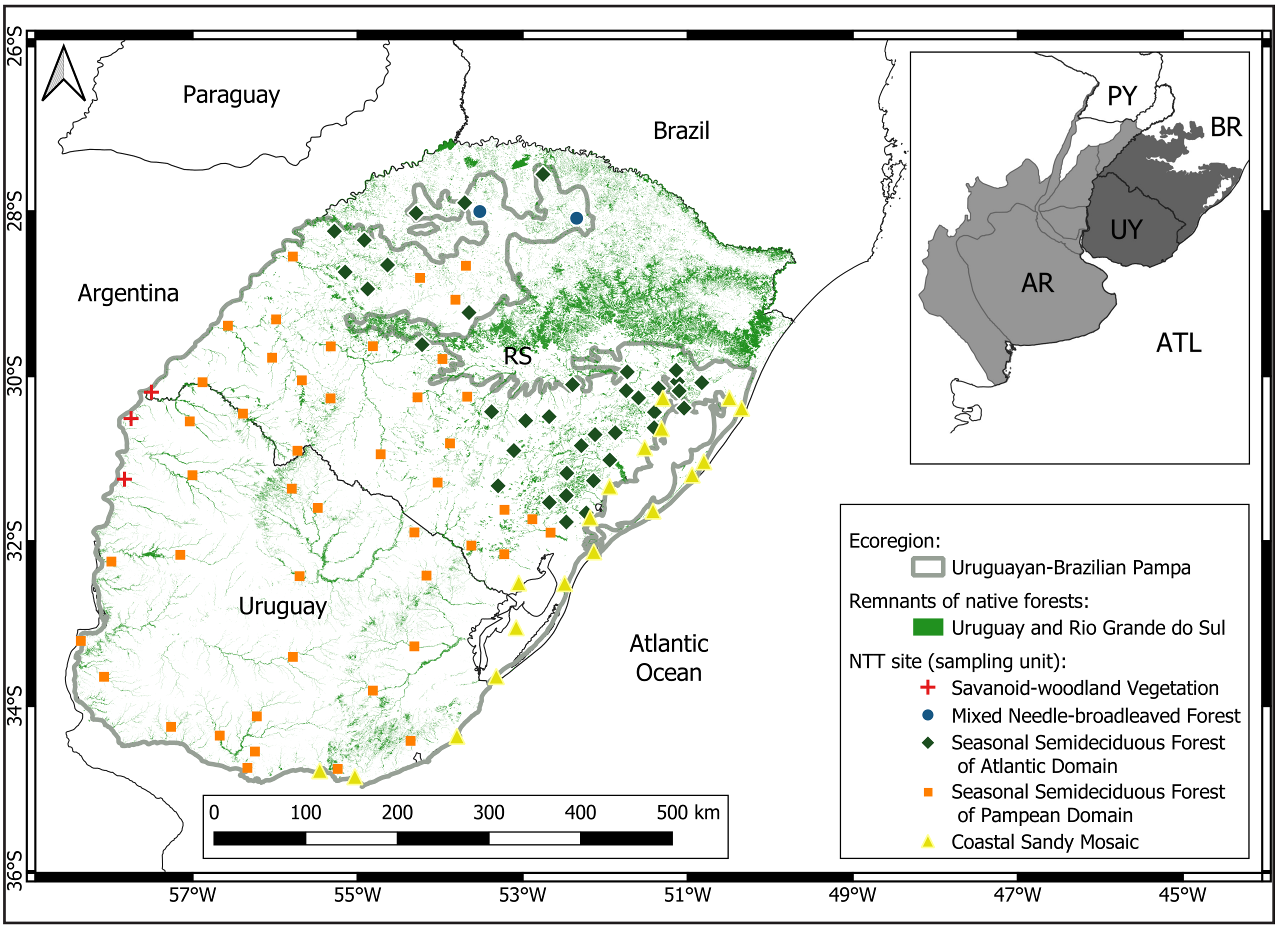
2.1 Study Area

The study area is the Uruguayan-Brazilian Pampa Ecoregion (Figure 1), delimited by the World Wide Fund for Nature (WWF) as the Uruguayan Savannas Ecoregion (sense Olson et al., 2001). This ecoregion is regionally inserted in the bioregion of the Río de la Plata Grasslands (or Pampa). To avoid the problems associated with the concept and delimitation of biomes, we opted to use the bioregion concept proposed by Gudynas (2002) and currently incorporated by WWF. According to this author, bioregions are “geographic spaces where there are homogeneous characteristics from an ecological point of view, with strong links between human populations and complementarities and similarities in the uses that humans make of these ecosystems” (Gudynas, 2002, p. 194). We believe that this is the most appropriate concept and regional classification system for analyzing agroforestry, as it includes cultural that transform the territory.

The Río de la Plata Grasslands (Pastizales del Río de la Plata - sense Soriano et al., 1992) are a complex of ecosystems with a predominance of open formations, found in Argentina, Uruguay and far southern Brazil. The forest formations occurs in mosaic with grasslands, but mainly within the Uruguayan and Brazilian territories.

Considering the cultural identity of the people who inhabit the Río de la Plata Grasslands with the word Pampa and the territory delimited by this ecoregion, we adopted the adaptation proposed by Sell (2017), and refer to the Uruguayan Savannas Ecoregion as the Uruguayan-Brazilian Pampa Ecoregion.

Figure 1 – Map of the Uruguayan-Brazilian Pampa Ecoregion with the location of the NeoTropTree (NTT) sites considered in this study



Source: Authors (2023)

Caption: The embedded legend identifies each site according to their main phytophysiognomy. The bioregion of the Río de la Plata Grasslands is highlighted in the map, including the Uruguayan-Brazilian Pampa, in dark gray, plus four additional ecoregions, in light gray. Data on forest remnants were obtained from Hofmann et al. (2015) for Rio Grande do Sul, base year 2015, and from Proyecto REDD+ Uruguay (2019) for Uruguay, base year 2016. Ecoregions boundaries from WWF (2012)

We used the sites of the *NeoTropTree* (NTT) database of the Uruguayan-Brazilian Pampa Ecoregion, as delimited by Olson et al. (2001), which approximately coincides with the delimitation of the Pampa Biome proposed by IBGE (2019) in Brazil and the entire territory of Uruguay (Figure 1). For the level of generalization proposed in this paper, we describe bellow the five main phytophysiognomies within our study area — Coastal Sandy Mosaic; Mixed Needle-broadleaved Forest; Savanoid-woodland Vegetation; Semideciduous Seasonal Forest of Atlantic Domain; Semideciduous Seasonal Forest of Pampean Domain — adapted from Oliveira-Filho (2015, 2017). Although two of these are not forest formations *per se*, they were considered because they include many tree or shrub species with potential usage in AFSs.

Coastal Sandy Mosaic (CSM) — disjunction of the Atlantic Forest *lato sensu* (*Restinga* Forest) and associated ecosystems that form a complex of vegetational formations that develop in the sandy substrate of the Coastal Plain. Synonyms or scope: *Área de Formações Pioneiras* and *Floresta de Restinga* [Area of Pioneer Formations and *Restinga* Forest] (IBGE, 2012); *Nanofloresta Latifoliada Subtropical Marítima Perenifolia Costeira Arenosa* [Subtropical Coastal Sandy Maritime Evergreen Broadleaved Dwarf-forest] (Oliveira-Filho, 2015); *Bosque Latifoliado Subtropical de Planicie Costeiro* [Subtropical Coastal Broadleaved Dwarf-forest], *Bosque Psamófilo* [Psammophilous Forest] or *Bosque Costero* [Coastal Forest] (Brazeiro et al., 2020).

Mixed Needle-broadleaved Forest (MNF) — disjunction of the Atlantic Forest *lato sensu* in the Pampa that includes species of the Seasonal Semideciduous Forest with the marked presence of *Araucaria angustifolia* associated with other species of the Antarctic element, as well as of the Neoantarctic and Holarctic elements (sense Waechter, 2002). Synonyms and scope: *Floresta Ombrófila Mista* [Mixed Ombrophilous Forest] or *Floresta de Araucária* [Araucaria Forest] (IBGE, 2012); *Floresta Mista Lati-aciculifoliada Subtropical Estacional fria* [Subtropical Seasonally cold Mixed Needle-broadleaved Forest] (Oliveira-Filho, 2015).

Savanoid-woodland Vegetation (SWV) — Savanna-like formation with the presence of forest and grassland synusia (generically treated in this study as a forest formation), with scattered trees that do not form a canopy and predominance of shrubs and continuous grassland cover. We substitute the word “savanna” with “savanoid” (savanna-like phytophysiognomy), because savanna is not a suitable term for the climate of the study region (Overbeck et al. 2015). Synonyms and scope: *Savana-estépica* [Savanna-Steppe] or *Parque de Espinilho* [Espinal Parkland] (IBGE, 2012); *Savana Arbórea-arbustiva* [Savanna-woodland] (Oliveira-Filho, 2015); *Sabana Arbolada Subtropical* [Subtropical Savanna-woodland] or *Bosque Parque* [Parkland Woods] (Brazeiro et al., 2020).

Seasonal Semideciduous Forest of Atlantic Domain (SSFPD) — Disjunction of the Atlantic Forest *lato sensu* in the Pampa marked by the impoverishment of tropical species with increasing latitude. The delimitation of the Atlantic Domain is that adopted in *NeoTropTree* (Oliveira-Filho, 2017), and applied by Oliveira-Filho et al. (2015). Synonyms and scope: *Floresta Estacional Decidual* and *Floresta Estacional Semidecidual* [Seasonal Deciduous Forest and Seasonal Semideciduous Forest] (IBGE, 2012); *Floresta Latifoliada Subtropical Estacional Fria Semideciduifolia* [Subtropical Seasonal cold Semideciduous Broadleaved Forest] (Oliveira-Filho, 2015).

Seasonal Semideciduous Forest of Pampean Domain (SSFPD) — Seasonal Forest with a lower contribution of tropical species typical of the Atlantic Domain and a greater presence of species from the Chacoan Domain (subxerophilous). Synonyms and scope: *Floresta Estacional Decidual* [Seasonal Deciduous Forest] (IBGE, 2012); *Floresta Latifoliada Subtropical Estacional Fria Semideciduifolia* [Subtropical Seasonal cold Semideciduous Broadleaved Forest] (Oliveira-Filho, 2015); *Bosque Latifoliado Subtropical Serrano* [Subtropical Lower hills Broadleaved Forest], *Bosque Latifoliado Subtropical de Planicie* [Subtropical Lowlands Broadleaved Forest], *Bosque Ribereño* [Riverine Forest], *Bosque de Quebrada* [*Quebrada* Forest], *Bosque Serrano* [*Serrano* Forest] and *Bosque de Cornisa* [*Cornisa* Forest] (Brazeiro et al., 2020).

2.2 Metadata

For the systematization of potential species for AFSs, the NTT database was used (Oliveira-Filho, 2017), which provides information on the occurrence of species (floristic list) and on environmental variables (bioclimatic, edaphic, geographic and phytophysiognomic) in the Neotropical Biogeographic Region. Arboreal and arborescent plant species included in the NTT are those with stems that can reach more than 3 meters in height without supporting themselves on other plants (Eisenlohr & Oliveira-Filho, 2015). This concept is compatible with that of perennial woody species used in AFSs (sense Lundgreen & Raintree, 1983), which includes palms, bamboos, etc. Each NTT site corresponds to a circular area with a radius of 5 km and includes published research information compiled by phytophysiognomy, such as phytosociological studies, taxonomic monographs and herbarium data.

The environmental variables available in the database were generated for the coordinates of the center of each NTT site with the following procedures: extraction of edaphic data from the Harmonized World Soil Database v. 1.1 (Fischer et al., 2009); extraction of bioclimatic data available in WorldClim (Hijmans et al., 2005) for the period from 1970 to 2000; estimation of aridity indices according to Zomer et al. (2006); estimation of periods of water deficit and excess based on Walter's Diagram (Walter, 1985).

There are 106 NTT sites in the Uruguayan-Brazilian Pampa Ecoregion (Figure 1), with the following sampling distribution among the phytophysiognomies: 46 in the SSFPD, 37 in the SSFAD, 18 in the CSM, 3 in the SWV, and 2 in the MNF. The differences in the number of sampling sites in each forest phytophysiognomy are due to their differential area coverages within the studied ecoregion. Between sites, the mean annual temperature ranges from 16.3 to 21°C and the annual precipitation ranges from 943 to 1887 mm. The list of species obtained in the NTT had the nomenclature updated by the name accepted in the *Flora e Funga do Brasil* (2022) and in the *Flora del Cono Sur* (2022).

2.3 Statistical Analyses

To determine if phytophysiognomies (only the forest formations) found in the Uruguayan-Brazilian Pampa Ecoregion have different species compositions (question i), we used nonmetric multidimensional scaling (nMDS), an unrestricted ordination, with the distance measure (D = 1 – S_J), the complement of Jaccard's similarity index (S_J). By reducing the multidimensionality of the data into two dimensions, we were able to maintain the relationship of the order of distance between the objects, where the most similar sites are the closest and the most dissimilar ones are further apart. A binary asymmetric coefficient was used to avoid the double-zero problem (Legendre & Legendre, 2012). The stress value (standard residuals sum of squares) was used as a measure of fit, ranging from 0 to 1, indicating the adjustment between the original distances (dissimilarities) from the distances of the nMDS (Clarke, 1993). As in Clarke (1993), the value of 0.2 was adopted as the acceptable upper limit of stress. Environmental variables with a significant goodness of fit statistic ($p < 0.01$) were adjusted to the nMDS to facilitate exploratory analysis (question ii).

The hypothesis of floristic distinction between forest formations (question i) was tested with the analysis of similarities (ANOSIM). Based on the order of distance relationship (dissimilarity) between the sampling units, ANOSIM tests the null hypothesis that there is no difference between the groups of samples defined *a priori,* assessing differences within and between the groups (Clarke 1993; Anderson 2001; Legendre & Legendre 2012). This method has been widely used in ecological studies to analyze community structures across different forest types. For instance, ANOSIM was applied to compare the basal area among three forest areas in tropical coniferous-forest ecotones (Zhang et al., 2014). Maçaneiro et al. (2019) used ANOSIM in an Atlantic subtropical rainforest to assess the statistical significance of floristic groups identified through NMDS. In tropical montane forests of Ecuador, distinct floristic groups were also identified using ANOSIM (Jadán et al.,2021).

The R statistic of the test ranks dissimilarities between values of -1 and 1, but usually ranges from 0 to 1. R values are close to zero if the null hypothesis is accepted. Positive R values signify dissimilarity between groups and the closer to 1, the more similar sites within a group are to each other than to other sites (Clarke, 1993). Statistical significance was obtained under 9,999 permutations, and *post-hoc* tests were performed for pairwise group comparisons.

The definition of the indicator species of the different phytophysiognomies (question iii) was made using the indicator species analysis proposed by Dufrene & Legendre (1997), which is expressed by the indication value index (IndVal) and its significance. Indicator species are those that are more characteristic of a group, found mainly in the group of a typology, being present in most of the group sites (Dufrene & Legendre, 1997). This concept expresses the relationship between the fidelity and specificity of a species. Fidelity is the degree to which a species is present in all sites of a group and specificity is the degree to which a species is found only in a group of sites (Legendre, 2013). The index ranges from 0 to 1 (or 0 to 100 %) and has the maximum value when individuals of the species are observed in all sites of only one group of sites (forest phytophysiognomies). The significance of the IndVal of each species was obtained by a random permutation procedure of the sites between groups to simulate and compare patterns expected in the absence of an ecological process (Dufrene & Legendre, 1997; Legendre & Legendre, 2012).

The selection of native species that are potentially important for the implementation of AFSs in the different phytophysiognomies within the study region (question iv) was based on the analysis of indicator species, distribution patterns in the different forest formations, environmental variables related to floristic differentiation between the phytophysiognomies, functional traits of the species, knowledge of the authors, and bibliographic research of studies carried out in the region (Reitz et al., 1983; Backes & Irgang, 2002; Guarino et al., 2018). Three main types of AFSs were considered for the study region: i - the Silvopastoral System, for association with traditional livestock activity; ii - Restorative AFS, considering the need to restore degraded areas; iii - Agroforestry homegardens, for diversity and food security in small properties. For each species, their predominant usages were indicated, considering the most characteristic AFS modalities of each forest phytophysiognomy, for example, for the typical species in Savanoid-woodland Vegetation, the Silvopastoral System was prioritized.

Analyses were performed primarily in the R statistical environment (R Core Team, 2022). The nMDS was performed with the "metaMDS" function and the environmental variables were adjusted by the "envfit" function, both from the "vegan" package (Oksanen et al., 2022). ANOSIM was performed in PAST (Hammer et al., 2001) with 9,999 iterations in the permutation test. IndVal and its significance were estimated by the "indval" function from the package "labdsv" (Roberts, 2022).

3 RESULTS

We recorded a total of 490 native tree and arborescent species within the 106 NTT sites located in the Uruguayan-Brazilian Pampa Ecoregion (see Table 1 SM – Supplementary Material). This value corresponds to the total species richness of the Uruguayan-Brazilian Pampa Ecoregion, and includes all species that occurred at least once in any of the NTT sites. The mean richness per NTT site was of 94.50 species (Table 1). Across phytophysiognomies, the mean richness ranged from 31 species in the SWV to 137.51 species in the SSFAD, where the later also presented the highest number of rare species (50 spp. with only one record in the 106 sites) and of restricted species (119 spp. found in only one of the forest phytophysiognomies) (Table 1, Figure 2).

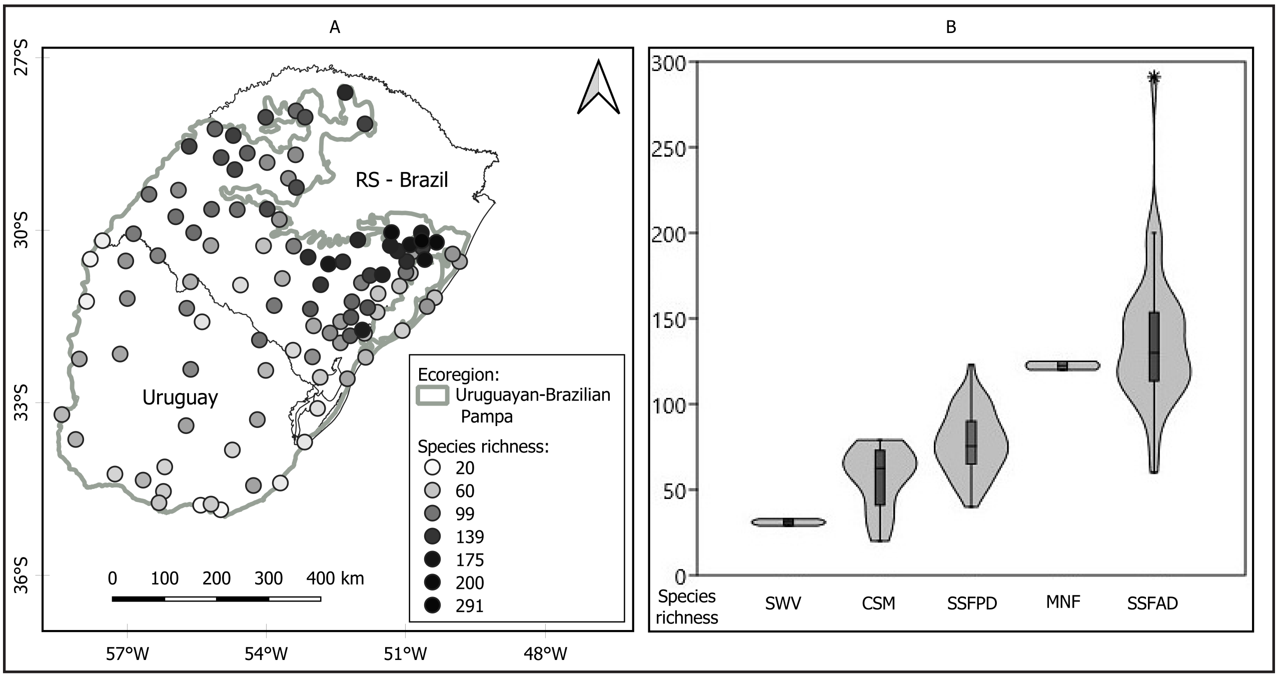
Spatial distribution of systematized richness by phytophysiognomy is available in Figure 2. Species richness exhibits a clear decline along a north–south gradient. The highest richness values (exceeding 100 species) are concentrated in the northern portion of the Uruguayan–Brazilian Pampa Ecoregion. Further south, between the Cuareim and Negro Rivers, richness values vary substantially, ranging from 99 to 60 and as low as 20. The lowest values are observed in the southernmost region, between the Río Negro and the Río de la Plata.

Table 1 – Synthesis of the distribution of tree and arborescent species recorded in the 106 NTT sites by phytophysiognomy in the Uruguayan-Brazilian Pampa Ecoregion

	SWV	MNF	SSFAD	SSFPD	CSM	UY-BR
Rare species	0	7	50	10	4	71
Restricted species	0	9	119	24	10	162
Indicator species	17	97	13	3	6	136
Mean richness	31.00	122.50	137.51	77.50	57.22	94.50
Standard deviation	2.00	3.54	40.21	18.45	17.97	43.58
Minimum– maximum	29–33	120–125	60– 291	40–123	20– 79	20–291

Source: Authors (2023). Legend: SWV = Savanoid-woodland Vegetation; MNF = Mixed Needle-broadleaved Forest; SSFAD = Seasonal Semideciduous Forest of Atlantic Domain; SSFPD = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic; Pampa UY-BR = Uruguayan-Brazilian Pampa Ecoregion; rare species = only one occurrence in the 106 NTT sites; restricted species = occurrence restricted to a forest physiognomy; indicator species = species that presented a significant IndVal ($p < 0.05$) for a forest physiognomy; mean richness = mean richness of the sites; standard deviation = standard deviation in relation to the mean richness; minimum – maximum = minimum and maximum richness in the sites

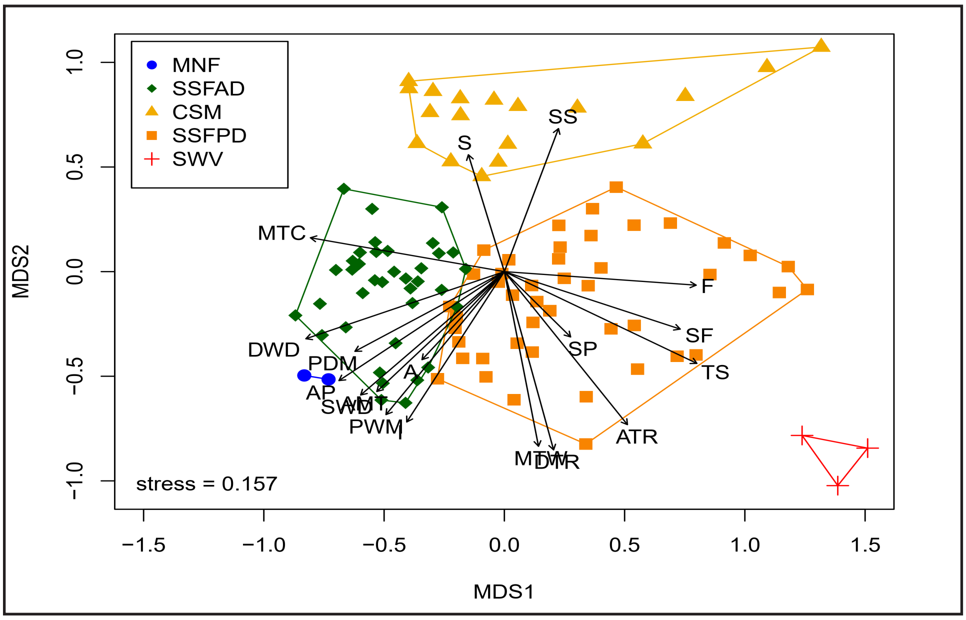
Figure 2 – Distribution of tree and shrub species richness across the Uruguayan-Brazilian Pampa Ecoregion (A), and across different phytophysiognomies (B)



Source: Authors (2023). Legend: SWV = Savanoid-woodland Vegetation; MNF = Mixed Needle-broadleaved Forest; SSFAD = Seasonal Semideciduous Forest of Atlantic Domain; SSFPD = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic. Box-plot: horizontal midline represents the median, the horizontal lines at the extremes are the maximum and minimum values. Outliers are plotted as asterisks. The quartiles of 25-75% are the boxes and the violin graph represents the kernel density

The non-Metric Scaling (nMDS) presented an adequate stress value of 0.157. The first two axes of multidimensional scaling (MDS1 and MDS2) demonstrates a clear distinction in species composition between the considered phytophysiognomies, showing no overlap between them (Figure 3). The first axis had a latitudinal gradient related to the Atlantic-Pampean floristic gradient, related to the species richness pattern seen in Figure 2A. Overall, the richest MNF and SSFAD phytophysionomies presented more negative MDS1 values than the SWV, CSM and SSFPD (with more positive values of MDS1, Figure 3). The MDS2 indicates an east-west gradient, where CSM (postive values, located at the east) stands out, showing no overlap in MDS2 values with the other phytophysionomies (negative values, Figure 3).

Figure 3 – Non-metric multidimensional scaling (nMDS) with two dimensions of the 106 NNT sites that occur in the Uruguayan-Brazilian Pampa Ecoregion and environmental variables with a significant goodness of fit statistic ($p < 0.01$)



Source: Authors (2023). Legend: SWV = Savanoid-woodland Vegetation; MNF = Mixed Needle-broadleaved forest; SSFAD = Seasonal Semideciduous Forest of Atlantic Domain; SSFPD = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic; A = altitude; AMT = annual mean temperature; DTR = Mean diurnal temperature range; I = isothermality; TS = temperature seasonality; MTW = maximum temperature of the warmest month; MTC = minimum temperature of the coldest month; ATR = annual temperature range; AP = annual precipitation; PWM= precipitation in the wettest month; PDM = precipitation in the driest month; SP = seasonality of precipitation; DWD= duration of water deficit periods; SWD = severity of water deficit periods; F = frost; S = ranked sand (soil texture); SF = soil fertility class; SS = soil salinity class

The nMDS-adjusted environmental variables (Figure 3) indicates three main sets of environmental gradients related to floristic differentiation between phytophysiognomy groups: 1. a gradient of more sandy and salinized soils, more characteristic of CSM; 2. a gradient with variables related to the greater variations in the southwest region by the effect of continentality and increasing latitude (temperature seasonality, precipitation seasonality, annual temperature range, mean diurnal temperature range, maximum temperature in the warmest month); and 3. another gradient related to the lower latitude and higher altitude regions (which have higher annual precipitation and in the driest and wettest month, a longer period and greater severity of excess water and isothermality).

The similarity analysis rejected the null hypothesis of no difference between the predefined phytophysionomies (R = 0.601 and p = 0.0001). With the exception of the SWV-MNF and SSFAD-MNF pairings, the post-hoc test results show significant differences on species compositions between phytophysiognomies (Table 2). Indicator species analysis resulted in 136 species with a significant IndVal for some of the phytophysiognomies (Table 1 SM – Supplementary Material). Indicator species analysis resulted in 136 species with a significant IndVal for some of the phytophysiognomies (Table 1 SM – Supplementary Material). Most species were indicative of the Mixed Needle-broadleaved Forest, while only a few were indicative of the Seasonal Semideciduous Forest of Pampean Domain. The complete list of indicator species is shown in Table 2 SM - Supplementary Material. From those, 27 priority indicator species were selected for their potential usage in AFSs across the Uruguayan-Brazilian Pampa Ecoregion (Table 3).

Table 2 – Results of *post-hoc* tests performed to make pairwise comparisons between pairs of groups (phytophysiognomies) in the analysis of similarity (ANOSIM). R statistic is presented above the diagonal, while p-values are shown bellow

p \ R	MNF	SSFAD	CSM	SSFPD	SWV
MNF		0.495	0.857	0.650	1.000
SSFAD	< 0.05		0.827	0.437	1.000
CSM	< 0.01	< 0.01		0.648	0.945
SSFPD	< 0.01	< 0.01	< 0.01		0.869
SWV	> 0.05	< 0.01	< 0.01	< 0.01	

Source: Authors (2023)

Legend: MNF = Mixed Needle-broadleaved Forest; SSFAD = Seasonal Semideciduous Forest of Atlantic Domain; SSFPD = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic, SWV = Savanoid-woodland Vegetation

Table 3 – List of indicator species of phytophysiognomies in the Uruguayan-Brazilian Pampa Ecoregion with significant indication value index - IndVal ($p < 0.05$) and potential use (priority) in AFSs

(Continued)

Group	Species	IndVal	p
SWV	*Prosopis nigra* Hiron.	0.94	0.001
SWV	*Aspidosperma quebracho-blanco* Schltdl.	0.90	0.001
SWV	*Prosopis affinis* Spreng.	0.84	0.001
SWV	*Parkinsonia aculeata* L.	0.69	0.001
SWV	*Vachellia caven* (Molina) Seigler & Ebinger *	0.54	0.001
SWV	*Vachellia farnesiana* (L.) Wight & Arn.	0.52	0.008
SWV	*Pouteria salicifolia* (Spreng.) Radlk.	0.44	0.003
SWV	*Ruprechtia salicifolia* (Cham. & Schltdl.) A.C.Meyer	0.42	0.046
SWV	*Scutia buxifolia* Reissek	0.30	0.021
MNF	*Araucaria angustifolia* (Bertol.) Kuntze	0.97	0.001
MNF	*Piptocarpha angustifolia* Dusén ex Malme	0.86	0.003
MNF	*Handroanthus albus* (Cham.) Mattos	0.83	0.003
MNF	*Ateleia glazioveana* Baill. *	0.79	0.007
MNF	*Ilex paraguariensis* A.St.-Hil.	0.77	0.002
MNF	*Erythrina falcata* Benth.	0.72	0.012
MNF	*Butia eriospatha* (Mart. ex Drude) Becc.	0.50	0.022
MNF	*Mimosa scabrella* Benth.	0.41	0.038
SSFAD	*Annona sylvatica* A.St.-Hil.	0.71	0.001
SSFAD	*Solanum pseudoquina* A.St.-Hil.	0.53	0.001
SSFAD	*Chrysophyllum gonocarpum* (Mart. & Eichler ex Miq.) Engl.	0.44	0.032

Table 3 – List of indicator species of phytophysiognomies in the Uruguayan-Brazilian Pampa Ecoregion with significant indication value index - IndVal ($p < 0.05$) and potential use (priority) in AFSs

(Conclusion)

Group	Species	IndVal	p
SSFAD	*Nectandra oppositifolia* Nees	0.43	0.029
SSFAD	*Inga marginata* Willd.	0.42	0.033
SSFPD	*Celtis tala* Gillies ex Planch.	0.47	0.049
CSM	*Myrsine parvifolia* A.DC.	0.89	0.001
CSM	*Annona maritima* (Záchia) H.Rainer	0.76	0.002
CSM	*Psidium cattleianum* Sabine	0.50	0.001
CSM	*Ficus cestrifolia* Schott ex Spreng.	0.47	0.001

Source: Authors (2023). Legend: MNF = Mixed Needle-broadleaved Forest; SSFAD = Seasonal Semideciduous Forest of Atlantic Domain; SSFPD = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic; SWV = Savanoid-woodland Vegetation; * = species with use restriction due to the potential to be invasive on grasslands formations

From the 490 species considered in this study, 153 species were selected for use in AFSs (Table 3 SM – Supplementary Material). The selected species include the 27 priority indicator species plus 57 priority non-indicator species, and 69 non-priority and non-indicator species (Table 4). These 69 species are multipurpose, with no established uses yet, but hold significant potential for future applications.

Table 4 – List of priority species for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion. The percentage value in the phytophysiognomies indicates the frequency of occurrence of the species in the sites

(Continued)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Anacardiaceae	*Astronium balansae* Engl.	0%	0%	14%	7%	0%	Tre	Sil Res Woo MePo Con EcSu Orn Fir
Anacardiaceae	*Schinus molle* L.	33%	0%	78%	70%	6%	Tre	Sil Res Woo Med MePo EcSu Orn Fir

Table 4 – List of priority species for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion. The percentage value in the phytophysiognomies indicates the frequency of occurrence of the species in the sites

(Continued)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Anacardiaceae	*Schinus terebinthifolia* Raddi	0%	100%	41%	4%	17%	Tre	Res Foo Woo Med MePo EcSu Orn Fir
Annonaceae	*Annona maritima* (Záchia) H.Rainer	0%	0%	0%	2%	78%	Shr Tre	AgHo Foo
Annonaceae	*Annona neosalicifolia* H.Rainer	0%	100%	57%	37%	0%	Tre	AgHo Foo
Annonaceae	*Annona sylvatica* A.St.-Hil.	0%	0%	86%	20%	0%	Tre	Res AgHo Foo
Apocynaceae	*Aspidosperma quebracho-blanco* Schltdl.	100%	0%	0%	11%	0%	Tre	Sil Woo Con Orn
Aquifoliaceae	*Ilex paraguariensis* A.St.-Hil.	0%	100%	22%	9%	0%	Tre	Sil Res AgHo Foo
Araucariaceae	*Araucaria angustifolia* (Bertol.) Kuntze	0%	100%	3%	0%	0%	Tre	Sil Res AgHo Foo Woo Con Orn
Arecaceae	*Bactris setosa* Mart.	0%	0%	22%	0%	6%	Pal	AgHo Foo MePo Con
Arecaceae	*Butia eriospatha* (Mart. ex Drude) Becc.	0%	50%	0%	0%	0%	Pal	AgHo Foo MePo Cra Con Orn
Arecaceae	*Butia odorata* (Barb. Rodr.) Noblick	0%	0%	49%	33%	33%	Pal	AgHo Foo MePo Cra Con Orn
Arecaceae	*Butia yatay* (Mart.) Becc.	33%	0%	11%	50%	0%	Pal	AgHo Foo MePo Cra Con Orn
Arecaceae	*Geonoma schottiana* Mart.	0%	0%	24%	0%	39%	Pal	AgHo Foo MePo Con
Arecaceae	*Syagrus romanzoffiana* (Cham.) Glassman	0%	100%	92%	61%	67%	Pal	Foo MePo Orn
Asteraceae	*Baccharis dracunculifolia* DC.	33%	50%	57%	50%	6%	Shr	Res MePo Med EcSu
Asteraceae	*Moquiniastrum polymorphum* (Less.) G. Sancho	0%	100%	86%	57%	0%	Tre Shr	Res MePo Woo Med EcSu Orn

Table 4 – List of priority species for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion. The percentage value in the phytophysiognomies indicates the frequency of occurrence of the species in the sites (Continued)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Asteraceae	*Piptocarpha angustifolia* Dusén ex Malme	0%	100%	16%	0%	0%	Tre Shr	Res EcSu
Bignoniaceae	*Handroanthus albus* (Cham.) Mattos	0%	100%	16%	4%	0%	Tre	Res Woo Orn
Bignoniaceae	*Handroanthus heptaphyllus* (Vell.) Mattos	0%	0%	24%	26%	0%	Tre	Res Woo Med Orn
Boraginaceae	*Cordia americana* (L.) Gottschling & J.S.Mill.	0%	100%	84%	46%	6%	Tre	Res Woo Orn
Boraginaceae	*Cordia trichotoma* (Vell.) Arráb. ex Steud.	0%	100%	57%	4%	0%	Tre	Res Woo Orn
Cactaceae	*Cereus uruguayanus* R. Kiesling	0%	0%	0%	26%	56%	Shr Suc	AgHo Foo Orn
Cactaceae	*Pereskia nemorosa* Rojas Acosta	0%	0%	0%	20%	0%	Shr	AgHo Foo Orn
Cannabaceae	*Celtis tala* Gillies ex Planch.	0%	0%	22%	63%	0%	Tre	Sil Res Foo Orn EcSu
Cannabaceae	*Trema micrantha* (L.) Blume	0%	50%	68%	15%	0%	Tre	Res EcSu Sil Woo Fir
Caricaceae	*Vasconcellea quercifolia* A.St.-Hil.	0%	100%	41%	11%	0%	Shr Tre	AgHo Foo Med
Celastraceae	*Monteverdia ilicifolia* (Mart. ex Reissek) Biral	67%	50%	57%	78%	0%	Shr Tre	AgHo Med Orn
Euphorbiaceae	*Gymnanthes klotzschiana* Müll.Arg.	0%	100%	100%	91%	89%	Tre	Res EcSu Fir
Euphorbiaceae	*Sapium haematospermum* Müll.Arg.	67%	0%	19%	33%	0%	Tre	Res Orn
Fabaceae	*Apuleia leiocarpa* (Vogel) J.F.Macbr.	0%	50%	43%	7%	0%	Tre	Woo Con Orn
Fabaceae	*Ateleia glazioveana* Baill. *	0%	100%	27%	0%	0%	Tre	Res EcSu Fir
Fabaceae	*Calliandra tweedii* Benth.	0%	50%	76%	74%	11%	Shr Tre	Res Orn
Fabaceae	*Enterolobium contortisiliquum* (Vell.) Morong	0%	0%	43%	37%	11%	Tre	Res Woo EcSu Orn
Fabaceae	*Erythrina crista-galli* L.	67%	0%	54%	65%	72%	Tre	Res MePo Orn

Table 4 – List of priority species for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion. The percentage value in the phytophysiognomies indicates the frequency of occurrence of the species in the sites

(Continued)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Fabaceae	*Erythrina falcata* Benth.	0%	100%	46%	0%	6%	Tre	Res MePo Orn
Fabaceae	*Inga marginata* Willd.	0%	0%	57%	4%	0%	Tre	Res Foo EcSu Orn Fir
Fabaceae	*Inga vera* Willd.	0%	0%	49%	41%	11%	Tre	Res Foo MePo Riv Orn
Fabaceae	*Mimosa bimucronata* (DC.) Kuntze	0%	0%	32%	11%	28%	Shr Tre	Res EcSu MePo Fir
Fabaceae	*Mimosa scabrella Benth.*	0%	50%	8%	2%	0%	Tre	Res EcSu MePo Woo Fir
Fabaceae	*Myrocarpus frondosus* Allemão	0%	100%	46%	13%	0%	Tre	Res MePo Woo Med Con
Fabaceae	*Parapiptadenia rigida* (Benth.) Brenan	0%	100%	0%	33%	0%	Tre	Res MePo Woo Med Fir
Fabaceae	*Parkinsonia aculeata* L.	100%	0%	16%	39%	6%	Shr Tre	Sil MePo Woo Orn Fir
Fabaceae	*Peltophorum dubium* (Spreng.) Taub.	0%	50%	0%	24%	0%	Tre	Res Woo Orn Fir
Fabaceae	*Prosopis affinis* Spreng.	100%	0%	0%	20%	0%	Shr Tre	Sil MePo Woo Med Foo Fir
Fabaceae	*Prosopis nigra* Hiron.	100%	0%	22%	7%	0%	Shr Tre	Sil MePo Woo Med Con Fir
Fabaceae	*Vachellia caven* (Molina) Seigler & Ebinger *	100%	0%	14%	57%	6%	Shr Tre	Sil MePo Con Fir
Fabaceae	*Vachellia farnesiana* (L.) Wight & Arn.	67%	0%	0%	20%	0%	Shr Tre	Sil MePo Fir
Lamiaceae	*Aegiphila brachiata* Vell.	0%	50%	100%	11%	0%	Shr Tre	Res Foo
Lamiaceae	*Vitex megapotamica* (Spreng.) Moldenke	0%	100%	3%	61%	67%	Tre	Res Woo Med Orn

Table 4 – List of priority species for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion. The percentage value in the phytophysiognomies indicates the frequency of occurrence of the species in the sites

(Continued)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Lauraceae	*Nectandra oppositifolia* Nees	0%	0%	43%	0%	0%	Tre	Res Foo
Lauraceae	*Ocotea catharinensis* Mez	0%	0%	24%	0%	6%	Tre	Woo Con Orn
Lauraceae	*Ocotea pulchella* (Nees & Mart.) Mez	0%	100%	84%	48%	72%	Tre	Res EcSu
Malvaceae	*Luehea divaricata* Mart. & Zucc.	0%	100%	81%	78%	39%	Tre	Res MePo Woo Med Orn Riv
Meliaceae	*Cedrela fissilis* Vell.	0%	100%	62%	15%	6%	Tre	Res Woo Med Con Orn
Moraceae	*Ficus cestrifolia* Schott ex Spreng.	0%	0%	62%	17%	89%	Tre	Res Woo Con Orn
Myrtaceae	*Campomanesia guazumifolia* (Cambess.) O.Berg	0%	100%	95%	9%	0%	Tre	Res AgHo Foo MePo Woo Orn Fir
Myrtaceae	*Campomanesia xanthocarpa* (Mart.) O.Berg	0%	100%	89%	46%	11%	Tre	Res AgHo Foo MePo Woo Orn Fir
Myrtaceae	*Eugenia involucrata* DC.	0%	100%	51%	28%	11%	Tre	Res AgHo Foo MePo Woo Orn
Myrtaceae	*Eugenia myrcianthes* Nied.	0%	0%	32%	41%	39%	Tre	Res AgHo Foo MePo Woo Orn Fir
Myrtaceae	*Eugenia pyriformis* Cambess.	0%	50%	62%	4%	0%	Tre	Res AgHo Foo MePo Woo Orn Fir
Myrtaceae	*Eugenia rostrifolia* D.Legrand	0%	50%	92%	11%	0%	Tre	Foo MePo Woo Orn Fir
Myrtaceae	*Eugenia uniflora* L.	67%	50%	43%	80%	61%	Tre	Res AgHo Foo MePo Med EcSu Orn Fir

Table 4 – List of priority species for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion. The percentage value in the phytophysiognomies indicates the frequency of occurrence of the species in the sites

(Continued)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Myrtaceae	*Feijoa sellowiana* (O.Berg) O.Berg	0%	50%	81%	48%	0%	Tre Shr	AgHo Foo MePo Orn Fir
Myrtaceae	*Myrcianthes pungens* (O.Berg) D.Legrand	67%	100%	32%	63%	6%	Tre	Res Foo MePo Woo Fir
Myrtaceae	*Plinia rivularis* (Cambess.) Rotman	0%	0%	57%	33%	0%	Tre	Foo Res Riv Woo Fir
Myrtaceae	*Psidium cattleianum* Sabine	0%	0%	38%	26%	94%	Tre Shr	Res AgHo Foo MePo Woo Orn Fir
Podocarpaceae	*Podocarpus lambertii* Klotzsch ex Endl.	0%	0%	8%	7%	0%	Tre	Res Foo Woo Orn EcSu
Polygonaceae	*Ruprechtia salicifolia* (Cham. & Schltdl.) A.C.Meyer	67%	0%	84%	30%	0%	Tre	Res Riv Woo Fir
Primulaceae	*Myrsine coriacea* (Sw.) R.Br. ex Roem. & Schult.	0%	50%	22%	57%	17%	Tre	Res EcSu
Primulaceae	*Myrsine parvifolia* A.DC.	0%	0%	0%	0%	89%	Shr	Res EcSu
Quillajaceae	*Quillaja lancifolia* D.Don	0%	0%	59%	54%	6%	Tre	Res Med Woo Con EcSu Fir
Rhamnaceae	*Scutia buxifolia* Reissek	100%	0%	27%	87%	83%	Tre Shr	Sil Res Woo Med Fir
Rutaceae	*Helietta apiculata* Benth.	0%	100%	97%	22%	0%	Tre	Res Woo Med EcSu
Salicaceae	*Casearia sylvestris* Sw.	0%	100%	27%	74%	72%	Tre	Res MePo Med
Salicaceae	*Salix humboldtiana* Willd.	0%	0%	27%	48%	39%	Tre	Res Riv MePo Med Orn
Santalaceae	*Acanthosyris spinescens* (Mart. & Eichler) Griseb.	67%	0%	100%	54%	0%	Tre	Sil Foo Orn
Sapindaceae	*Dodonaea viscosa* Jacq.	0%	0%	41%	39%	67%	Shr SubShr	Res EcSu Fir

Table 4 – List of priority species for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion. The percentage value in the phytophysiognomies indicates the frequency of occurrence of the species in the sites

(Conclusion)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Sapotaceae	*Chrysophyllum gonocarpum* (Mart. & Eichler ex Miq.) Engl.	0%	0%	73%	37%	11%	Shr Tre	Foo
Sapotaceae	*Pouteria salicifolia* (Spreng.) Radlk.	100%	0%	46%	54%	28%	Tre	Res Riv
Sapotaceae	*Sideroxylon obtusifolium* (Roem. & Schult.) T.D.Penn.	33%	0%	76%	20%	83%	Tre Shr	Foo Med Com
Solanaceae	*Solanum mauritianum* Scop.	0%	100%	30%	46%	39%	Tre Shr	Res EcSu
Solanaceae	*Solanum pseudoquina* A.St.-Hil.	0%	0%	78%	9%	28%	Tre	Res EcSu
Urticaceae	*Cecropia pachystachya* Trécul	0%	0%	22%	2%	44%	Tre	Res EcSu Orn

Source: Authors (2023). Legend: MNF = Mixed Needle-broadleaved forest; SFA = Seasonal Semideciduous Forest of Atlantic Domain; SFP = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic; SWV = Savanoid-woodland Vegetation; LF = life form; Shr = shrub; Tre = tree; Pal = palm; Subshr = subshrub; Suc = succulent; AgHo = Agroforestry homegardens; Res = Restorative AFS; Sil = Silvopastoral AFS; Foo = food; Cra = craft; Con = conservation; Fir = firewood; Woo = wood; Med = medicinal; MePo = melliferous/pollinators; Ole = oleiferous; Orn = ornamental; EcSu = ecological succession (pioneer, early secondary); Riv = riverine; * = species with use restriction due to the potential to be invasive on grassland formations

4 DISCUSSION

The results of this study demonstrate the importance of considering the local phytophysiognomies when planning the implementation of AFSs with native species. The five forest phytophysiognomies analyzed have different floristic compositions, which, on a broad scale, are congruent with the latitudinal diversity gradient and the expected effect of continentality on species assemblages (Stevens 1989; de Aledo et al. 2023). Within the Uruguayan-Brazilian Pampa Ecoregion, species assemblages consistently differ between phytophysiognomies, allowing us to select the most adequate native species for AFSs. Through this study, we show that the diversity of native species in the Uruguayan-Brazilian Pampa Ecoregion can potentially be used to our advantage while planning and developing AFSs, keeping agroecosystem functionality while also applying positive conservation actions for maintaining this diversity.

Across the Uruguayan-Brazilian Pampa Ecoregion, this study has shown that native tree and arborescent species richness increases towards the north and northeast. By following a clear gradient, our results implicates on practical solutions to AFS design. In the Savanoid-woodland Vegetation, a AFS designed with 20 species would be a good representative of the local species diversity, while, for other phytophysiognomies, such as the Mixed Needle-broadleaved Forest or the Semideciduous Seasonal Forest of Atlantic Domain, the same number of species would impoverish the local species expected pool. In AFSs, complementary species can increase ecosystem functions in the short term, especially in sites with lower species richness (Moonen & Bàrberi, 2008; Arshad, 2023). Meanwhile, redundant species can increase the resilience and stability of the agroecosystem in the long term, while the possibility remains to reverse functional redundancy over time after environmental changes or disturbances (Moonen & Bàrberi, 2008). Hence, by observing the local pool of species prior to their selection for AFS is an important tool for the functionality of agroecosystems.

The floristic differentiation presented between the different phytophysiognomies demonstrates the importance of recognizing the heterogeneity within the Uruguayan-Brazilian Pampa Ecoregion. The native forests in the Pampa are generally neglected in relation to their economic potential or diversity, and are generically treated as Riverine, Alluvial, Pampa Forests, etc. (IBGE, 2012; Oliveira-Filho et al. 2015). Due to scale-dependent processes, the different classification systems available (biogeographic provinces, domains, etc.) often implicate on underestimated differences in vegetation composition for the ecoregion, altering our perception of the occurrence and classification of forests in the Pampa (Vargas & Brack, 2021). The ecoregion concept has the advantage of not being strongly influenced by the classification of vegetation, while it includes the history of human occupation and transformation of the territory. Thus, we avoided a discussion on biome boundaries and adopted a classification system that allows the occurrence of distinct forest phytophysiognomies by highlighting the cultural identity of the people within the territory.

The distinct floristic compositions across the phytophysiognomies and their relationship with sets of environmental variables allowed us to establish different strategies for the design of AFSs in the Uruguayan-Brazilian Pampa Ecoregion. In the regions where the Savanoid-woodland Vegetation occur, greater variation in temperature and rainfall variables is expected, benefiting the predominance of livestock activity, and, hence, the main implementation of Silvopastoral Systems. The tree and shrub species that occur naturally in consortium with the grassland matrix in such environments can bring greater thermal comfort to cattle, benefiting pasture composition, while also providing sufficient wood quality for fence posts and firewood in a region with limited supply (Patt & Aian, 2008; Nascimento et al., 2018). In the Mixed Needle-broadleaved Forest region, implementing AFS for the production of pine nuts, yerba mate, native fruits, wood and firewood can also be associated with livestock in a Silvopastoral System similar to the *Caívas* (Hanisch, 2018). Although MNF occurs only in the extreme north of the Uruguayan-Brazilian Pampa Ecoregion, tree species typical to the MNF, such as *Araucaria angustifolia* (Bertol.) Kuntze and *Ilex paraguariensis* A.St.-Hil., are also present in the *Serra do Sudeste* plateau in Rio Grande do Sul (Carlucci et al., 2011), and may be used in future AFS. The same cannot be said to other species, such as *Mimosa scabrella* Benth. and *Butia eriospatha* (Mart. ex Drude) Becc., that are not found in the *Serra do Sudeste*.

Herein, the use of the NTT database (Oliveira-Filho, 2017) and the profile of the Uruguayan-Brazilian Pampa Ecoregion allowed us to address the heterogeneity of Pampa phytophysiognomies in order to select species for use in AFSs. By applying a metadata approach to a broad region, we acknowledge a certain level of generalization that was added to our results, which does not necessarily translates to some characteristic formations such as the *Butiazais* (Marchiori et al., 1995), the *Pau-ferro* woodlands (Longhi et al., 1987) and the Mixed forests with *Araucaria* in the *Serra do Sudeste* (Carlucci et al., 2011) or with *Podocarpus* (Longhi et al., 1992). Still, the species occurring in these formations were included in the sites located in their surroundings, where a reinterpretation of our results would sufficiently be applicable during AFS planning.

Our study emphasizes the importance of considering the different phytophysiognomic contexts while designing future AFSs. Several tree and shrub species currently or historically used in agroforestry systems are among the most widespread and ecologically damaging plant invaders, highlighting the importance of selecting native species to prevent long-term ecological disruption (Richardson et al. 2004). These authors suggested that even when native species may offer lower agroforestry performance compared to exotic alternatives, their use is preferable due to their lower risk of invasiveness and greater ecological compatibility. Building on this principle, the present study not only compiles a list of native species but also evaluates their functional roles within agroforestry systems (AFSs), thereby supporting more informed and ecologically responsible decision-making. This approach allows practitioners to balance functionality with ecological fit when selecting species for AFS implementation in the Uruguayan–Brazilian Pampa Ecoregion. In this context, greater attention should be paid to species with a strong potential to colonize native fields, such as *Vachellia caven* (Molina) Seigler & Ebinger and *Ateleia glazioveana* Baill (Carvalho 2003). In such cases, our list of priority species can be used as an important tool while implementing or managing AFSs in the Uruguayan-Brazilian Pampa Ecoregion. In contrast to other available lists, our study included species that are important indicatives of local phytophysiognomies, that have consolidated or potential use, and/or have multiple purposes. Hence, it foresees working with a reduced set of species that sufficiently represent the local biodiversity and are already adequate to local climatic conditions. We expect our list not only will help maintaining the local floristic characteristics, but it will also facilitate and diminishes the expected costs of AFS implementation in the Uruguayan-Brazilian Pampa Ecoregion.

5 FINAL CONSIDERATIONS

This study is the first to foster a transnational discussion on AFS planning based on the shared environmental characteristics between southern Brazil and Uruguay. The references for the approach adopted included the patterns of species richness and composition in the study region, allowing us to establish an overview of its distribution. Adding to the detailed information reported in previous studies (e.g., Brazeiro et al., 2020; Guarino et al., 2018), we provide novel views on how to approach AFS while considering the heterogeneity within the Uruguayan-Brazilian Pampa Ecoregion. Moving forward in this ongoing discussion, we propose the adoption of an intermediate level-approach between generalization and specification. To this aim, integrating finer-scaled and experiment-based data between the two countries, while using our proposal as a base, will be an important path to pursue while applying ecologically-based AFS strategies in the ecoregion.

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APPENDICES

SUPPLEMENTARY MATERIAL (SM)

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	Life Form
Achatocarpaceae	*Achatocarpus praecox* Griseb.	Shr|Tre
Adoxaceae	*Sambucus australis* Cham. & Schltdl.	Shr|Tre
Anacardiaceae	*Astronium balansae* Engl.	Tre
Anacardiaceae	*Lithraea brasiliensis* Marchand	Shr|Tre
Anacardiaceae	*Lithraea molleoides* (Vell.) Engl.	Shr|Tre
Anacardiaceae	*Schinus areira* L.	Tre
Anacardiaceae	*Schinus engleri* F.A.Barkley	Shr|Tre
Anacardiaceae	*Schinus ferox* Hassl.	Shr|Tre
Anacardiaceae	*Schinus lentiscifolia* Marchand	Shr|Tre
Anacardiaceae	*Schinus longifolia* (Lindl.) Speg.	Shr|Tre
Anacardiaceae	*Schinus molle* L.	Tre
Anacardiaceae	*Schinus terebinthifolia* Raddi	Shr|Tre
Annonaceae	*Annona cacans* Warm.	Tre
Annonaceae	*Annona emarginata* (Schltdl.) H.Rainer	Shr|Tre
Annonaceae	*Annona maritima* (Záchia) H.Rainer	Tre
Annonaceae	*Annona neosalicifolia* H.Rainer	Tre
Annonaceae	*Annona rugulosa* (Schltdl.) H.Rainer	Tre
Annonaceae	*Annona sylvatica* A.St.-Hil.	Tre
Annonaceae	*Duguetia lanceolata* A.St.-Hil.	Tre
Apocynaceae	*Aspidosperma australe* Müll.Arg.	Tre
Apocynaceae	*Aspidosperma quebracho-blanco* Schltdl.	Tre
Apocynaceae	*Aspidosperma riedelii* Müll.Arg.	Shr|Tre
Apocynaceae	*Tabernaemontana catharinensis* A.DC.	Shr|Tre
Aquifoliaceae	*Ilex brevicuspis* Reissek	Tre
Aquifoliaceae	*Ilex dumosa* Reissek	Shr|Tre
Aquifoliaceae	*Ilex microdonta* Reissek	Shr|Tre
Aquifoliaceae	*Ilex paraguariensis* A.St.-Hil.	Tre
Aquifoliaceae	*Ilex pseudobuxus* Reissek	Shr|Tre
Aquifoliaceae	*Ilex theezans* Mart. ex Reissek	Shr|Tre
Araliaceae	*Aralia warmingiana* (Marchal) J.Wen	Tre
Araliaceae	*Dendropanax cuneatus* (DC.) Decne. & Planch.	Tre
Araliaceae	*Didymopanax angustissimus* Marchal	Tre
Araliaceae	*Oreopanax fulvus* Marchal	Tre
Araliaceae	*Schefflera calva* (Cham.) Frodin & Fiaschi	Tre
Araucariaceae	*Araucaria angustifolia* (Bertol.) Kuntze	Tre
Arecaceae	*Acrocomia aculeata* (Jacq.) Lodd. ex Mart.	Pal
Arecaceae	*Bactris setosa* Mart.	Pal
Arecaceae	*Butia catarinensis* Noblick & Lorenzi	Pal

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	**Species**	**Life Form**
Arecaceae	*Butia eriospatha* (Mart. ex Drude) Becc.	Pal
Arecaceae	*Butia odorata* (Barb.Rodr.) Noblick	Pal
Arecaceae	*Butia witeckii K.* Soares & S. Longhi	Pal
Arecaceae	*Butia yatay* (Mart.) Becc.	Pal
Arecaceae	*Euterpe edulis* Mart.	Pal
Arecaceae	*Geonoma pohliana* Mart.	Her
Arecaceae	*Geonoma schottiana* Mart.	Her
Arecaceae	*Syagrus romanzoffiana* (Cham.) Glassman	Pal
Arecaceae	*Trithrinax brasiliensis* Mart.	Pal
Arecaceae	*Trithrinax campestris* (Burmeist.) Drude & Griseb.	Pal
Asparagaceae	*Cordyline spectabilis* Kunth & Bouché	Tre
Asteraceae	*Austroeupatorium inulaefolium* (Kunth) R.M.King & H.Rob.	Shr|Her|SubShr
Asteraceae	*Baccharis calvescens* DC.	Shr
Asteraceae	*Baccharis caprariifolia* DC.	Shr
Asteraceae	*Baccharis dentata* (Vell.) G.M.Barroso	Shr
Asteraceae	*Baccharis dracunculifolia* DC.	Shr
Asteraceae	*Baccharis longiattenuata* A.S.Oliveira	Shr|Tre
Asteraceae	*Baccharis microdonta* DC.	Shr
Asteraceae	*Baccharis montana* DC.	Shr|Tre
Asteraceae	*Baccharis psiadioides* (Less.) Joch.Müll.	Shr
Asteraceae	*Baccharis retusa* DC.	Shr
Asteraceae	*Baccharis semiserrata* DC.	Shr|Tre
Asteraceae	*Baccharis serrulata* (Lam.) Pers.	SubShr
Asteraceae	*Baccharis singularis* (Vell.) G.M.Barroso	Shr
Asteraceae	*Dasyphyllum brasiliense* (Spreng.) Cabrera	Shr|Tre
Asteraceae	*Dasyphyllum spinescens* (Less.) Cabrera	Tre
Asteraceae	*Kaunia rufescens* (Lund ex DC.) R.M. King	Shr|Tre
Asteraceae	*Malmeanthus subintegerrimus* (Malme) R.M.King & H.Rob.	Shr
Asteraceae	*Moquiniastrum polymorphum* (Less.) G. Sancho	Tre
Asteraceae	*Moquiniastrum sordidum* (Less.) G. Sancho	Shr
Asteraceae	*Piptocarpha angustifolia* Dusén ex Malme	Tre
Asteraceae	*Piptocarpha axillaris* (Less.) Baker	Tre
Asteraceae	*Tessaria dodoneifolia* (Hook. & Arn.) Cabrera subsp. *dodoneifolia*	Shr
Asteraceae	*Tessaria integrifolia* Ruiz & Pav.	Shr|Tre
Asteraceae	*Trixis praestans* (Vell.) Cabrera	Shr
Asteraceae	*Vernonanthura beyrichii* (Less.) H.Rob.	Shr
Asteraceae	*Vernonanthura discolor* (Spreng.) H.Rob.	Tre
Asteraceae	*Vernonanthura puberula* (Less.) H.Rob.	Shr
Berberidaceae	*Berberis laurina* Billb.	Shr|Tre
Berberidaceae	*Berberis ruscifolia* Lam.	Shr
Bignoniaceae	*Cybistax antisyphilitica* (Mart.) Mart.	Tre
Bignoniaceae	*Handroanthus albus* (Cham.) Mattos	Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	**Species**	**Life Form**
Bignoniaceae	*Handroanthus chrysotrichus* (Mart. ex DC.) Mattos	Tre
Bignoniaceae	*Handroanthus heptaphyllus* (Vell.) Mattos	Tre
Bignoniaceae	*Handroanthus pulcherrimus* (Sandwith) Mattos	Tre
Bignoniaceae	*Handroanthus umbellatus* (Sond.) Mattos	Tre
Bignoniaceae	*Jacaranda micrantha* Cham.	Tre
Bignoniaceae	*Jacaranda puberula* Cham.	Tre
Blechnaceae	*Lomariocycas schomburgkii* (Klotzsch) Gasper & A.R. Sm.	Her
Boraginaceae	*Cordia americana* (L.) Gottschling & J.S.Mill.	Tre
Boraginaceae	*Cordia ecalyculata* Vell.	Tre
Boraginaceae	*Cordia silvestris* Fresen.	Tre
Boraginaceae	*Cordia trichotoma* (Vell.) Arráb. ex Steud.	Tre
Cactaceae	*Cereus hildmannianus* K.Schum.	Shr|Tre|Suc
Cactaceae	*Cereus stenogonus* K.Schum.	Shr|Suc
Cactaceae	*Cereus uruguayanus R. Kiesling*	Shr|Tre|Suc
Cactaceae	*Opuntia monacantha* Haw.	Shr|Suc
Cactaceae	*Pereskia nemorosa* Rojas Acosta	Shr
Canellaceae	*Cinnamodendron dinisii* Schwacke	Tre
Cannabaceae	*Celtis brasiliensis* (Gardner) Planch.	Tre|Shr
Cannabaceae	*Celtis chichape* (Weed.) Miq.	Shr|Tre|SubShr
Cannabaceae	*Celtis iguanaea* (Jacq.) Sarg.	Shr|Tre
Cannabaceae	*Celtis tala Gillies* ex Planch.	Shr|Tre
Cannabaceae	*Trema micrantha* (L.) Blume	Shr|Tre
Cardiopteridaceae	*Citronella gongonha* (Mart.) R.A.Howard	Shr|Tre
Cardiopteridaceae	*Citronella paniculata* (Mart.) R.A.Howard	Tre
Caricaceae	*Jacaratia spinosa* (Aubl.) A.DC.	Tre
Caricaceae	*Vasconcellea quercifolia* A.St.-Hil.	Shr|Tre
Celastraceae	*Maytenus boaria* Molina	Shr|Tre
Celastraceae	*Maytenus vitis-idaea* Griseb.	Shr|Tre
Celastraceae	*Monteverdia aquifolia* (Mart.) Biral	Tre
Celastraceae	*Monteverdia cassineformis* (Reissek) Biral	Shr|Tre
Celastraceae	*Monteverdia dasyclada* (Mart.) Biral	Shr
Celastraceae	*Monteverdia evonymoides* (Reissek) Biral	Shr|Tre
Celastraceae	*Monteverdia glaucescens* (Reissek) Biral	Shr|Tre
Celastraceae	*Monteverdia ilicifolia* (Mart. ex Reissek) Biral	Shr
Celastraceae	*Schaefferia argentinensis* Speg.	Shr
Chrysobalanaceae	*Hirtella hebeclada* Moric. ex DC.	Tre
Clethraceae	*Clethra scabra* Pers.	Shr|Tre
Clusiaceae	*Clusia criuva* Cambess.	Shr|Tre
Clusiaceae	*Garcinia gardneriana* (Planch. & Triana) Zappi	Shr|Tre
Combretaceae	*Terminalia australis* Cambess.	Shr|Tre
Combretaceae	*Terminalia triflora* (Griseb.) Lillo	Shr|Tre
Cunoniaceae	*Lamanonia ternata* Vell.	Shr|Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	Life Form
Cunoniaceae	*Weinmannia paulliniifolia* Pohl ex Ser.	Shr|Tre
Cyatheaceae	*Alsophila setosa* Kaulf.	Tre
Cyatheaceae	*Cyathea atrovirens* (Langsd. & Fisch.) Domin	Tre
Cyatheaceae	*Cyathea corcovadensis* (Raddi) Domin	Tre
Cyatheaceae	*Cyathea delgadii* Sternb.	Tre
Dicksoniaceae	*Dicksonia sellowiana* Hook.	Tre
Ebenaceae	*Diospyros inconstans* Jacq.	Shr|Tre
Elaeocarpaceae	*Sloanea hirsuta* (Schott) Planch. ex Benth.	Tre
Elaeocarpaceae	*Sloanea lasiocoma* K.Schum.	Tre
Ericaceae	*Agarista eucalyptoides (Cham. & Schltdl.) G.Don*	Shr|Tre
Ericaceae	*Gaylussacia brasiliensis* (Spreng.) Meisn.	Shr|Tre|SubShr
Erythroxylaceae	*Erythroxylum argentinum* O.E.Schulz	Shr|Tre
Erythroxylaceae	*Erythroxylum cuneifolium* (Mart.) O.E.Schulz	Shr
Erythroxylaceae	*Erythroxylum deciduum* A.St.-Hil.	Shr|Tre|SubShr
Erythroxylaceae	*Erythroxylum myrsinites* Mart.	Shr|Tre
Erythroxylaceae	*Erythroxylum pelleterianum* A.St.-Hil.	Shr|Tre
Erythroxylaceae	*Erythroxylum umbu* Costa-Lima	Shr|Tre
Escalloniaceae	*Escallonia bifida* Link & Otto	Shr
Escalloniaceae	*Escallonia chlorophylla* Cham. & Schltdl.	
Escalloniaceae	*Escallonia megapotamica* Spreng.	Shr|SubShr
Euphorbiaceae	*Actinostemon concolor* (Spreng.) Müll.Arg.	Shr|Tre
Euphorbiaceae	*Alchornea glandulosa* Poepp. & Endl.	Shr|Tre
Euphorbiaceae	*Alchornea sidifolia* Müll.Arg.	Tre
Euphorbiaceae	*Alchornea triplinervia* (Spreng.) Müll.Arg.	Shr|Tre|Lia
Euphorbiaceae	*Bernardia pulchella* (Baill.) Müll.Arg.	Shr
Euphorbiaceae	*Croton urucurana* Baill.	Tre
Euphorbiaceae	*Gymnanthes klotzschiana* Müll.Arg.	Shr|Tre
Euphorbiaceae	*Gymnanthes schottiana* Müll.Arg.	Shr|Tre
Euphorbiaceae	*Manihot grahamii* Hook.	Shr|Tre
Euphorbiaceae	*Pachystroma longifolium* (Nees) I.M.Johnst.	Tre
Euphorbiaceae	*Sapium glandulosum* (L.) Morong	Shr|Tre
Euphorbiaceae	*Sapium haematospermum* Müll.Arg.	Shr|Tre
Euphorbiaceae	*Sebastiania brasiliensis* Spreng.	Shr|Tre
Euphorbiaceae	*Tetrorchidium rubrivenium* Poepp.	Tre
Fabaceae	*Albizia burkartiana* Barneby & J.W.Grimes	Tre
Fabaceae	*Albizia edwallii* (Hoehne) Barneby & J.W.Grimes	Tre
Fabaceae	*Albizia inundata* (Mart.) Barneby & J.W.Grimes	Tre
Fabaceae	*Albizia niopoides* (Spruce ex Benth.) Burkart	Tre
Fabaceae	*Apuleia leiocarpa* (Vogel) J.F.Macbr.	Tre
Fabaceae	*Ateleia glazioveana* Baill.	Tre
Fabaceae	*Bauhinia forficata* Link	Tre
Fabaceae	*Bauhinia uruguayensis* Benth.	Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	Life Form
Fabaceae	*Calliandra brevipes* Benth.	Shr
Fabaceae	*Calliandra foliolosa* Benth.	Shr|Tre
Fabaceae	*Calliandra tweedii* Benth.	Shr|Tre
Fabaceae	*Cassia leptophylla* Vogel	Tre
Fabaceae	*Dahlstedtia muehlbergiana* (Hassl.) M.J.Silva & A.M.G. Azevedo	Tre
Fabaceae	*Enterolobium contortisiliquum* (Vell.) Morong	Tre
Fabaceae	*Erythrina crista-galli* L.	Tre
Fabaceae	*Erythrina falcata* Benth.	Tre
Fabaceae	*Geoffroea decorticans* (Gillies ex Hook. & Arn.) Burkart	Shr|Tre
Fabaceae	*Gleditsia amorphoides* (Griseb.) Taub.	Tre
Fabaceae	*Holocalyx balansae* Micheli	Tre
Fabaceae	*Inga marginata* Willd.	Tre
Fabaceae	*Inga sessilis* (Vell.) Mart.	Tre
Fabaceae	*Inga striata* Benth.	Tre
Fabaceae	*Inga vera* Willd.	Tre
Fabaceae	*Inga virescens* Benth.	Tre
Fabaceae	*Lonchocarpus cultratus* (Vell.) A.M.G.Azevedo & H.C.Lima	Tre
Fabaceae	*Lonchocarpus nitidus* (Vogel) Benth.	Tre
Fabaceae	*Machaerium hirtum* (Vell.) Stellfeld	Tre
Fabaceae	*Machaerium nyctitans* (Vell.) Benth.	Tre
Fabaceae	*Machaerium paraguariense* Hassl.	Tre
Fabaceae	*Machaerium stipitatum* Vogel	Tre
Fabaceae	*Mimosa bimucronata* (DC.) Kuntze	Shr|Tre
Fabaceae	*Mimosa incana* Benth.	Shr
Fabaceae	*Mimosa pilulifera* Benth.	Tre
Fabaceae	*Mimosa scabrella* Benth.	Tre
Fabaceae	*Muellera campestris* (Mart. ex Benth.) M.J. Silva & A.M.G. Azevedo	Tre
Fabaceae	*Myrocarpus frondosus* Allemão	Tre
Fabaceae	*Ormosia arborea* (Vell.) Harms	Tre
Fabaceae	*Parapiptadenia rigida* (Benth.) Brenan	Tre
Fabaceae	*Parkinsonia aculeata* L.	Shr|Tre
Fabaceae	*Peltophorum dubium* (Spreng.) Taub.	Tre
Fabaceae	*Poecilanthe parviflora* Benth.	Tre
Fabaceae	*Porlieria microphylla* (Baill.) Descole, O´Donell & Lourteig	Shr
Fabaceae	*Prosopis affinis* Spreng.	Tre
Fabaceae	*Prosopis nigra* Hiron.	Tre
Fabaceae	*Senegalia bonariensis* (Gillies ex Hook. & Arn.) Seigler & Ebinger	Shr|Lia
Fabaceae	*Senegalia praecox* (Griseb.) Seigler & Ebinger	Tre
Fabaceae	*Senna alata* (L.) Roxb.	Shr|Tre|SubShr
Fabaceae	*Senna araucarietorum* H.S.Irwin & Barneby	Shr

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion (Continua...)

Family	Species	Life Form
Fabaceae	*Senna corymbosa* (Lam.) H.S.Irwin & Barneby	Shr|SubShr
Fabaceae	*Senna macranthera* (DC. ex Collad.) H.S.Irwin & Barneby	Shr|Tre
Fabaceae	*Senna multijuga* (Rich.) H.S.Irwin & Barneby	Tre
Fabaceae	*Senna oblongifolia* (Vogel) H.S.Irwin & Barneby	Shr
Fabaceae	*Sesbania punicea* (Cav.) Benth.	Shr
Fabaceae	*Vachellia astringens* (Gillies ex Hook. & Arn.) Speg.	Shr|Tre
Fabaceae	*Vachellia caven* (Molina) Seigler & Ebinger	Shr
Fabaceae	*Vachellia farnesiana* (L.) Wight & Arn.	Shr
Lamiaceae	*Aegiphila brachiata* Vell.	Shr|Tre
Lamiaceae	*Aegiphila integrifolia* (Jacq.) Moldenke	Shr|Tre
Lamiaceae	*Aegiphila riedeliana* Schauer	Shr
Lamiaceae	*Vitex megapotamica* (Spreng.) Moldenke	Shr|Tre
Lauraceae	*Aiouea amoena* (Nees & Mart.) R. Rohde	Tre
Lauraceae	*Aiouea saligna* Meisn.	Tre
Lauraceae	*Aiouea sellowiana* (Ness & Mart.) Kosterm.	Tre
Lauraceae	*Cinnamomum pseudoglaziovii* (Lorea-Hern.) Van der Werff	Tre
Lauraceae	*Cryptocarya aschersoniana* Mez	Tre
Lauraceae	*Endlicheria paniculata* (Spreng.) J.F.Macbr.	Shr|Tre
Lauraceae	*Nectandra angustifolia* (Schrad.) Nees	Tre
Lauraceae	*Nectandra cissiflora* Nees	Tre
Lauraceae	*Nectandra grandiflora* Nees	Tre
Lauraceae	*Nectandra lanceolata* Nees	Tre
Lauraceae	*Nectandra megapotamica* (Spreng.) Mez	Tre
Lauraceae	*Nectandra oppositifolia* Nees	Tre
Lauraceae	*Ocotea acutifolia* (Nees) Mez	Tre
Lauraceae	*Ocotea catharinensis* Mez	Tre
Lauraceae	*Ocotea corymbosa* (Meisn.) Mez	Tre
Lauraceae	*Ocotea diospyrifolia* (Meisn.) Mez	Tre
Lauraceae	*Ocotea glaziovii* Mez	Tre
Lauraceae	*Ocotea indecora* (Schott) Mez	Shr|Tre
Lauraceae	*Ocotea lancifolia* (Schott) Mez	Tre
Lauraceae	*Ocotea odorifera* (Vell.) Rohwer	Tre
Lauraceae	*Ocotea porosa* (Nees & Mart.) Barroso	Tre
Lauraceae	*Ocotea puberula* (Rich.) Nees	Tre
Lauraceae	*Ocotea pulchella* (Nees & Mart.) Mez	Tre
Lauraceae	*Ocotea pulchra* Vattimo-Gil	Tre
Lauraceae	*Ocotea silvestris* Vattimo-Gil	Tre
Lauraceae	*Ocotea tristis* (Nees & Mart.) Mez	Shr|Tre
Lauraceae	*Persea venosa* Nees & Mart.	Tre
Loganiaceae	*Strychnos brasiliensis* Mart.	Shr|Tre|Lia
Lythraceae	*Lafoensia pacari* A.St.-Hil.	Tre
Magnoliaceae	*Magnolia ovata* (A.St.-Hil.) Spreng.	Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	Life Form
Malpighiaceae	*Bunchosia pallescens* Skottsb.	Shr|Tre
Malpighiaceae	*Byrsonima ligustrifolia* A.Juss.	Tre
Malpighiaceae	*Byrsonima niedenzuiana* Skottsb.	Tre
Malvaceae	*Abutilon grandifolium* (Willd.) Sweet	Shr
Malvaceae	*Ceiba speciosa* (A.St.-Hil.) Ravenna	Tre
Malvaceae	*Guazuma ulmifolia* Lam.	Tre
Malvaceae	*Heliocarpus popayanensis* Kunth	Tre
Malvaceae	*Luehea divaricata* Mart. & Zucc.	Tre
Malvaceae	*Pseudobombax grandiflorum* (Cav.) A.Robyns	Tre
Melastomataceae	*Leandra carassana* (DC.) Cogn.	Shr|Tre
Melastomataceae	*Leandra regnellii* (Triana) Cogn.	Shr|Tre
Melastomataceae	*Miconia cinerascens* Miq.	Tre
Melastomataceae	*Miconia hyemalis* A.St.-Hil. & Naudin	Shr|Tre
Melastomataceae	*Miconia petropolitana* Cogn.	Shr|Tre
Melastomataceae	*Miconia pusilliflora* (DC.) Naudin	Shr|Tre
Melastomataceae	*Miconia sellowiana* Naudin	Shr|Tre
Melastomataceae	*Pleroma trichopodum* DC.	Shr
Meliaceae	*Cabralea canjerana* (Vell.) Mart.	Shr|Tre
Meliaceae	*Cedrela fissilis* Vell.	Tre
Meliaceae	*Guarea macrophylla* Vahl	Tre
Meliaceae	*Trichilia casaretti* C.DC.	Tre
Meliaceae	*Trichilia catigua* A.Juss.	Tre
Meliaceae	*Trichilia clausseni* C.DC.	Tre
Meliaceae	*Trichilia elegans* A.Juss.	Shr|Tre
Monimiaceae	*Hennecartia omphalandra* J.Poiss.	Tre
Monimiaceae	*Mollinedia elegans* Tul.	Shr|Tre
Monimiaceae	*Mollinedia schottiana* (Spreng.) Perkins	Shr|Tre
Monimiaceae	*Mollinedia triflora* (Spreng.) Tul.	Tre
Moraceae	*Brosimum glaziovii* Taub.	Shr|Tre
Moraceae	*Brosimum lactescens* (S.Moore) C.C.Berg	Tre
Moraceae	*Ficus adhatodifolia* Schott in Spreng.	Tre
Moraceae	*Ficus cestrifolia* Schott ex Spreng.	Tre
Moraceae	*Ficus citrifolia* Mill.	Tre
Moraceae	*Ficus enormis* Mart. ex Miq.	Tre
Moraceae	*Ficus ernanii* Carauta et al.	Tre
Moraceae	*Ficus eximia* Schott	Tre
Moraceae	*Ficus luschnathiana* (Miq.) Miq.	Tre
Moraceae	*Ficus pertusa* L.f.	Tre
Moraceae	*Maclura tinctoria* (L.) D.Don ex Steud.	Shr|Tre
Moraceae	*Sorocea bonplandii* (Baill.) W.C.Burger et al.	Shr|Tre
Myrtaceae	*Blepharocalyx salicifolius* (Kunth) O.Berg	Shr|Tre
Myrtaceae	*Calyptranthes brasiliensis* Spreng.	Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	Life Form
Myrtaceae	*Calyptranthes concinna* DC.	Tre
Myrtaceae	*Calyptranthes tricona* D.Legrand	Tre
Myrtaceae	*Campomanesia guaviroba* (DC.) Kiaersk.	Tre
Myrtaceae	*Campomanesia guazumifolia* (Cambess.) O.Berg	Tre
Myrtaceae	*Campomanesia xanthocarpa* (Mart.) O.Berg	Tre
Myrtaceae	*Eugenia bacopari* D.Legrand	Tre
Myrtaceae	*Eugenia brevistyla* D.Legrand	Tre
Myrtaceae	*Eugenia burkartiana* (D.Legrand) D.Legrand	Tre
Myrtaceae	*Eugenia florida* DC.	Shr|Tre
Myrtaceae	*Eugenia hiemalis* Cambess.	Shr|Tre
Myrtaceae	*Eugenia involucrata* DC.	Shr|Tre|SubShr
Myrtaceae	*Eugenia mansoi* O.Berg	Shr|Tre
Myrtaceae	*Eugenia multicostata* D.Legrand	Tre
Myrtaceae	*Eugenia myrcianthes* Nied.	Shr|Tre
Myrtaceae	*Eugenia oeidocarpa* O.Berg	Tre
Myrtaceae	*Eugenia paracatuana* O.Berg	Tre
Myrtaceae	*Eugenia pluriflora* DC.	Tre
Myrtaceae	*Eugenia pyriformis* Cambess.	Shr|Tre|SubShr
Myrtaceae	*Eugenia ramboi* D.Legrand	Tre
Myrtaceae	*Eugenia repanda* O.Berg	Shr|Tre
Myrtaceae	*Eugenia rostrifolia* D.Legrand	Tre
Myrtaceae	*Eugenia speciosa* Cambess.	Tre
Myrtaceae	*Eugenia subterminalis* DC.	Tre
Myrtaceae	*Eugenia uniflora* L.	Shr
Myrtaceae	*Eugenia uruguayensis* Cambess.	Tre
Myrtaceae	*Eugenia verticillata* (Vell.) Angely	Shr
Myrtaceae	*Feijoa sellowiana* (O.Berg) O.Berg	Tre
Myrtaceae	*Myrceugenia campestris* (DC.) D.Legrand & Kausel	Tre
Myrtaceae	*Myrceugenia cucullata* D.Legrand	Tre
Myrtaceae	*Myrceugenia euosma* (O.Berg) D.Legrand	Tre
Myrtaceae	*Myrceugenia glaucescens* (Cambess.) D.Legrand & Kausel	Tre
Myrtaceae	*Myrceugenia mesomischa* (Burret) D.Legrand & Kausel	Tre
Myrtaceae	*Myrceugenia myrcioides* (Cambess.) O.Berg	Tre
Myrtaceae	*Myrceugenia myrtoides* O.Berg	Tre
Myrtaceae	*Myrcia brasiliensis* Kiaersk.	Tre
Myrtaceae	*Myrcia catharinensis* (D.Legrand) NicLugh.	Tre
Myrtaceae	*Myrcia glabra* (O.Berg) D.Legrand	Tre
Myrtaceae	*Myrcia guianensis* (Aubl.) DC.	Tre
Myrtaceae	*Myrcia hartwegiana* (O.Berg) Kiaersk.	Tre
Myrtaceae	*Myrcia hatschbachii* D.Legrand	Tre
Myrtaceae	*Myrcia lajeana* D.Legrand	Tre
Myrtaceae	*Myrcia laruotteana* Cambess.	Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	Life Form
Myrtaceae	*Myrcia multiflora* (Lam.) DC.	Shr|Tre
Myrtaceae	*Myrcia oblongata* DC.	Shr|Tre
Myrtaceae	*Myrcia palustris* DC.	Tre
Myrtaceae	*Myrcia selloi* (Spreng.) N.Silveira	Shr|Tre
Myrtaceae	*Myrcia splendens* (Sw.) DC.	Tre
Myrtaceae	*Myrcia tijucensis* Kiaersk.	Tre
Myrtaceae	*Myrcia undulata* O.Berg	Tre
Myrtaceae	*Myrcianthes cisplatensis* (Cambess.) O.Berg	Tre
Myrtaceae	*Myrcianthes gigantea* (D.Legrand) D.Legrand	Tre
Myrtaceae	*Myrcianthes pungens* (O.Berg) D.Legrand	Tre
Myrtaceae	*Myrciaria cuspidata* O.Berg	Tre
Myrtaceae	*Myrciaria delicatula* (DC.) O.Berg	Tre
Myrtaceae	*Myrciaria floribunda* (H.West ex Willd.) O.Berg	Tre
Myrtaceae	*Myrciaria plinioides* D.Legrand	Tre
Myrtaceae	*Myrciaria tenella* (DC.) O.Berg	Tre
Myrtaceae	*Myrrhinium atropurpureum* Schott	Shr|Tre
Myrtaceae	*Neomitranthes gemballae* (D.Legrand) D.Legrand	Tre
Myrtaceae	*Plinia peruviana* (Poir.) Govaerts	Tre
Myrtaceae	*Plinia rivularis* (Cambess.) Rotman	Tre
Myrtaceae	*Psidium cattleianum* Sabine	Shr|Tre
Myrtaceae	*Psidium longipetiolatum* D.Legrand	Tre
Nyctaginaceae	*Guapira hirsuta* (Choisy) Lundell	Shr|Tre|SubShr
Nyctaginaceae	*Guapira opposita* (Vell.) Reitz	Shr|Tre
Nyctaginaceae	*Pisonia aculeata* L.	Lia
Nyctaginaceae	*Pisonia zapallo* Griseb.	Tre
Oleaceae	*Chionanthus filiformis* (Vell.) P.S.Green	Tre
Oleaceae	*Chionanthus trichotomus* (Vell.) P.S.Green	Tre
Opiliaceae	*Agonandra excelsa* Griseb.	Shr|Tre
Phytolaccaceae	*Phytolacca dioica* L.	Tre
Phytolaccaceae	*Seguieria americana* L.	Shr
Phytolaccaceae	*Seguieria langsdorffii* Moq.	Tre
Picramniaceae	*Picramnia parvifolia* Engl.	Shr|Tre
Picramniaceae	*Picramnia sellowii* Planch.	Shr|Tre
Piperaceae	*Piper aduncum* L.	Shr|Tre
Piperaceae	*Piper amalago* L.	Shr
Piperaceae	*Piper arboreum* Aubl.	Shr
Piperaceae	*Piper hispidum* Sw.	Shr
Piperaceae	*Piper mollicomum* Kunth	Shr
Poaceae	*Guadua chacoensis* (Rojas Acosta) Londoño & P.M.Peterson	Bam
Poaceae	*Guadua paraguayana* Döll	Bam
Poaceae	*Guadua trinii* (Nees) Nees ex Rupr.	Bam
Podocarpaceae	*Podocarpus lambertii* Klotzsch ex Endl.	Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	**Species**	**Life Form**
Polygonaceae	*Coccoloba argentinensis* Speg.	Shr
Polygonaceae	*Coccoloba cordata* Cham.	Shr|Tre
Polygonaceae	*Ruprechtia laxiflora* Meisn.	Tre
Polygonaceae	*Ruprechtia salicifolia* (Cham. & Schltdl.) A.C.Meyer	Tre
Primulaceae	*Myrsine balansae* (Mez) Otegui	Tre
Primulaceae	*Myrsine coriacea* (Sw.) R.Br. ex Roem. & Schult.	Shr|Tre
Primulaceae	*Myrsine gardneriana* A.DC.	Shr
Primulaceae	*Myrsine guianensis* (Aubl.) Kuntze	Shr|Tre
Primulaceae	*Myrsine laetevirens* (Mez) Arechav.	Tre
Primulaceae	*Myrsine loefgrenii* (Mez) Imkhan.	Tre
Primulaceae	*Myrsine parvifolia* A.DC.	Shr
Primulaceae	*Myrsine parvula* (Mez) Otegui	Tre
Primulaceae	*Myrsine umbellata* Mart.	Tre
Primulaceae	*Myrsine venosa* A.DC.	Shr|Tre
Proteaceae	*Roupala montana* Aubl.	Shr|Tre
Quillajaceae	*Quillaja lancifolia* D.Don	Tre
Rhamnaceae	*Colletia paradoxa* (Spreng.) Escal.	Shr
Rhamnaceae	*Colubrina glandulosa* Perkins	Tre
Rhamnaceae	*Condalia buxifolia* Reissek	Shr|Tre
Rhamnaceae	*Scutia buxifolia* Reissek	Shr|Tre
Rosaceae	*Prunus myrtifolia* (L.) Urb.	Tre
Rubiaceae	*Chomelia obtusa* Cham. & Schltdl.	Shr|Tre
Rubiaceae	*Coussarea contracta* (Walp.) Müll.Arg.	Shr|Tre
Rubiaceae	*Coutarea hexandra* (Jacq.) K.Schum.	Shr|Tre
Rubiaceae	*Faramea montevidensis* (Cham. & Schltdl.) DC.	Shr|Tre
Rubiaceae	*Faramea porophylla* (Vell.) Müll.Arg.	Desconhecida
Rubiaceae	*Guettarda uruguensis* Cham. & Schltdl.	Shr
Rubiaceae	*Machaonia acuminata* Bonpl.	Shr|Tre
Rubiaceae	*Palicourea mamillaris* (Müll.Arg.) C.M.Taylor	Shr|Tre
Rubiaceae	*Posoqueria latifolia* (Rudge) Schult.	Shr|Tre
Rubiaceae	*Psychotria carthagenensis* Jacq.	Shr|Tre
Rubiaceae	*Psychotria suterella* Müll.Arg.	Shr
Rubiaceae	*Randia calycina* Cham.	Shr
Rubiaceae	*Randia ferox* (Cham. & Schltdl.) DC.	Tre
Rubiaceae	*Rudgea coriacea* (Spreng.) K.Schum.	Shr|Tre
Rutaceae	*Balfourodendron riedelianum* (Engl.) Engl.	Tre
Rutaceae	*Esenbeckia grandiflora* Mart.	Shr|Tre
Rutaceae	*Esenbeckia hieronymi* Engl.	Tre
Rutaceae	*Helietta apiculata* Benth.	Tre
Rutaceae	*Pilocarpus pennatifolius* Lem.	Tre
Rutaceae	*Zanthoxylum caribaeum* Lam.	Tre
Rutaceae	*Zanthoxylum fagara* (L.) Sarg.	Tre

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	**Species**	**Life Form**
Rutaceae	*Zanthoxylum kleinii* (R.S.Cowan) P.G.Waterman	Shr|Tre
Rutaceae	*Zanthoxylum petiolare* A.St.-Hil. & Tul.	Tre
Rutaceae	*Zanthoxylum rhoifolium* Lam.	Tre
Sabiaceae	*Meliosma sellowii* Urb.	Tre
Salicaceae	*Azara uruguayensis* (Speg.) Sleumer	Shr|Tre
Salicaceae	*Banara parviflora* (A.Gray) Benth.	Tre
Salicaceae	*Banara tomentosa* Clos	Shr|Tre
Salicaceae	*Banara umbraticola* Arechav.	Tre
Salicaceae	*Casearia decandra* Jacq.	Shr|Tre
Salicaceae	*Casearia sylvestris* Sw.	Shr|Tre|SubShr
Salicaceae	*Salix humboldtiana* Willd.	Tre
Salicaceae	*Xylosma ciliatifolia* (Clos) Eichler	Shr|Tre
Salicaceae	*Xylosma prockia* (Turcz.) Turcz.	Shr|Tre
Salicaceae	*Xylosma schroederi* Sleumer ex Herter	Shr|Tre
Salicaceae	*Xylosma tweediana* (Clos) Eichler	Shr|Tre
Santalaceae	*Acanthosyris spinescens (Mart. & Eichler) Griseb.*	Shr|Tre
Santalaceae	*Jodina rhombifolia* (Hook. & Arn.) Reissek	Shr|Tre
Sapindaceae	*Allophylus edulis* (A.St.-Hil. et al.) Hieron. ex Niederl.	Shr|Tre
Sapindaceae	*Allophylus guaraniticus* (A. St.-Hil.) Radlk.	Shr|Tre
Sapindaceae	*Cupania oblongifolia* Mart.	Tre
Sapindaceae	*Cupania vernalis* Cambess.	Tre
Sapindaceae	*Diatenopteryx sorbifolia* Radlk.	Tre
Sapindaceae	*Dodonaea viscosa* Jacq.	Shr|Tre|SubShr
Sapindaceae	*Matayba elaeagnoides* Radlk.	Shr|Tre
Sapindaceae	*Matayba intermedia* Radlk.	Shr|Tre
Sapotaceae	*Chrysophyllum gonocarpum* (Mart. & Eichler ex Miq.) Engl.	Tre
Sapotaceae	*Chrysophyllum marginatum* (Hook. & Arn.) Radlk.	Shr|Tre
Sapotaceae	*Chrysophyllum viride* Mart. & Eichler	Tre
Sapotaceae	*Pouteria gardneriana* (A.DC.) Radlk.	Shr|Tre
Sapotaceae	*Pouteria salicifolia* (Spreng.) Radlk.	Tre
Sapotaceae	*Sideroxylon obtusifolium* (Roem. & Schult.) T.D.Penn.	Shr|Tre
Scrophulariaceae	*Buddleja stachyoides* Cham. & Schltdl.	
Simaroubaceae	*Castela tweedii* Planch.	Shr
Simaroubaceae	*Picrasma crenata* (Vell.) Engl.	Tre
Solanaceae	*Athenaea fasciculata* (Vell.) I.M.C. Rodrigues & Stehmann	Shr
Solanaceae	*Brunfelsia australis* Benth.	Shr
Solanaceae	*Cestrum bracteatum* Link & Otto	Shr
Solanaceae	*Cestrum euanthes* Schltdl.	Shr
Solanaceae	*Cestrum intermedium* Sendtn.	Shr|Tre
Solanaceae	*Cestrum mariquitense* Kunth	Shr
Solanaceae	*Cestrum strigilatum* Ruiz & Pav.	Shr|Tre
Solanaceae	*Iochroma arborescens* (L.) J.M.H. Shaw	Shr

Table 1 – SM. List of species occurring in the 106 sites of the NeoTropTree (NTT) in the Uruguayan-Brazilian Pampa Ecoregion

(Conclusão)

Family	**Species**	**Life Form**
Solanaceae	*Lycium boerhaaviifolium* L.f.	Shr
Solanaceae	*Lycium cestroides* Schltdl	Shr
Solanaceae	*Cestrum parqui* L'Hér.	Shr
Solanaceae	*Solanum caavurana* Vell.	Shr
Solanaceae	*Solanum compressum* L.B.Sm. & Downs	Tre
Solanaceae	*Solanum didymum* Dunal	Shr
Solanaceae	*Solanum diploconos* (Mart.) Bohs	Shr|Tre
Solanaceae	*Solanum granulosoleprosum* Dunal	Tre
Solanaceae	*Solanum mauritianum* Scop.	Shr|Tre
Solanaceae	*Solanum paranense* Dusén	Shr|Tre
Solanaceae	*Solanum pseudoquina* A.St.-Hil.	Tre
Solanaceae	*Solanum ramulosum* Sendtn.	Shr
Solanaceae	*Solanum reitzii* L.B.Sm. & Downs	Tre
Solanaceae	*Solanum sanctae-catharinae* Dunal	Tre
Solanaceae	*Solanum variabile* Mart.	Shr|Tre
Solanaceae	*Vassobia breviflora* (Sendtn.) Hunz.	Shr
Styracaceae	*Styrax acuminatus* Pohl	Tre
Styracaceae	*Styrax leprosus* Hook. & Arn.	Tre
Symplocaceae	*Symplocos tetrandra* Mart.	Shr|Tre
Symplocaceae	*Symplocos uniflora* (Pohl) Benth.	Shr|Tre
Theaceae	*Laplacea fruticosa* (Schrad.) Kobuski	Shr|Tre
Thymelaeaceae	*Daphnopsis racemosa* Griseb.	Shr|Tre
Urticaceae	*Boehmeria caudata* Sw.	Shr|SubShr
Urticaceae	*Cecropia glaziovii* Snethl.	Tre
Urticaceae	*Cecropia pachystachya* Trécul	Tre
Urticaceae	*Coussapoa microcarpa* (Schott) Rizzini	Shr|Tre
Urticaceae	*Urera aurantiaca* Wedd.	Shr|Lia
Urticaceae	*Urera baccifera* (L.) Gaudich. ex Wedd.	Shr|Tre
Verbenaceae	*Aloysia virgata* (Ruiz & Pav.) Juss.	Shr|Tre
Verbenaceae	*Citharexylum montevidense* (Spreng.) Moldenke	Tre
Verbenaceae	*Citharexylum myrianthum* Cham.	Tre
Verbenaceae	*Citharexylum solanaceum* Cham.	Tre
Verbenaceae	*Recordia reitzii* (Moldenke) N.O'Leary & V.Thode	Tre
Winteraceae	*Drimys brasiliensis* Miers	Tre

Source: Authors (2023). Legend: Shr = shrub; Tre = tree; Pal = palm; Her = herb; SubShr = Subshrub; Suc = succulent; Bam = bamboo; Lia = liana/scandent/vine

Table 2 – SM. List of indicator species of forest formations in the Uruguayan-Brazilian Pampa Ecoregion with significant IndVal ($p < 0.05$)

(Continua...)

Group	Species	IndVal	p
SWV	*Prosopis nigra* Hiron.	0.94	0.001
SWV	*Albizia inundata* (Mart.) Barneby & J.W.Grimes	0.90	0.001
SWV	*Aspidosperma quebracho-blanco* Schltdl.	0.90	0.001
SWV	*Prosopis affinis* Spreng.	0.84	0.001
SWV	*Parkinsonia aculeata* L.	0.69	0.001
SWV	*Gleditsia amorphoides* (Griseb.) Taub.	0.67	0.001
SWV	*Lycium cestroides* Schltdl	0.61	0.001
SWV	*Senegalia praecox* (Griseb.) Seigler & Ebinger	0.59	0.004
SWV	*Vachellia caven* (Molina) Seigler & Ebinger *	0.54	0.001
SWV	*Lycium boerhaaviifolium* L.f.	0.52	0.033
SWV	*Berberis ruscifolia* Lam.	0.52	0.007
SWV	*Vachellia farnesiana* (L.) Wight & Arn.	0.52	0.008
SWV	*Pouteria salicifolia* (Spreng.) Radlk.	0.44	0.003
SWV	*Lithraea molleoides* (Vell.) Engl.	0.43	0.001
SWV	*Ruprechtia salicifolia* (Cham. & Schltdl.) A.C.Meyer	0.42	0.046
SWV	*Myrcianthes cisplatensis* (Cambess.) O.Berg	0.39	0.019
SWV	*Scutia buxifolia* Reissek	0.30	0.021
MNF	*Cinnamodendron dinisii* Schwacke	1.00	0.001
MNF	*Oreopanax fulvus* Marchal	1.00	0.001
MNF	*Araucaria angustifolia* (Bertol.) Kuntze	0.97	0.001
MNF	*Lamanonia ternata* Vell.	0.90	0.003
MNF	*Annona rugulosa* (Schltdl.) H.Rainer	0.89	0.002
MNF	*Balfourodendron riedelianum* (Engl.) Engl.	0.86	0.004
MNF	*Piptocarpha angustifolia* Dusén ex Malme	0.86	0.003
MNF	*Handroanthus albus* (Cham.) Mattos	0.83	0.003
MNF	*Albizia edwallii* (Hoehne) Barneby & J.W.Grimes	0.79	0.003
MNF	*Ateleia glazioveana* Baill. *	0.79	0.007
MNF	*Jacaranda micrantha* Cham.	0.79	0.003
MNF	*Solanum ramulosum* Sendtn.	0.79	0.005
MNF	*Ilex paraguariensis* A.St.-Hil.	0.77	0.002
MNF	*Aspidosperma australe* Müll.Arg.	0.76	0.003
MNF	*Baccharis microdonta* DC.	0.75	0.002
MNF	*Erythrina falcata* Benth.	0.72	0.012
MNF	*Campomanesia guazumifolia* (Cambess.) O.Berg	0.71	0.001
MNF	*Machaerium stipitatum* Vogel	0.70	0.006
MNF	*Cestrum euanthes* Schltdl.	0.69	0.002
MNF	*Myrcia oblongata* DC.	0.69	0.002
MNF	*Myrocarpus frondosus* Allemão	0.69	0.003
MNF	*Helietta apiculata* Benth.	0.67	0.001
MNF	*Vasconcellea quercifolia* A.St.-Hil.	0.66	0.002
MNF	*Cordia trichotoma* (Vell.) Arráb. ex Steud.	0.62	0.005
MNF	*Schinus terebinthifolia* Raddi	0.62	0.017
MNF	*Ilex brevicuspis* Reissek	0.62	0.002
MNF	*Erythroxylum deciduum* A.St.-Hil.	0.61	0.011
MNF	*Cestrum intermedium* Sendtn.	0.61	0.014
MNF	*Nectandra lanceolata* Nees	0.61	0.002
MNF	*Allophylus guaraniticus* (A. St.-Hil.) Radlk.	0.57	0.001
MNF	*Myrciaria tenella* (DC.) O.Berg	0.57	0.001
MNF	*Myrsine loefgrenii* (Mez) Imkhan.	0.56	0.001
MNF	*Parapiptadenia rigida* (Benth.) Brenan	0.56	0.001
MNF	*Myrceugenia euosma* (O.Berg) D.Legrand	0.55	0.001
MNF	*Bauhinia forficata* Link	0.54	0.001
MNF	*Vassobia breviflora* (Sendtn.) Hunz.	0.53	0.008
MNF	*Cedrela fissilis* Vell.	0.52	0.002
MNF	*Annona neosalicifolia* H.Rainer	0.52	0.001

Table 2 – SM. List of indicator species of forest formations in the Uruguayan-Brazilian Pampa Ecoregion with significant IndVal ($p < 0.05$)

(Continua...)

Group	Species	IndVal	p
MNF	*Banara tomentosa* Clos	0.51	0.003
MNF	*Cabralea canjerana* (Vell.) Mart.	0.51	0.001
MNF	*Butia eriospatha* (Mart. ex Drude) Becc.	0.50	0.022
MNF	*Clethra scabra* Pers.	0.50	0.020
MNF	*Ocotea corymbosa* (Meisn.) Mez	0.50	0.017
MNF	*Psidium longipetiolatum* D.Legrand	0.50	0.025
MNF	*Senna araucarietorum* H.S.Irwin & Barneby	0.50	0.022
MNF	*Solanum compressum* L.B.Sm. & Downs	0.50	0.014
MNF	*Solanum reitzii* L.B.Sm. & Downs	0.50	0.022
MNF	*Myrsine gardneriana* A.DC.	0.49	0.038
MNF	*Strychnos brasiliensis* Mart.	0.48	0.004
MNF	*Coussarea contracta* (Walp.) Müll.Arg.	0.47	0.033
MNF	*Guadua paraguayana* Döll	0.47	0.033
MNF	*Ocotea pulchra* Vattimo-Gil	0.47	0.031
MNF	*Plinia peruviana* (Poir.) Govaerts	0.47	0.026
MNF	*Psychotria suterella* Müll.Arg.	0.47	0.040
MNF	*Zanthoxylum kleinii* (R.S.Cowan) P.G.Waterman	0.47	0.023
MNF	*Phytolacca dioica* L.	0.47	0.004
MNF	*Trichilia elegans* A.Juss.	0.47	0.005
MNF	*Piptocarpha axillaris* (Less.) Baker	0.46	0.026
MNF	*Baccharis montana* DC.	0.45	0.042
MNF	*Citharexylum solanaceum* Cham.	0.45	0.031
MNF	*Eugenia involucrata* DC.	0.44	0.002
MNF	*Ilex microdonta* Reissek	0.43	0.041
MNF	*Cordia americana* (L.) Gottschling & J.S.Mill.	0.43	0.001
MNF	*Baccharis semiserrata* DC.	0.41	0.034
MNF	*Mimosa scabrella* Benth.	0.41	0.038
MNF	*Matayba elaeagnoides* Radlk.	0.41	0.001
MNF	*Moquiniastrum polymorphum* (Less.) G. Sancho	0.41	0.001
MNF	*Ficus pertusa* L.f.	0.41	0.033
MNF	*Zanthoxylum petiolare* A.St.-Hil. & Tul.	0.41	0.038
MNF	*Schinus lentiscifolia* Marchand	0.41	0.003
MNF	*Ocotea puberula* (Rich.) Nees	0.40	0.001
MNF	*Campomanesia xanthocarpa* (Mart.) O.Berg	0.40	0.001
MNF	*Solanum mauritianum* Scop.	0.38	0.023
MNF	*Albizia niopoides* (Spruce ex Benth.) Burkart	0.38	0.048
MNF	*Leandra regnellii* (Triana) Cogn	0.38	0.039
MNF	*Calliandra foliolos*a Benth.	0.37	0.037
MNF	*Senna oblongifolia* (Vogel) H.S.Irwin & Barneby	0.37	0.027
MNF	*Handroanthus chrysotrichus* (Mart. ex DC.) Mattos	0.36	0.046
MNF	*Picramnia parvifolia* Engl.	0.36	0.040
MNF	*Ficus luschnathiana* (Miq.) Miq.	0.36	0.002
MNF	*Zanthoxylum rhoifolium* Lam.	0.36	0.012
MNF	*Diatenopteryx sorbifolia* Radlk.	0.35	0.043
MNF	*Myrsine umbellata* Mart.	0.34	0.038
MNF	*Aiouea amoena* (Nees & Mart.) R. Rohde	0.33	0.045
MNF	*Nectandra megapotamica* (Spreng.) Mez	0.33	0.002
MNF	*Ocotea pulchella* (Nees & Mart.) Mez	0.33	0.046
MNF	*Luehea divaricata* Mart. & Zucc.	0.32	0.002
MNF	*Sapium glandulosum* (L.) Morong	0.32	0.035
MNF	*Xylosma tweediana* (Clos) Eichler	0.32	0.001
MNF	*Syagrus romanzoffiana* (Cham.) Glassman	0.31	0.023
MNF	*Cupania vernalis* Cambess.	0.31	0.002
MNF	*Vitex megapotamica* (Spreng.) Moldenke	0.31	0.024
MNF	*Lithraea brasiliensis* Marchand	0.30	0.045

Table 2 – SM. List of indicator species of forest formations in the Uruguayan-Brazilian Pampa Ecoregion with significant IndVal ($p < 0.05$)

(Conclusão)

Group	Species	IndVal	p
MNF	*Casearia sylvestris* Sw.	0.29	0.010
MNF	*Gymnanthes klotzschiana* Müll.Arg.	0.26	0.008
MNF	*Blepharocalyx salicifolius* (Kunth) O.Berg	0.26	0.003
MNF	*Allophylus edulis* (A.St.-Hil. et al.) Hieron. ex Niederl.	0.24	0.041
SSFAD	*Annona sylvatica* A.St.-Hil.	0.71	0.001
SSFAD	*Solanum pseudoquina* A.St.-Hil.	0.53	0.001
SSFAD	*Myrcia glabra* (O.Berg) D.Legrand	0.53	0.032
SSFAD	*Sorocea bonplandii* (Baill.) W.C.Burger et al.	0.52	0.001
SSFAD	*Actinostemon concolor* (Spreng.) Müll.Arg.	0.48	0.001
SSFAD	*Chrysophyllum gonocarpum* (Mart. & Eichler ex Miq.) Engl.	0.44	0.032
SSFAD	*Miconia pusilliflora* (DC.) Naudin	0.44	0.034
SSFAD	*Nectandra oppositifolia* Nees	0.43	0.029
SSFAD	*Inga marginata* Willd.	0.42	0.033
SSFAD	*Roupala montana* Aubl.	0.42	0.041
SSFAD	*Pachystroma longifolium* (Nees) I.M.Johnst.	0.41	0.048
SSFAD	*Myrcia palustris* DC.	0.40	0.001
SSFAD	*Styrax leprosus* Hook. & Arn.	0.37	0.010
SSFPD	*Celtis tala* Gillies ex Planch.	0.47	0.049
SSFPD	*Citharexylum montevidense* (Spreng.) Moldenke	0.42	0.001
SSFPD	*Myrceugenia glaucescens* (Cambess.) D.Legrand & Kausel	0.41	0.037
CSM	*Myrsine parvifolia* A.DC.	0.89	0.001
CSM	*Annona maritima* (Záchia) H.Rainer	0.76	0.002
CSM	*Psidium cattleianum* Sabine	0.50	0.001
CSM	*Ficus cestrifolia* Schott ex Spreng.	0.47	0.001
CSM	*Ilex pseudobuxus* Reissek	0.34	0.043
CSM	*Eugenia uruguayensis* Cambess.	0.29	0.007

Source: Authors (2023). Legend: SWV = Savanoid-woodland Vegetation; MNF = Mixed Needle-broadleaved Forest; SSFAD = Seasonal Semideciduous Forest of Atlantic Domain; SSFPD = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic; * = species with use restriction due to the potential to be invasive on grasslands formations

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Adoxaceae	*Sambucus australis* Cham. & Schltdl.	0%	50%	19%	20%	0%	Tre	Med
Anacardiaceae	*Astronium balansae* Engl.	0%	0%	14%	7%	0%	Tre	Sil Res Woo Con EcSu Orn
Anacardiaceae	*Schinus molle* L.	33%	0%	78%	70%	6%	Shr Tre	Res Med EcSu Orn
Anacardiaceae	*Schinus terebinthifolia* Raddi	0%	100%	41%	4%	17%	Tre	Res Foo EcSu
Annonaceae	*Annona emarginata* (Schltdl.) H.Rainer	0%	0%	22%	20%	0%	Shr Tre	AgHo Foo

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Annonaceae	*Annona maritima* (Záchia) H.Rainer	0%	0%	0%	2%	78%	Shr Tre	AgHo Foo
Annonaceae	*Annona neosalicifolia* H.Rainer	0%	100%	57%	37%	0%	Tre	AgHo Foo
Annonaceae	*Annona rugulosa* (Schltdl.) H.Rainer	0%	100%	11%	2%	0%	Tre	AgHo Foo
Annonaceae	*Annona sylvatica* A.St.-Hil.	0%	0%	86%	20%	0%	Tre	Res AgHo Foo
Apocynaceae	*Aspidosperma quebracho-blanco* Schltdl.		0%	0%	11%	0%	Tre	Woo Con Orn
Apocynaceae	*Aspidosperma riedelii* Müll.Arg.	0%	0%	3%	0%	0%	Shr Tre	Con
Apocynaceae	*Tabernaemontana catharinensis* A.DC.	33%	0%	35%	24%	0%	Shr Tre	Res Med Orn
Aquifoliaceae	*Ilex brevicuspis* Reissek	0%	100%	62%	0%	0%	Tre	Res EcSu
Aquifoliaceae	*Ilex paraguariensis* A.St.-Hil.	0%	100%	22%	9%	0%	Tre	Res AgHo Foo
Araliaceae	*Aralia warmingiana* (Marchal) J.Wen	0%	0%	5%	0%	0%	Tre	Orn
Araliaceae	*Schefflera calva* (Cham.) Frodin & Fiaschi	0%	0%	24%	2%	0%	Tre	Woo Orn
Araucariaceae	*Araucaria angustifolia* (Bertol.) Kuntze	0%	100%	3%	0%	0%	Tre	Sil Res AgHo Foo Woo Con Orn
Arecaceae	*Acrocomia aculeata* (Jacq.) Lodd. ex Mart.	0%	0%	0%	17%	0%	Pal	Foo Ole
Arecaceae	*Bactris setosa* Mart.	0%	0%	22%	0%	6%	Pal	AgHo Foo Con
Arecaceae	*Butia catarinensis* Noblick & Lorenzi	0%	0%	8%	0%	0%	Pal	AgHo Foo MePo Con Orn
Arecaceae	*Butia eriospatha* (Mart. ex Drude) Becc.	0%	50%	0%	0%	0%	Pal	AgHo Foo MePo Cra Con Orn
Arecaceae	*Butia odorata* (Barb. Rodr.) Noblick	0%	0%	49%	33%	33%	Pal	AgHo Foo MePo Cra Con Orn
Arecaceae	*Butia witeckii* K. Soares & S. Longhi	0%	0%	11%	0%	0%	Pal	AgHo Foo MePo Orn
Arecaceae	*Butia yatay* (Mart.) Becc.	33%	0%	11%	50%	0%	Pal	AgHo Foo MePo Cra Con Orn

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Arecaceae	*Euterpe edulis* Mart.	0%	0%	8%	0%	0%	Pal	AgHo Foo Con Orn
Arecaceae	*Geonoma schottiana* Mart.	0%	0%	24%	0%	39%	Pal	AgHo Con Orn
Arecaceae	*Syagrus romanzoffiana* (Cham.) Glassman	0%	100%	92%	61%	67%	Pal	Foo MePo Orn
Arecaceae	*Trithrinax brasiliensis* Mart.	0%	0%	19%	2%	0%	Pal	Con Orn
Asparagaceae	*Cordyline spectabilis* Kunth & Bouché	0%	0%	8%	2%	0%	Tre	Orn
Asteraceae	*Baccharis dracunculifolia* DC.	33%	50%	57%	50%	6%	Shr	Res MePo Med EcSu
Asteraceae	*Moquiniastrum polymorphum* (Less.) G. Sancho	0%	100%	86%	57%	0%	Tre Shr	Res MePo Med EcSu
Asteraceae	*Piptocarpha angustifolia* Dusén ex Malme	0%	100%	16%	0%	0%	Tre Shr	Res EcSu
Bignoniaceae	*Cybistax antisyphilitica* (Mart.) Mart.	0%	0%	24%	0%	0%	Tre	Orn
Bignoniaceae	*Handroanthus albus* (Cham.) Mattos	0%	100%	16%	4%	0%	Tre	Res Woo Orn
Bignoniaceae	*Handroanthus heptaphyllus* (Vell.) Mattos	0%	0%	24%	26%	0%	Tre	Res Woo Orn
Bignoniaceae	*Handroanthus pulcherrimus* (Sandwith) Mattos	0%	0%	30%	0%	28%	Tre	Orn
Bignoniaceae	*Jacaranda micrantha* Cham.	0%	100%	27%	0%	0%	Tre	Orn
Boraginaceae	*Cordia americana (L.)* Gottschling & J.S.Mill.	0%	100%	84%	46%	6%	Tre	Res Woo Orn
Boraginaceae	*Cordia trichotoma* (Vell.) Arráb. ex Steud.	0%	100%	57%	4%	0%	Tre	Res Woo
Cactaceae	*Cereus hildmannianus* K.Schum.	0%	0%	43%	0%	11%	Shr Tre	Foo Orn
Cactaceae	*Cereus uruguayanus* R. Kiesling	0%	0%	0%	26%	56%	Shr Suc	Foo
Cactaceae	*Pereskia nemorosa* Rojas Acosta	0%	0%	0%	20%	0%	Shr	AgHo Foo
Cannabaceae	*Celtis iguanaea* (Jacq.) Sarg.	67%	100%	81%	74%	72%	Shr Tre	Foo
Cannabaceae	*Celtis tala* Gillies ex Planch.	0%	0%	22%	63%	0%	Tre Shr	Sil Foo Orn
Cannabaceae	*Trema micrantha* (L.) Blume	0%	50%	68%	15%	0%	Tre	Res EcSu

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguay-an-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Caricaceae	*Jacaratia spinosa* (Aubl.) A.DC.	0%	0%	5%	0%	0%	Tre	AgHo Foo
Caricaceae	*Vasconcellea quercifolia* A.St.-Hil.	0%	100%	41%	11%	0%	Shr Tre	AgHo Foo
Celastraceae	*Monteverdia ilicifolia* (Mart. ex Reissek) Biral	67%	50%	57%	78%	0%	Shr Tre	AgHo Med
Clusiaceae	*Clusia criuva* Cambess.	0%	0%	3%	0%	0%	Shr Tre	Con
Clusiaceae	*Garcinia gardneriana* (Planch. & Triana) Zappi	0%	0%	30%	0%	11%	Tre	Foo
Combretaceae	*Terminalia australis* Cambess.	0%	0%	54%	39%	6%	Tre	Res Riv
Dicksoniaceae	*Dicksonia sellowiana* Hook.	0%	50%	38%	9%	0%	Tre	Con Orn
Ericaceae	*Gaylussacia brasiliensis* (Spreng.) Meisn.	0%	0%	0%	0%	28%	Shr Tre	Foo
Escalloniaceae	*Escallonia bifida* Link & Otto	0%	50%	32%	26%	6%	Shr Tre	Res Orn
Euphorbiaceae	*Gymnanthes klotzschiana* Müll.Arg.	0%	100%	100%	91%	89%	Shr	Res EcSu Fir
Euphorbiaceae	*Gymnanthes schottiana* Müll.Arg.	0%	50%	62%	54%	44%	Shr Tre	Res Riv
Euphorbiaceae	*Sapium glandulosum* (L.) Morong	0%	100%	84%	57%	72%	Tre	Res EcSu
Euphorbiaceae	*Sapium haematosper-mum* Müll.Arg.	67%	0%	19%	33%	0%	Shr Tre	Res Orn
Fabaceae	*Albizia edwallii* (Hoehne) Barneby & J.W.Grimes	0%	100%	24%	2%	0%	Tre	Orn
Fabaceae	*Apuleia leiocarpa* (Vogel) J.F.Macbr.	0%	50%	43%	7%	0%	Tre	Woo Con Orn
Fabaceae	*Ateleia glazioveana* Baill.	0%	100%	27%	0%	0%	Tre	Res EcSu
Fabaceae	*Calliandra brevipes* Benth.	0%	0%	27%	22%	0%	Shr Tre	Orn
Fabaceae	*Calliandra foliolosa* Benth.	0%	50%	11%	7%	0%	Shr Tre	Orn
Fabaceae	*Calliandra tweedii* Benth.	0%	50%	76%	74%	11%	Shr Tre	Res Orn
Fabaceae	*Enterolobium contor-tisiliquum* (Vell.) Morong	0%	0%	43%	37%	11%	Tre	Res EcSu Orn
Fabaceae	*Erythrina crista-galli* L.	67%	0%	54%	65%	72%	Tre	Res MePo Orn
Fabaceae	*Erythrina falcata* Benth.	0%	100%	32%	0%	6%	Tre	Res Orn
Fabaceae	*Inga marginata* Willd.	0%	0%	46%	4%	0%	Tre	Res Foo EcSu Orn
Fabaceae	*Inga vera* Willd.	0%	0%	57%	41%	11%	Tre	Res Foo MePo Orn

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguay-an-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Fabaceae	*Mimosa bimucronata* (DC.) Kuntze	0%	0%	49%	11%	28%	Shr Tre	Res EcSu MePo Fir
Fabaceae	*Mimosa scabrella* Benth.	0%	50%	8%	2%	0%	Tre	Res EcSu MePo Woo Fir
Fabaceae	*Myrocarpus frondosus* Allemão	0%	100%	32%	13%	0%	Tre	MePo Woo Med Con
Fabaceae	*Parapiptadenia rigida* (Benth.) Brenan	0%	100%	46%	33%	0%	Tre	Res MePo Woo
Fabaceae	*Parkinsonia aculeata* L.		0%	0%	39%	6%	Tre	Sil Orn
Fabaceae	*Peltophorum dubium* (Spreng.) Taub.	0%	50%	16%	24%	0%	Tre	Mas Orn
Fabaceae	*Prosopis affinis* Spreng.		0%	0%	20%	0%	Shr Tre	Sil MePo Woo Med Con
Fabaceae	*Prosopis nigra* Hiron.		0%	0%	7%	0%	Shr Tre	Sil MePo Woo Con
Fabaceae	*Senegalia bonariensis* (Gillies ex Hook. & Arn.) Seigler & Ebinger		50%	30%	46%	0%	Shr Lia	MePo
Fabaceae	*Senna corymbosa* (Lam.) H.S.Irwin & Barneby	0%	50%	59%	76%	67%	Shr	Med
Fabaceae	*Vachellia caven* (Molina) Seigler & Ebinger		0%	22%	57%	6%	Shr Tre	Sil MePo Con Fir
Fabaceae	*Vachellia farnesiana* (L.) Wight & Arn.	67%	0%	0%	20%	0%	Shr Tre	Sil MePo Fir
Lamiaceae	*Aegiphila brachiata* Vell.	0%	50%	14%	11%	0%	Shr Tre	Res Foo
Lamiaceae	*Vitex megapotamica* (Spreng.) Moldenke	0%	100%	100%	61%	67%	Tre	Res Woo Orn
Lauraceae	*Nectandra angustifolia* (Schrad.) Nees	0%	0%	3%	28%	17%	Tre	Con Riv
Lauraceae	*Nectandra oppositifolia* Nees	0%	0%	43%	0%	0%	Tre	Res Foo
Lauraceae	*Ocotea catharinensis* Mez	0%	0%	24%	0%	6%	Tre	Woo Con
Lauraceae	*Ocotea odorifera* (Vell.) Rohwer	0%	0%	11%	0%	0%	Tre	Con
Lauraceae	*Ocotea pulchella* (Nees & Mart.) Mez	0%	100%	84%	48%	72%	Tre	Res EcSu
Malpighiaceae	*Byrsonima ligustrifolia* A.Juss.	0%	0%	3%	0%	0%	Tre	Foo
Malvaceae	*Ceiba speciosa* (A.St.-Hil.) Ravenna	0%	0%	8%	0%	0%	Tre	Orn
Malvaceae	*Luehea divaricata* Mart. & Zucc.	0%	100%	95%	78%	39%	Tre	MePo Woo Med Orn

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguay-an-Brazilian Pampa Ecoregion (Continua...)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Malvaceae	*Pseudobombax grandiflorum* (Cav.) A.Robyns	0%	0%	5%	0%	0%	Tre	Res Orn
Meliaceae	*Cabralea canjerana* (Vell.) Mart.	0%	100%	81%	15%	0%	Tre	Res Woo
Meliaceae	*Cedrela fissilis* Vell.	0%	100%	70%	15%	6%	Tre	Res Woo Con Orn
Moraceae	*Ficus cestrifolia* Schott ex Spreng.	0%	0%	62%	17%	89%	Tre	Con Orn
Moraceae	*Ficus eximia* Schott	0%	0%	5%	0%	0%	Tre	Con
Myrtaceae	*Blepharocalyx salicifolius* (Kunth) O.Berg	0%	100%	100%	96%	89%	Shr Tre	Res Foo MePo EcSu
Myrtaceae	*Campomanesia guazumifolia* (Cambess.) O.Berg	0%	100%	32%	9%	0%	Tre	Res AgHo Foo MePo
Myrtaceae	*Campomanesia xanthocarpa* (Mart.) O.Berg	0%	100%	95%	46%	11%	Tre	Res AgHo Foo MePo
Myrtaceae	*Eugenia involucrata* DC.	0%	100%	89%	28%	11%	Tre	Res AgHo Foo MePo Woo
Myrtaceae	*Eugenia multicostata* D.Legrand	0%	0%	3%	0%	0%	Tre	Foo Orn
Myrtaceae	*Eugenia myrcianthes* Nied.	0%	0%	51%	41%	39%	Tre	Foo MePo
Myrtaceae	*Eugenia pyriformis* Cambess.	0%	50%	32%	4%	0%	Tre	Foo MePo
Myrtaceae	*Eugenia rostrifolia* D.Legrand	0%	50%	62%	11%	0%	Tre	Foo MePo
Myrtaceae	*Eugenia speciosa* Cambess.	0%	0%	30%	2%	0%	Tre	Foo MePo
Myrtaceae	*Eugenia uniflora* L.	67%	50%	92%	80%	61%	Tre	Res AgHo Foo MePo Med EcSu Orn
Myrtaceae	*Feijoa sellowiana* (O.Berg) O.Berg	0%	50%	43%	48%	0%	Tre Shr	AgHo Foo MePo
Myrtaceae	*Myrcianthes pungens* (O.Berg) D.Legrand	67%	100%	81%	63%	6%	Tre	Res Foo MePo Woo
Myrtaceae	*Myrciaria cuspidata* O.Berg	0%	0%	59%	2%	22%	Tre	Orn
Myrtaceae	*Myrciaria tenella* (DC.) O.Berg	0%	100%	49%	28%	0%	Tre	Orn
Myrtaceae	*Plinia rivularis* (Cambess.) Rotman	0%	0%	32%	33%	0%	Tre	Foo Res Riv
Myrtaceae	*Psidium cattleianum* Sabine	0%	0%	57%	26%	94%	Tre Shr	Res AgHo Foo MePo Orn

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguayan-Brazilian Pampa Ecoregion

(Continua...)

Family	Species	SWV	MNF	SFA	SFP	CSM	LF	Uses
Oleaceae	*Chionanthus filiformis* (Vell.) P.S.Green	0%	0%	16%	0%	6%	Shr Tre	Con
Opiliaceae	*Agonandra excelsa* Griseb.	0%	0%	14%	0%	0%	Shr Tre	Foo
	Phytolacca dioica L.	0%	100%	59%	35%	17%	Tre	Res Orn
	Podocarpus lambertii Klotzsch ex Endl.	0%	0%	38%	7%	0%	Tre	Foo Woo Orn
Polygonaceae	*Ruprechtia laxiflora* Meisn.	67%	50%	86%	61%	0%	Tre	Woo
Polygonaceae	*Ruprechtia salicifolia* (Cham. & Schltdl.) A.C.Meyer	67%	0%	8%	30%	0%	Tre	Res Riv
Primulaceae	*Myrsine coriacea* (Sw.) R.Br. ex Roem. & Schult.	0%	50%	84%	57%	17%	Tre	Res EcSu
Primulaceae	*Myrsine guianensis* (Aubl.) Kuntze	0%	0%	22%	4%	44%	Shr	Res EcSu
Primulaceae	*Myrsine parvifolia* A.DC.	0%	0%	0%	0%	89%	Shr	Res EcSu
Quillajaceae	*Quillaja lancifolia* D.Don	0%	0%	68%	54%	6%	Tre	Res Med Con EcSu
Rhamnaceae	*Colubrina glandulosa* Perkins	0%	0%	5%	0%	0%	Shr	Woo
Rhamnaceae	*Condalia buxifolia* Reissek	0%	0%	11%	24%	0%	Tre	Con
Rhamnaceae	*Scutia buxifolia* Reissek		0%	59%	87%	83%	Tre Shr	Sil Res Woo Med
Rubiaceae	*Randia ferox* (Cham. & Schltdl.) DC.	0%	0%	54%	20%	61%	Tre	Foo
Rutaceae	*Esenbeckia hieronymi* Engl.	0%	0%	3%	0%	0%	Tre	Con
Rutaceae	*Helietta apiculata* Benth.	0%	100%	27%	22%	0%	Tre	Res Woo Med EcSu
Rutaceae	*Pilocarpus pennatifolius* Lem.	0%	50%	24%	9%	0%	Tre	Med
Salicaceae	*Casearia decandra* Jacq.	0%	50%	92%	43%	67%	Tre	Foo
Salicaceae	*Casearia sylvestris* Sw.	0%	100%	97%	74%	72%	Tre	Res MePo Med
Salicaceae	*Salix humboldtiana* Willd.	0%	0%	27%	48%	39%	Tre	Res Riv Orn
Santalaceae	*Acanthosyris spinescens* (Mart. & Eichler) Griseb.	67%	0%	27%	54%	0%	Shr Tre	Foo Orn
Santalaceae	*Jodina rhombifolia* (Hook. & Arn.) Reissek	67%	0%	30%	43%	72%	Tre	Orn

Table 3 – SM. This is a list of the 153 species selected for use in AFSs in the Uruguay-an-Brazilian Pampa Ecoregion

(Conclusão)

Family	**Species**	**SWV**	**MNF**	**SFA**	**SFP**	**CSM**	**LF**	**Uses**
Sapindaceae	*Allophylus edulis* (A.St.-Hil. et al.) Hieron. ex Niederl.	33%		100%	85%	100%	Shr Tre	Res Foo
Sapindaceae	*Allophylus guaraniticus* (A. St.-Hil.) Radlk.	0%		41%	35%	0%	Shr Tre	Foo
Sapindaceae	*Cupania vernalis* Cambess.	0%		97%	78%	50%	Tre	Res
Sapindaceae	*Dodonaea viscosa* Jacq.	0%	0%	49%	39%	67%	Shr SubShr	Res EcSu Fir
Sapotaceae	*Chrysophyllum gonocarpum* (Mart. & Eichler ex Miq.) Engl.	0%	0%	73%	37%	11%	Shr Tre	Foo
Sapotaceae	*Chrysophyllum viride* Mart. & Eichler	0%	0%	3%	0%	0%	Shr Tre	Foo
Sapotaceae	*Pouteria gardneriana* (A.DC.) Radlk.	0%	0%	41%	46%	6%	Tre	Res Foo Riv
Sapotaceae	*Pouteria salicifolia* (Spreng.) Radlk.		0%	46%	54%	28%	Tre	Res Riv
Sapotaceae	*Sideroxylon obtusifolium* (Roem. & Schult.) T.D.Penn.	33%	0%	62%	20%	83%	Tre Shr	Foo Med
Solanaceae	*Brunfelsia australis* Benth.	0%	0%	8%	11%	0%	Shr	Orn
Solanaceae	*Solanum diploconos* (Mart.) Bohs	0%	0%	0%	0%	11%	Shr	Foo
Solanaceae	*Solanum mauritianum* Scop.	0%		76%	46%	39%	Tre Shr	Res EcSu
Solanaceae	*Solanum pseudoquina* A.St.-Hil.	0%	0%	78%	9%	28%	Tre	Res
Urticaceae	*Cecropia glaziovii* Snethl.	0%	0%	3%	0%	0%	Shr	Res EcSu Orn
Urticaceae	*Cecropia pachystachya* Trécul	0%	0%	30%	2%	44%	Tre	Res EcSu Orn
Urticaceae	*Urera aurantiaca* Wedd.	33%	0%	5%	2%	0%	Shr Lia	Foo
Urticaceae	*Urera baccifera* (L.) Gaudich. ex Wedd.	0%	50%	22%	7%	0%	Shr Lia	Foo Med
Verbenaceae	*Citharexylum myrianthum* Cham.	0%	0%	22%	4%	39%	Tre	Res EcSu
Winteraceae	*Drimys brasiliensis* Miers	0%	0%	11%	0%	0%	Shr SubShr	Med

Source: Authors (2023). Legend: SWV = Savanoid-woodland Vegetation; MNF = Mixed Needle-broadleaved Forest; SFA = Seasonal Semideciduous Forest of Atlantic Domain; SFP = Seasonal Semideciduous Forest of Pampean Domain; CSM = Coastal Sandy Mosaic; LF = life form; Shr = shrub; Tre = tree; Lia = liana; Pal = palm; Subshr = subshrub; Suc = succulent; AgHo = Agroforestry homegardens; Res = Restorative AFS; Sil = Silvopastoral AFS; Foo = food; Cra = craft; Con = conservation; Fir = firewood; Woo = wood; Med = medicinal; MePo = melliferous/pollinators; Ole = oleiferous; Orn = ornamental; EcSu = ecological succession (pioneer, early secondary); Riv = riverine; * = species with use restriction due to the potential to be invasive on grassland formations

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