Oecologia Australis
23(4):776-798, 2019
https://doi.org/10.4257/oeco.2019.2304.06

FLORA AND VEGETATION STRUCTURE OF *VEREDA* IN SOUTHWESTERN CERRADO

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Abstract: This work was carried out aiming to evaluate phytosociological parameters and the influence of topographic gradient and water levels on plant distribution in a *vereda*. That for, we sampled two sites (wet grassland and floodable transition to pond) in two seasons (rainy and dry). Along permanent transects, every 10 m we placed transversally four quadrats of 1 m^2, 2 m apart, a total of 280 plots, to estimate percentage cover of each species and water depth. To evaluate the influence of relief and flood level on plant distribution we performed a Principal Coordinate Analysis (PCoA) and Analysis of Permutational Multivariate Variance (PERMANOVA). We recorded 174 species, the richest families were Poaceae (40), Cyperaceae (25) and Asteraceae (14) and the richest genera *Paspalum*, *Rhynchospora* and *Utricularia* (8 each), *Hyptis* and *Cyperus* (6), *Eleocharis*, *Ludwigia* and *Xyris* (5). The phytosociological parameters revealed the importance of Poaceae, Cyperaceae and Asteraceae in these communities, corroborating other reports on v*eredas.* We found discrete difference in the species richness between sampling periods, in both wet grassland and transition areas. The slope varied from 0 to 314 cm and was significant for species distribution in both seasons, with a continuum related to waterlogging and surface water on the distinct topographic quotas. In general, we found discrete groupments of species, particularly in lower quotas. The main indicator species were the filiform *Eriochrysis holcoides* (Poales, Poaceae), *Rhynchospora emaciata* (Poales, Poaceae), *Andropogon virgatus* (Poales, Poaceae), *Paspalum erianthoides* (Poales, Poaceae) and *P. flaccidum* (Poales, Poaceae). Some species tend to be selective whilst others show plasticity regarding microhabitat.

Keywords: marsh grassland; phytosociology; savanna; topographic gradient; wetland.

INTRODUCTION

The Cerrado domain is characterized by a vegetation mosaic of savanna, forest and grassland (Felfili *et al.* 2004). According to Ribeiro & Walter (1998), the *vereda* is one of the physiognomies. This environment is interposed between Cerrado *stricto sensu* and gallery forest (Oliveira-Filho & Martins 1986) and plays an important role in linking these vegetation types (Carvalho 1991). *Veredas* are legally defined as "physiognomy of savanna, found on hydromorphic soils, usually with the arboreal palm *Mauritia flexuosa* (Arecales, Arecaceae) – buriti, emergent, without forming continuous canopy, intermingled with clumps of shrubby-herbaceous species" (Brasil 2012). That rule also considers Permanent Preservation Area (PPA) a minimum 50 m wide belt along *veredas*, after the limit of the swampy or waterlogged area. Although there is a law protecting v*eredas*, considering them as PPAs, they undergo anthropic processes that may become irreversible (Oliveira *et al.* 2009) since they are highly sensitive to disturbance and little resilient environments (Carvalho 1991). Human disturbances in wetlands can be shown by floristic changes, causing loss of biodiversity and consequent disruption of the ecosystem (Meirelles *et al.* 2004).

The distribution of *veredas* is basically conditioned by physical factors, such as wet plain surfaces or flat valleys, permeable surface layer over an impermeable subsoil, water saturation nearly year-round and shallow water table (Drummond *et al.* 2005), where gentle slopes favor its seasonal rise to the surface (Oliveira-Filho & Martins 1986). The hydromorphic soils are ill-drained (Baccaro 1994, Ribeiro & Walter 1998), such as gleysols, planosols and organosols (Drummond *et al.* 2005). Guimarães *et al.* (2002) found two soil classes, Haplic Gleysol and Melanic Gleysol, in *veredas* in Uberlândia, MG.

The hydrologic regime in wetlands is the major determinant in plant community patterns and species zonation (Casanova & Brock 2000). Gentry (1988) suggested that habitat contributes significantly for plant species diversity along topographic and edaphic gradients, as well as Rezende (2007) who found a strong influence of soil moisture gradient on species distribution, assorting plants into groups of dry and wet habitats and some occurring in both conditions.

In the study area, the drainage from the wet grassland provides water to an adjacent pond (Moreira *et al.* 2015). Consequently, areas near the pond (transitional areas) remain with more water throughout the year when compared with wet grassland. The hypothesis we want to test is that topographic gradient and consequent different water levels influence plant species distribution patterns and abundance in *vereda* vegetation. Therefore, the study was divided into secondary objectives: (1) present the floristic composition of the whole *vereda*; (2) evaluate species richness and abundance in the areas (wet grassland and transitional areas) and in the seasons (dry and rainy); (3) analyze, in each season, if the topography and different water levels influence plant species distribution; (4) compare the floristic similarity between areas and seasons; (5) compare species richness between areas.

MATERIAL AND METHODS

Study area

Our work was done in a *vereda* (20º33’24.1” S, 54º47’23.6” W, *datum* SAD69) at the Fazenda Modelo, municipality of Terenos, Mato Grosso do Sul state, Brazil. The area is at 550 m altitude and the seasonal climate is Aw in the classification of Peel *et al.* (2007). Monthly rainfall data were provided by a weather station, 30 km away, at the headquarters of Embrapa Beef Cattle Research Center. The original vegetation was Cerrado woodland of which a fragment remains at the wetland headwater, near an outcrop of laterite we believed that underlies this *vereda*. Close to the headwater is a stand of *M. flexuosa*. Surrounded by pasture (mainly *Paspalum notatum* (Poales, Poaceae) and *Urochloa* spp.), the study area is grazed and trampled by cows and horses, mainly in the dry season and on the edges, not sampled.

Fieldwork and data analysis

Samplings were performed in the rainy and in the dry season. We placed four permanent transects to sample vegetation, being two on the floodable transitional zone, with 170 m (68 plots) and 140 m (56 plots) and two on the wet grassland, one 150 m long (60 plots) and another one 240 m long (96 plots), a total of 280 plots. The transition site, so called because it is located near a pond (described by Moreira *et al.* 2011), is seasonally flooded.

In each transect, at every 10 m, we placed four plots of 1 m^2 transversally to the transect line and 2 m apart, a total of 280 plots. To visually estimate cover, we imagined a cross line dividing the plot in four quarters, and so on (Figure 1). The percentage cover (vertical projection) per plant species within each plot was visually estimated, always by the same two persons (S. N. M. and V. J. P.), who recognized vegetative plants. Some grasses flowered where we trampled them. Fertile plant specimens were botanized for the Herbarium CGMS of the Universidade Federal de Mato Grosso do Sul, while sterile ones were taken to the greenhouse until flowering. Taxonomic identification was achieved comparing vouchers

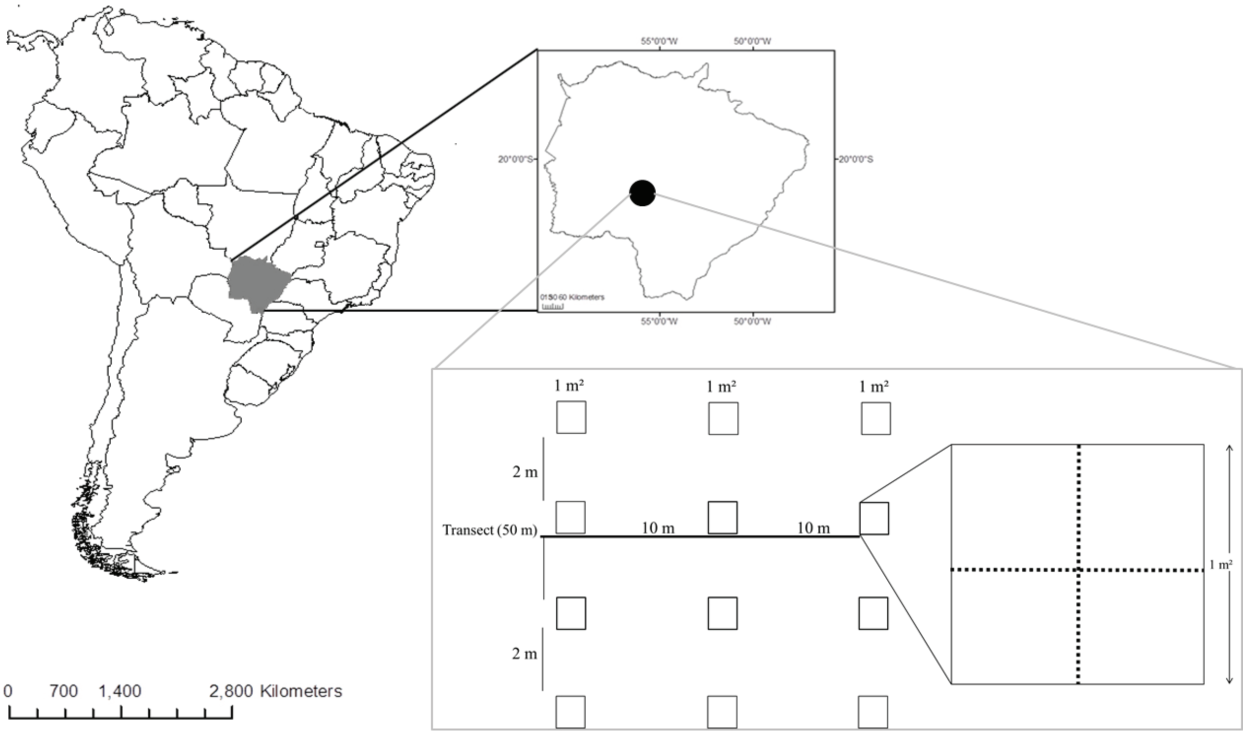

Figure 1. Study area and scheme of distribution of the plots in the place at the Fazenda Modelo, municipality of Terenos, Mato Grosso do Sul state, Brazil.

in the herbarium and consulting bibliography and specialists.

We calculated the phytosociological parameters Absolute Frequency (AF), Relative Frequency (RF), Absolute Cover (AC) and Relative Cover (RC) (Brower & Zar 1984) and the Sørensen Similarity Index (Mueller-Dombois & Ellenberg 1974). For that analysis we used percentage of cover as a measure of abundance instead of number of individuals, once defining an individual is very difficult for bunchy herbaceous species (Kent & Coker 1992), generally filiform.

We used an optical level to do the topographic survey on the flood free part and we measured water depth per plot with a ruler (in cm) on flooded grassland to determine the altimetric position of each plot along transects. To evaluate the influence of the topography on the pattern of species distribution in the wet grassland and in transition areas, we utilized the spreadsheets with the percentages of cover of the species in relation to the topographic quotas of the terrain. In the analyses, the species cover percentages were distributed according to the respective topographic quotas, on a scale of 15 cm per quota. The plots within the limits of the topographic quotas were grouped for the analyses.

To compare the data between both seasons, we utilized the Principal Coordinates Analysis (PCoA), which allows to explore and visualize similarities or differences between data sets and reveals a centralized matrix decomposed in its eigenvalues and eigenvectors. Next, the groups identified in the PCoA were submitted to a Permutational Multivariate Analysis of Variance (PERMANOVA) to verify significance between the groupments of topographic quotas. The analyses were performed utilizing the package Vegan (Oksanen et al. 2014) of the program R (R Core team 2017).

Regarding indicator species (Dufrêne & Legendre 1997), we utilized the function indval() of the package labdsv (David, 2016), also in R. An indicator species has specificity to a particular niche; thus, its presence or abundance was utilized to indicate a particular environment (Cáceres *et al.* 2010).

RESULTS

Overall floristic data

The overall data shows a high plant richness in the studied *vereda.* In the wet grassland plus transition areas, we sampled 174 species of 97 genera and 46 families. Poaceae (40 species), Cyperaceae (25), Asteraceae (14) were the richest families, adding up 45% of the species, while 21 families showed single species. The richest genera were *Paspalum*, *Rhynchospora* and *Utricularia* (8 each), *Hyptis* and *Cyperus* (6), *Eleocharis*, *Ludwigia* and *Xyris* (5), typical of *veredas* (Appendix 1).

Comparing the general richness found in the wet grassland with the transitional areas, we observed that the first had a slightly lower number of species (113) than the latter (122). In the transition zone, we sampled 43 exclusive species, while the wet grassland showed 33, and 79 were common to both formations (Appendix 1). The Sørensen Similarity indexes for habitats and seasons showed a higher floristic similarity between dry and rainy seasons in similar environments than in relation to different environments (Table 1).

In the analysis of the topographic gradient, we compared wet grassland and transitional area. The topographic quotas varied from 314 cm, the top level, where the water table was just close to the surface, to zero, the lowest ground, where the soil was waterlogged or flooded since toward the pond the water rose to the surface (Figures 2 and 3). The topography was important to determine the pattern of species distribution in both rainy (p = 0.001) and dry period (p = 0.001).

In the rainy period, the Principal Coordinates Analysis (PCoA) indicates two main centroids related to the topographic quotas of 0-15 cm and 15-30 cm. The other quotas do not represent a clear pattern of separation of species, indicating that they are more

Table 1. Sørensen Similarity Index between areas and sampled periods in a *vereda*, municipality of Terenos, State of Mato Grosso do Sul, Brazil.

	Grassland Rainy	Grassland Dry	Transitions Rainy	Transitions Dry
Grassland/Rainy	.	0.81	0.65	0.62
Grassland/Dry	.	.	0.51	0.55
Transitions/Rainy	.	.	.	0.87
Transitions/Dry	.	.	.	.

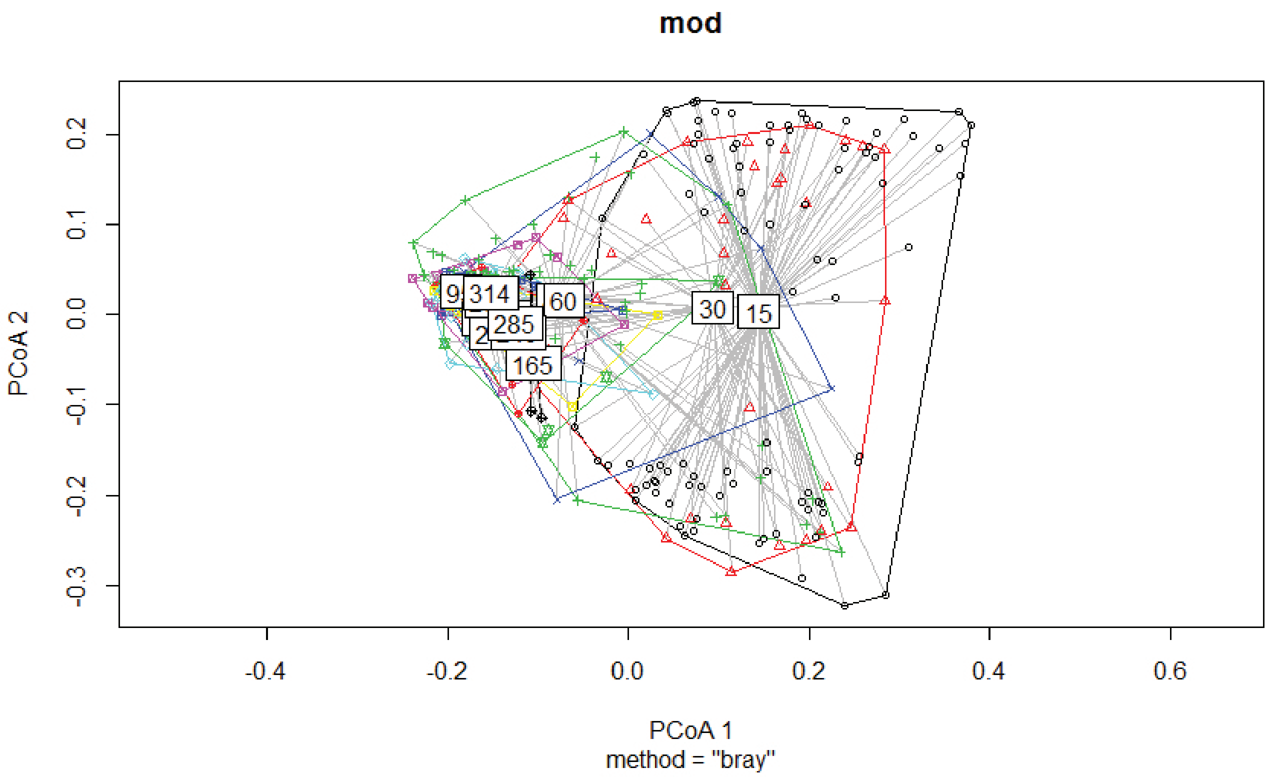

Figure 2. Ordination of the herbaceous species by Principal Coordinates Analysis (PCoA) through declivity of the terrain sampled in a *vereda* in municipality of Terenos, state of Mato Grosso do Sul, Brazil, in the rainy period. The numbers mean the topographical quotas in centimeters.

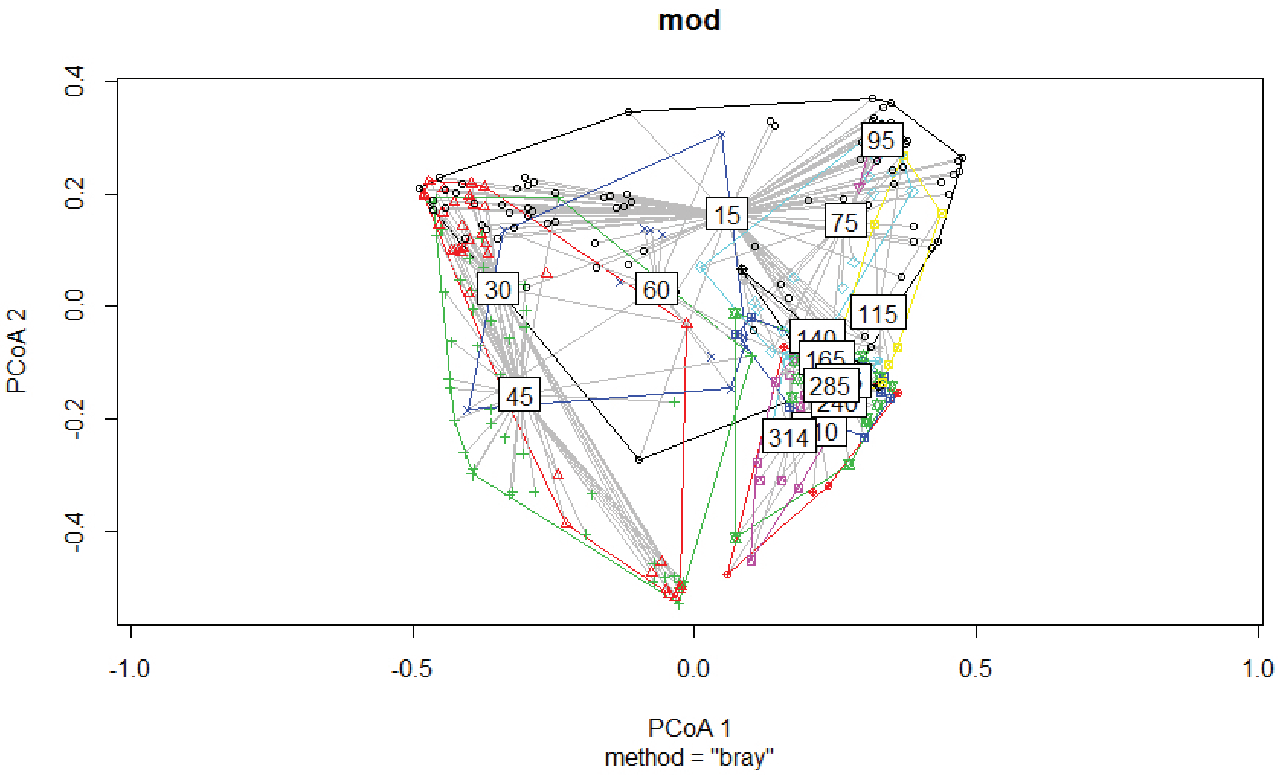

Figure 3. Ordination of the herbaceous species by Principal Coordinates Analysis (PCoA) through declivity of the terrain sampled in a *vereda* in municipality of Terenos, state of Mato Grosso do Sul, Brazil, in the dry period. The numbers mean the topographic quotas in centimeters.

similar between them (Figure 2).

The Indicator Species Analysis for the rainy period revealed 62 species related with distinct topographic quotas forming two large groups, the first with 22 species and the second with 40 species. The indicator species of the first group are distributed in nine families, the richest being Poaceae (7 species), Cyperaceae (3) and Malvaceae, Lentibulariaceae and Asteraceae (2). The characteristic species of group I are: *Utricularia gibba* (Lamiales, Lentibulariaceae), *Rhytachne rottboellioides* (Poales, Poaceae), *Byttneria palustris* (Malvales, Malvaceae), *Saccharum asperum* (Poales, Poaceae) and *Andropogon hypogynus* (Poales, Poaceae). The species of the second group are represented by 10 families, Poaceae (12 species), Cyperaceae (11) and Asteraceae (5) having the largest number. The main indicator species are *Eriochrysis holcoides* (Poales, Poaceae), *Rhynchospora emaciata* (Poales, Cyperaceae), *Andropogon virgatus* (Poales, Poaceae), *Paspalum erianthoides* (Poales, Poaceae) and *Paspalum flaccidum* (Poales, Poaceae).

In the dry period, the Principal Coordinates Analysis (PCoA) revealed a spaced pattern of the centroids, indicating that more topographic quotas influenced the pattern of distribution. The quota of 0-15 cm, as well as in the rainy season, indicates the preference of some species, whilst the quotas 15-30 cm and 30-45 cm are more related between them than with the others. The highest topographic quotas demonstrated that the species occur similarly along the gradient, without forming characteristic groups (Figure 3).

The Indicator Species Analysis for the dry period revealed 57 species related to the distinct topographic quotas. Differently from the rainy period, when we related the indicator species with the graph of species distribution, there is not a clear spatial separation or preference. However, the analysis indicated some key-species for the quota of 0-15 cm *Schizachyrium gracilipes* (Poales, Poaceae) and *Eryngium ebracteatum* (Apiales, Apiaceae) and 15-30 cm, *Leersia hexandra* (Poales, Poaceae), *Caperonia castaneifolia* (Malpighiales, Euphorbiaceae), *Eleocharis plicarhachis* (Poales, Cyperaceae), *E. acutangula* (Poales, Cyperaceae), *Mikania stenophylla* (Asterales, Asteraceae), *Phyllanthus stipulatus* (Malpighiales, Phyllanthaceae) and *Aeschynomene* *fluminensis* (Fabales, Fabaceae). The quota of 30-45 cm presented just a single indicator species, *Lessingianthus rubricaulis* (Asterales, Asteraceae).

Wet grassland

In wet grassland, we sampled 113 species, of 71 genera and 34 families. Poaceae (27 species), Cyperaceae (20), Asteraceae (11), Lamiaceae (6) and Xyridaceae and Lentibulariaceae (5) were the richest families, adding to 65.5% of total richness. The richest genera were *Rhynchospora* (8 species), *Hyptis*, *Paspalum*, *Utricularia*, and *Xyris* (5 each). Twenty families were represented by a single species and accumulated 17.8% of the floristic richness (Appendix 1).

Eriochrysis holcoides (Poales, Poaceae) showed the highest cover in the rainy season, followed by *Anthaenantia lanata* (Poales, Poaceae), *P. flaccidum*, *P. erianthoides*, *Rhynchospora globosa* (Poales, Cyperaceae), *A. virgatus*, *A. hypogynus* and *Axonopus uninodis* (Poales**,** Poaceae). In the dry season, *A. uninodis* was the species with highest CV, followed by *P. erianthoides*, *A. lanata*, *A. virgatus*, *P. dedeccae* (Poales**,** Poaceae), *P. flaccidum*, *R. globosa*, *A. hypogynus* and *Rhynchospora mariscus* (Poales**,** Cyperaceae) (Table 2). The cover of *Eryngium pandanifolium* (Apiales, Apiaceae) did not differ between seasons.

Transition areas

In the transition areas, we sampled 122 species and 72 genera distributed into 34 families. Poaceae (28 species), Cyperaceae (20), Asteraceae (11) and Lentibulariaceae (8) were the richest families, adding to 55.8% of all recorded species. Another 15 families were represented by a single species or just 17.8% of the floristic richness. The richest genera were *Utricularia* (8), *Rhynchospora* (7) and *Xyris*, *Eleocharis*, *Scleria*, *Hyptis* and *Ludwigia* (4 each) (Appendix 1).

Saccharum asperum, *A. hypogynus* and *A. uninodis* were the species with the highest relative cover the rainy season, compared with *R. rottboellioides*, *A. hypogynus* and *Imperata tenuis* (Poales**,** Poaceae) in the dry season (Table 2).

DISCUSSION

Overall floristic data

Poaceae, Cyperaceae and Asteraceae were the richest families in other studies on wetlands in Cerrado (Guimarães 2001, Guimarães *et al.* 2002, Araújo *et al.* 2002, Meirelles *et al.* 2004, Munhoz & Felfili 2008, Oliveira *et al.* 2009, Moreira *et al.* 2011, Moreira *et al.* 2015, Bijos *et al.* 2017), as we also observed. These families contain species which

Table 2. Species with highest Cover Values in Wet grassland and Transition Area at *Vereda,* municipality of Terenos, State of Mato Grosso do Sul, Brazil, in two differents environments and seasons with their respective Collector Number (COL.). M= Moreira,S.N. Numbers in bold represent the highest cover values.

Family/Species	Col.	Wet grassland		Transition Area	
		Rainy	Dry	Rainy	Dry
APIACEAE					
Eryngium pandanifolium Cham. & Schltdl.	M 143	**5.8**	**6.33**	1.04	0.35
MALVACEAE					
Byttneria palustris Cristóbal	M 37	1.11	1.93	**6.45**	**8.58**
POACEAE					
Andropogon hypogynus Hack.	M 89	**7.13**	**7.16**	**17.38**	**16.86**
Axonopus uninodis (Hack.) G.A. Black	M 19	**6.49**	**18.6**	**13.14**	**11.09**
Eriochrysis holcoides (Nees) Kuhlm.	M 101	**23.04**	3.78	3.65	**5.69**
Imperata tenuis Hack.	M 208	3.15	2.55	**11.7**	**15.73**
Paspalum erianthoides Lindm.	M 303	**12.22**	**14.38**	**12.55**	**13.83**
Paspalum flaccidum Nees	M 285	**12.91**	**10.15**	1.25	1.19
Rhytachne rottboellioides Desv.	M 90	2.07	1.84	5.05	**34.32**
Saccharum asperum (Nees) Steud.	M 61	1.75	0.25	**22.26**	3.66

occur mostly in sunny habitats (Coutinho 1978) but in wet grassland, the herbaceous dominance can be attributed to excess of water in the soil, what hinders the establishment of woody strata (Araújo *et al.* 2002). We collected a recently described new species, *Cyperus longiculmis* (Poales, Cyperaceae) (Pereira-Silva *et al.* 2018).

In spite of wet grassland and transition zone presenting some exclusive species, the large number of species (79) in common reflects their capacity to colonize both habitats with higher or lower water saturation and a high similarity between the same habitats, even considering distinct sampling seasons. Thus, the sampled area exerts higher influence on the species composition than does the water regime. A similar result was already observed by Moreira *et al.* (2011) in ponds associated with *veredas*.

The relationship between topographic quotas and distribution patterns is attributed to different moisture conditions along the relief gradient. Similar results were described in other studies (see Teixeira & Assis 2005 and Gaya 2014), where hydromorphic soils have different floristic and structural peculiarities, besides providing a greater variety of environments and, consequently, a more diverse flora. In our study area, the slope is easily perceived as slow and the drainage is gradual. The water movement is visible in the veins and animal tracks, from the highest to the lowest ground, where the water begins to dam up, as well as in puddles in small depressions between grass bunches. The soil was not analyzed, but we observed that the wet grassland was waterlogged in spite of the slope because there is a thicker organic top horizon functioning as a sponge compared with the transition floodable grassland. Positive relationships between declivity and species distribution in forests were described by several authors (see Gartlan *et al.* 1986, Oliveira-Filho *et al.* 1994a, 1994b, Van Den Berg & Oliveira-Filho 1999).

The Principal Coordinates Analysis and the Indicator Species Analysis in both sampled periods suggest the formation of groups mainly on the lowest quotas and that these lack exclusive species since they occur in the transition zone between the wet grassland and the associated pond. This could be explained by transition areas containing species from either. The transition zones can be characterized as ecotones. A pioneer study on *vereda* by Goldsmith (1974) found a type of vegetation in the transition area and that this change occurs in a subtle way, as a continuum. In the moist and flooded gradient of *veredas* occurs a continuum of species replacement gradient where the plant communities have components from neighbouring zones and also exclusive species (Costa 2007). The moisture gradient can select different species (Kurtz *et al.* 2013). Some occur preferentially in flooded soils, others in dry soils, plus those occurring in both environments (Guimarães *et al.* 2002, Resende *et al.* 2013).

The indicator species of the rainy period reflect basically the growth habit of the individuals. Many cespitous tall grasses have vigorous growth in wetlands, such as *A. hypogynus*, *A. virgatus*, *E. holcoides*, *P. erianthoides*, *P. flaccidum*, *R. rottboellioides* and *S. asperum*, as well as Cyperaceae, *e.g. R. emaciata*. The submerged or palustrine herb *Utricularia gibba* (Lamiales, Lentibulariaceae) has abundant ramified stolons (Baleeiro *et al.* 2017), what contributes to its higher frequency and cover, preferentially in wetter habitats, along animal tracks throughout the area.

The indicator species in the dry period correspond majorly to other botanical families. *P. stipulatus*, *A. fluminensis* and *L. rubricaulis* do not present stoloniferous propagation, such as Poaceae and Cyperaceae, however, occur in specific zones, *i.e.* areas with less flooding.

Wet grassland

Similar to several reports the richest families in wet grassland were Poaceae, Cyperaceae and Asteraceae (Guimarães *et al.* 2002, Araújo *et al.* 2002, Meirelles *et al.* 2004, Munhoz & Felfili 2007, Munhoz & Felfili 2008, Oliveira *et al.* 2009, Moreira *et al.* 2011, Moreira *et al.* 2015, Bijos *et al.* 2017), plus the main genera *Rhynchospora* and *Xyris* (Araújo *et al.* 2002, Munhoz & Felfili 2007, Resende *et al.* 2013). Araújo *et al.* (2002) suggest that these richest families have species well adapted to the conditions of soil and waterlogging, commonly found in *veredas*, reflected by the high representativity of the herbaceous stratum.

The highest cover values (CV) represent species with dense tussocks as much in the dry as in the rainy season, such as *A.lanata* and *P. erianthoides* (Poaceae) and *R. globosa* (Cyperaceae). The dense tussocks of filiform species can hinder the establishment of other species in wetter zones of the *vereda* (Araújo *et al.* 2002), such as *A. lanata, A. hypogynus, A. uninodis* and *R. rottboellioides. E. pandanifolium* (Apiaceae) showed high CV in both seasons. Differently from grasses, this species grows in groups and shows high competitiveness for space with graminoids, mainly for having rosette-like large strong leaves (Cardozo 2017), pushing others aside. The species which form dense tussocks, such as grasses, tend to show higher cover than small and slender herbs in high abundance (Munhoz & Felfili 2008). We observed that some species of Lamiaceae (*Hyptis* spp.), Ochnaceae (*Sauvagesia racemosa*), Apocynaceae (*Rhabdadenia ragonesei*), Orobanchaceae (*Escobedia grandiflora*), Gesneriaceae (*Sinningia elatior*) and Lentibulariaceae (*Utricularia praelonga*) elongate stems over the filiform tussocks to expose the flowers, as also reported by Araújo *et al.* (2002). The dense grass bunch expands to its periphery and tends to die in the middle, where the decayed matter becomes colonized by ferns and shrubs (*e. g. Miconia chamissois,* Myrtales, Melastomataceae).

There is a higher probability to find fertile plants during the rainy season. We found the highest species richness in the rainy season (Munhoz & Felfili 2006), what does not correspond to the establishment of true aquatic plants but to the appearance of species between seasons or just not sampled before.

Transition areas

Poaceae, Cyperaceae and Asteraceae correspond to the richest families in most reports on wetlands, such as *veredas* (Araújo *et al.* 2002, Guimarães *et al.* 2002, Meirelles *et al.* 2002, Tannus & Assis 2004, Munhoz & Felfili 2006, Munhoz & Felfili, 2007, Oliveira *et al.* 2009, Moreira *et al.* 2011, Resende *et al.* 2013, Moreira *et al.* 2015, Silva *et al.* 2017, Bijos *et al.* 2017, Moreira *et al.* 2017). Coutinho (1998) and Araújo *et al.* (2002) mention that these three families present a great number of genera and heliophilous species.

Saccharum asperum can occur either in drier areas of the *vereda* edge (Oliveira *et al.* 2009) or water courses and marshes, with high cover (Meirelles *et al.* 2002). *Andropogon hypogynus* was representative in both seasons, showing to be adapted to either flooding or relative water deficit. This tussock grass is only grazed after burn or during critical dry or flood periods (Pott 1982), though in the study area it occurs in the transition temporary pond/wet grassland, where cattle can have access but prefers softer grasses, what could explain its high coverage. We observed that *I. tenuis* formed dense dominant populations, what is due to the multiple aggregate culms (Welker & Longhi-Wagner 2012) from the strong rhizome net. Frequent in the studied *vereda*, *R. rottboellioides* is not yet cited for the Central-West region in the list of the Brazilian Flora (Flora do Brasil 2018).

We concluded that the studied *vereda* presents a continuum of environmental conditions related to soil moisture and waterlogging of the distinct topographic quotas. Thereby, some species tend to occur preferentially in certain microhabitats whilst others show a wider plasticity.

ACKNOWLEDGEMENTS

We thank the Universidade Federal de Mato Grosso do Sul (UFMS) for sponsoring the study. To Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for scholarship to Suzana Neves Moreira and grants to Arnildo Pott and Geraldo Alves Damasceno Junior. To Embrapa Gado de Corte that gave us access to the area and kept firebreaks.

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Submitted: 15 October 2018
Accepted: 22 July 2019
Published online: 16 December 2019
Associate Editors: Camila Aoki & Gudryan J. Barônio

Appendix 1. Species sampled in Wet grassland and Transition Areas at *Vereda*, municipality of Terenos, State of Mato Grosso do Sul, Brazil, with their respective Collector Number (Col.), Relative Frequency (RF), Relative Cover (RC) and Cover Values (CV). The value was described for two different seasons (Rainy and Dry) and two different environments (Wet Grassland and Transition Area). M= Suzana Neves Moreira and P= Vali Joana Pott. The numbers in bold represent the highest coverage values.

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
ALISMATACEAE													
Echinodorus longipetalus Micheli	M 084	0.06	0.12	0.18	0.06	0.13	0.19						
Helanthium tenellum (Mart.) Britton	P 10.918	0.08	0.37	0.45	0.4	0.27	0.67	0.53	1.17	1.7	1.7	3.85	**5.55**
Sagittaria rhombifolia Cham.	M 87							0	0.16	0.16			
APIACEAE													
Eryngium ebracteatum Lam.	M 178	0.08	0.12	0.2				3.96	2.02	**5.98**	0.31	0.09	0.4
Eryngium floribundum Cham. & Schltdl.	M 31	0.74	0.61	1.35	0.94	0.66	1.6	0.25	0.16	0.4	0.83	0.75	1.58
Eryngium pandanifolium Cham. & Schltdl.	M 143	3.72	2.08	**5.8**	3.94	2.39	**6.33**	0.57	0.47	1.04	0.07	0.28	0.35
APOCYNACEAE													
Mandevilla widgrenii C. Ezcurra	M 284	0.06	0.37	0.43				0.3	0.62	0.92	2.99	5.91	**8.91**
Rhabdadenia madida (Vell.) Miers	M 26	0.06	0.37	0.43	0.01	0.13	0.14	0.03	0.23	0.27	0.03	0.19	0.22
Secondatia densiflora A. DC.	M 58				0.25	0.4	0.65				0.1	0.19	0.29
Widgrenia corymbosa Malme	M 54							0.32	1.63	1.95	0.61	2.07	2.68
ARECACEAE													
Mauritia flexuosa L.f.	M 366												
ASTERACEAE													
Acilepidopsis echitifolia (Mart. ex DC.) H.Rob.	M 192	0.59	0.86	1.45				0.03	0.16	0.18	0.08	0.09	0.17
Achyrocline alata (Kunth) DC.	M 156				0.06	0.13	0.19						

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Campuloclinium macrocephalum (Less.) DC.	M 358												
Chromolaena laevigata (Lam.) R.M. King & H. Rob.	M 199	0.52	0.49	1.01	0.56	0.27	0.83	0.04	0.16	0.2			
Chromolaena palmaris (Sch. Bip. ex Baker) R.M. King. & H. Rob.	M 359	1.29	1.84	3.13	0.06	0.13	0.19	0.06	0.23	0.29			
Conyza bonariensis (L.) Cronquist	M 135							0.02	0.16	0.17	0.05	0.19	0.24
Leptostelma tweediei (Hook. & Arn.) D.J.N.Hind & G.L.Nesom	M 107	0.06	0.25	0.31	0.14	0.27	0.41						
Lessingianthus bardanoides (Less.) H. Rob.	M 100	0.36	0.25	0.61	0.07	0.27	0.34	0.1	0.39	0.49	0.04	0.19	0.23
Lessingianthus rubricaulis (Humb. & Bonpl.) H.Rob.	M 176	0.7	1.1	1.8	0.02	0.13	0.15	0.32	1.17	1.49	0.45	1.88	2.33
Mikania cordifolia (L. f.) Willd.	M 201	0	0.12	0.12				0.14	0.23	0.37			
Mikania stenophylla Holmes	M 95							0.12	0.39	0.51			
Pichrosia longifolia D. Don	P 8914	0.19	0.86	1.05				0.03	0.23	0.26			
Trichogonia crenulata (Gardner) D.J.N. Hind	M 125	0.67	1.1	1.77	1.63	1.33	2.96	0.22	0.47	0.69			
Vernonanthura chamaedrys (Less.) H.Rob.	M 40	0.11	0.37	0.48	0.31	0.27	0.58	0.49	0.7	1.19	0.23	0.66	0.89
BEGONIACEAE													
Begonia cucullata Willd.	M 108	0.01	0.12	0.13	0.01	0.13	0.14						
CAMPANULACEAE													
Lobelia aquatica Cham.	M 152							0.02	0.16	0.17	0.01	0.09	0.1
Lobelia camporum Pohl	M 113	0.06	0.12	0.18	0.05	0.13	0.18	0.02	0.16	0.17			
Pratia hederacea Hook. & Arn.	M 45							0.65	0.23	0.89	0.15	0.09	0.25

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
CHARACEAE													
Nitella furcata (Roxb. ex Bruzelius) Agardh	M 307							0.09	0.39	0.48			
CHLORANTHACEAE													
Hedyosmum brasiliense Miq.	M 43												
CUCURBITACEAE													
Melothria fluminensis Gardner	M 28	0.05	0.25	0.3									
CYPERACEAE													
Ascolepis brasiliensis (Kunth) Benth. ex C.B. Clarke	M 11	0.3	1.47	1.77	0.12	0.53	0.65						
Cyperus brevifolius (Rottb.) Endl. ex Hassk.	23	0.04	0.12	0.16									
Cyperus haspan L.	M 67	0.04	0.12	0.16				0.11	0.54	0.65	0.17	0.56	0.73
Cyperus longiculmis Pereira-Silva, Hefler & R. Trevis.	M 71							0.01	0.16	0.16			
Cyperus rigens var. i*mpolitus* (Kunth) Hefler & Longhi-Wagner	P 10.841	0.37	1.23	1.6	0.71	1.86	2.57	0.03	0.23	0.27	0.03	0.19	0.22
Cyperus unioloides R. Br.	M 77	0.2	0.86	1.06	0.25	0.27	0.52	0.03	0.16	0.19			
Cyperus valie Pereira-Silva. Hefler & R. Trevis.	P 10.274												
Eleocharis acutangula (Roxb.) Schult.	M 310							0.09	0.93	1.02	0.2	0.94	1.14
Eleocharis capillacea Kunth	P 10.848	0.13	0.86	0.99	0.12	0.53	0.65						
Eleocharis minima Kunth	P 10.985	0.01	0.49	0.5	0.01	0.13	0.14	0.03	0.39	0.42	0.34	0.66	1
Eleocharis nudipes Palla	M 7	0	0.12	0.12				0.24	0.62	0.86	0.75	2.72	3.47

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Eleocharis plicarhachis (Griseb.) Svenson	M 309							0.58	2.56	3.14	0.48	1.6	2.07
Lipocarpha humboldtiana Nees	M 12	0.17	0.74	0.91	1.31	3.32	4.63	0.2	0.93	1.13	0.02	0.09	0.11
Rhynchospora conferta (Nees) Boeckeler	M 10	0.04	0.25	0.29									
Rhynchospora corymbosa (L.) Britton	M	0.2	0.98	1.18	0.05	0.4	0.45	0.18	0.23	0.41	0.35	0.19	0.53
Rhynchospora emaciata (Nees) Boeckeler	M 116	0.26	0.49	0.75				1.8	3.03	4.83	0.99	2.82	3.81
Rhynchospora loefgrenii Boeckeler	M 14	3.33	4.9	**8.23**	4.41	5.05	**9.46**				0.12	0.19	0.3
Rhynchospora marisculus Lindl. ex Nees	M 80	2.7	2.45	5.15	3.97	3.06	**7.03**	0.08	0.16	0.24	0.08	0.09	0.17
Rhynchospora rugosa (Vahl) Gale	M 325	0.62	0.86	1.48	1.06	1.73	2.79				0.03	0.19	0.22
Rhynchospora trispicata (Nees) Schrad. ex Steud.	M 204	0.41	0.49	0.9	0.95	1.33	2.28	0.68	1.09	1.76	0.19	0.38	0.57
Rhynchospora velutina (Kunth) Boeckeler	M 294	1.69	1.84	3.53	0.5	1.33	1.83	0.3	0.93	1.24	0.35	0.94	1.29
Scleria hirtella Sw.	M 8							0.06	0.62	0.68			
Scleria leptostachya Kunth	M 148	0.46	1.1	1.56	0.39	1.73	2.12	0.14	0.62	0.76	0.03	0.19	0.22
Scleria lithosperma (L.) Sw.	M 162	0.29	1.35	1.64	0.64	2.66	3.3	0.01	0.47	0.48	0.31	0.38	0.68
Scleria microcarpa Nees ex Kunth	M 75							0	0.16	0.16	0.12	0.09	0.21
ERIOCAULACEAE													
Eriocaulon sellowianum Kunth	M 69	0.2	0.74	0.94	0.27	0.53	0.8	0	0.16	0.16	0.35	0.38	0.73
Syngonanthus caulescens (Poir.) Ruhland	M 3	0.52	1.1	1.62	0.65	1.33	1.98	0.02	0.16	0.17	0.04	0.28	0.32
EUPHORBIACEAE													
Caperonia castaneifolia (L.) A. St.-Hil.	M 165							0.31	1.63	1.95	0.54	1.88	2.41

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Sapium hasslerianum Huber	M 144	0.02	0.12	0.14									
FABACEAE													
Aeschynomene fluminensis Vell.	M 50							0.11	0.23	0.35	0.26	0.38	0.64
Aeschynomene sensitiva Sw.	M 175							0.1	0.31	0.41	0.08	0.09	0.17
GENTIANACEAE													
Chelonanthus alatus (Aubl.) Pulle	M 117	0.07	0.37	0.44				0.02	0.16	0.17	0.01	0.09	0.1
Schultesia aptera Cham.	P 10.870	0.3	1.47	1.77									
Schultesia gracilis Mart.	M 114												
Schultesia heterophylla Miq.	P 10.849												
GESNERIACEAE													
Sinningia elatior (Kunth) Chautems	M 59	0.97	2.7	3.67	0.32	0.93	1.25						
HYPNACEAE													
Isopterygium tenerifolium Mitt.	P 10.969				0.02	0.13	0.15	0.11	0.31	0.42	0.04	0.09	0.13
IRIDACEAE													
Cypella laxa Ravenna	M 98	0.17	0.86	1.03									
Cantinoa althaeifolia (Pohl ex Benth.) Harley & J.F.B.Pastore	M 301	0.82	0.98	1.8	0.81	1.06	1.87				0.02	0.19	0.2
LAMIACEAE													
Hyptis crenata Pohl ex Benth.	M 944	0.01	0.12	0.13									
Hyptis lavandulacea Pohl ex Benth.	M 188	0.18	0.37	0.55	0.35	1.46	1.81	0.08	0.31	0.39			
Hyptis microphylla Pohl ex Benth.	M 360										0.02	0.09	0.11
Hyptis pachyarthra Briq.	M 109	0.26	0.61	0.87	0.09	0.53	0.62	0.02	0.16	0.17	0.01	0.09	0.1

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Hyptis pulchella Briq.	M 170				0.05	0.4	0.45						
Hyptis recurvata Poit.	M 82	0.48	1.96	2.44	0.24	0.66	0.9						
LAURACEAE													
Nectandra gardneri Meisn.	M 336							0.12	0.16	0.28	0.07	0.09	0.16
LENTIBULARIACEAE													
Utricularia foliosa L.	M 184							0.51	1.17	1.67			
Utricularia gibba L.	M 129	0	0.12	0.12				2.11	4.66	**6.77**	0.01	0.09	0.1
Utricularia hydrocarpa Vahl	M 180	0.01	0.12	0.13				0.61	2.72	3.33			
Utricularia myriocista A. St.-Hil. & Girard	M 134							0.21	0.62	0.84			
Utricularia nervosa Weber ex Benj.	M 30	0.25	0.37	0.62	0.05	0.27	0.32				0.01	0.09	0.1
Utricularia praelonga A. St.-Hil. & Girard	M 1	0	0.12	0.12	0.05	0.4	0.45				0.01	0.09	0.1
Utricularia trichophylla Spruce ex Oliv.	M 76	0.03	0.37	0.4				0.25	0.23	0.48			
Utricularia tricolor A. St.-Hil.	M 130										0.02	0.09	0.11
MALPIGHIACEAE													
Heteropterys procoriacea Nied.	M 38							0.14	0.31	0.45	0.14	0.19	0.33
Heteropterys eglandulosa A. Juss.	M 345	0.28	0.37	0.65	0.31	0.4	0.71						
Heteropterys orinocensis (Kunth) A.Juss.	M 371												
MALVACEAE													
Byttneria palustris Cristóbal	M 37	0.37	0.74	1.11	0.6	1.33	1.93	2.18	4.27	**6.45**	2.19	6.38	**8.58**
Melochia simplex A. St.-Hil.	M 362							0.57	1.55	2.13	0.04	0.09	0.13
Melochia villosa (Mill.) Fawc. & Rendle	M 282							0.13	0.31	0.44	0.25	0.75	1

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Sida rhombifolia L.	-							0.01	0.16	0.16			
MAYACACEAE													
Mayaca sellowiana Kunth	M 83	0.06	0.25	0.31	0.1	0.4	0.5	0.87	2.41	3.28	0.02	0.19	0.2
MELASTOMATACEAE													
Acisanthera alsinaefolia Triana	-							0.36	1.17	1.53	0.94	2.25	3.19
Acisanthera divaricata Cogn.	M 314												
Acisanthera variabilis (DC.) Triana	M 339												
Miconia chamissois Naudin	M 34				0.21	0.66	0.87	0.34	0.7	1.04	0.32	0.66	0.98
Tibouchina gracilis (Bonpl.) Cogn.	M 85	0.47	1.71	2.18	0.34	1.06	1.4	0.17	0.62	0.79	0.02	0.19	0.21
MYRSINACEAE													
Rapanea umbellata (Mart.) Mez	M 96												
OCHNACEAE													
Sauvagesia racemosa A. St.-Hil.	M 32	0.12	0.12	0.24	0.34	1.59	1.93	0.04	0.39	0.43	0.15	0.47	0.62
ONAGRACEAE													
Ludwigia bullata (Hassl.) H. Hara	M 166												
Ludwigia filiformis (Micheli) Ramamoorthy	M 174							0.2	0.54	0.74	0.22	0.66	0.88
Ludwigia irwinii Ramamoorthy	M 86							0.37	1.09	1.46	0.41	1.41	1.82
Ludwigia nervosa (Poir.) H. Hara	M 74	0.52	1.59	2.11	0.99	1.99	2.98	0.36	1.09	1.45	0.48	1.5	1.98
Ludwigia sericea (Cambess.) H. Hara	M 39	0.07	0.12	0.19	0.06	0.13	0.19	0.08	0.16	0.24	0.2	0.47	0.67
ORCHIDACEAE													
Cyrtopodium paludicola Hoehne	M 123	0.06	0.12	0.18	0.06	0.13	0.19	0.06	0.16	0.21	0.04	0.09	0.13

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Habenaria nuda Lindl.	M 324	0.02	0.12	0.14				0.01	0.16	0.16			
Habenaria pungens Cogn.	M 323	0.02	0.12	0.14									
OROBANCHACEAE													
Escobedia grandiflora (L. f.) Kuntze	M 94	0.14	0.37	0.51	0.06	0.13	0.19						
PASSIFLORACEAE													
Passiflora pottiae Cervi & Imig	M 363	0.07	0.12	0.19	0.19	0.13	0.32						
PHYLLANTHACEAE													
Hieronyma alchorneoides Allemão	M 364												
Phyllanthus stipulatus (Raf.) G.L. Webster	M 203												
PIPERACEAE													
Piper fuligineum Kunth	M 36				0.02	0.13	0.15	0.11	0.31	0.43	0.14	0.28	0.42
Piper macedoi Yunck.	-												
PLANTAGINACEAE													
Bacopa monnierioides (Cham.) B.L. Rob.	M 41							0.03	0.31	0.34			
Bacopa reflexa (Benth.) Edwall	M 213							0	0.16	0.16			
Bacopa scabra Descole & Borsini	M 205	0.05	0.25	0.3	0.02	0.13	0.15						
POACEAE													
Andropogon bicornis L.	M 137	0.06	0.12	0.18									
Andropogon glaziovii Hack.	M 221										0.15	0.09	0.25
Andropogon hypogynus Hack.	M 89	3.58	3.55	**7.13**	3.57	3.59	**7.16**	12.96	4.42	**17.38**	11.79	5.07	**16.86**
Andropogon macrothrix Trin.	M 104	0.24	0.12	0.36	0.39	0.4	0.79						

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Andropogon virgatus Desv.	P 10058	3.87	4.78	**8.65**	4.91	6.24	**11.15**	0.65	1.32	1.97	0.74	1.88	2.61
Anthaenantia lanata (Kunth) Benth.	M 334	9.08	4.41	**13.49**	6.88	4.65	**11.53**						
Anthaenantiopsis trachystachya (Nees) Mez ex Pilg.	M 56	0.78	0.37	1.15	0.75	0.4	1.15	0.12	0.16	0.28			
Arundinella hispida (Humb. & Bonpl. ex Willd.) Kuntze	M 24				0.04	0.13	0.17						
Axonopus cf. *comans* (Trin. ex Döll) Kuhlm.	P 10.777										0.96	0.66	1.62
Axonopus uninodis (Hack.) G.A. Black	M 19	5.02	1.47	**6.49**	12.36	6.24	**18.6**	9.88	3.26	**13.14**	7.33	3.76	**11.09**
Axonopus purpusii (Mez) Chase	M 20							0.14	0.16	0.29			
Axonopus siccus (Nees) Kuhlm.	M 20	1.74	0.86	2.6									
Coelorhachis aurita (Steud.) A. Camus	M 60	0.29	0.61	0.9	0.27	0.66	0.93	0.43	0.7	1.12	0.31	0.75	1.06
Eriochrysis cayennensis P. Beauv.	M 17	0.47	1.35	1.82	1.22	1.99	3.21	0.44	0.7	1.14	1.38	1.41	2.79
Eriochrysis holcoides (Nees) Kuhlm.	M 101	14.83	8.21	**23.04**	2.05	1.73	3.78	1.86	1.79	3.65	3.53	2.16	**5.69**
Hyparrhenia bracteata (Humb. & Bonpl. ex Willd.) Stapf	M 189	0.58	0.98	1.56	0.37	0.66	1.03	0.61	0.78	1.39	0.41	0.75	1.16
Hyparrhenia rufa (Nees) Stapf	M 361								0.08	0.08		0.09	0.1
Ichnanthus procurrens (Nees ex Trin.) Swallen	M 22	0.18	0.49	0.67	0.15	0.4	0.55						
Imperata tenuis Hack.	M 208	1.92	1.23	3.15	1.62	0.93	2.55	8.05	3.65	**11.7**	10.47	5.26	**15.73**
Leersia hexandra Sw.	M 259							2.49	2.87	**5.36**	0.69	3	3.69
Paspalum dedeccae Quarin	M 343				6.22	4.38	**10.6**						
Paspalum erianthoides Lindm.	M 303	9.65	2.57	**12.22**	11.32	3.06	**14.38**	9.68	2.87	**12.55**	10.26	3.57	**13.83**
Paspalum erianthum Nees ex Trin.	M 304	0.02	0.12	0.14	2.27	2.13	4.4						

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
Paspalum flaccidum Nees	M 285	8.99	3.92	**12.91**	6.7	3.45	**10.15**	0.63	0.62	1.25	0.53	0.66	1.19
Paspalum glaucescens Hack.	M 365	1.29	1.23	2.52				0.08	0.16	0.24	0.04	0.09	0.13
Paspalum lenticulare Kunth	M 327												
Paspalum maculosum Trin.	M 299												
Paspalum wrightii Hitchc. & Chase	M 355												
Rheochloa scabriflora Filg.. P.M. Peterson & Y. Herrera	M 330	0.06	0.49	0.55	0.19	0.66	0.85	0.01	0.16	0.16	0.09	0.28	0.37
Rhytachne rottboellioides Desv.	M 90	0.6	1.47	2.07	1.31	0.53	1.84	3.11	1.94	5.05	24.37	9.95	**34.32**
Saccharum asperum (Nees) Steud.	M 61	1.38	0.37	1.75	0.12	0.13	0.25	16.36	5.9	**22.26**	1.41	2.25	3.66
Saccharum villosum Steud.	M 73	0.28	0.25	0.53	2.97	2.52	5.49	5.22	3.42	**8.63**	3.71	3.85	**7.55**
Sacciolepis vilvoides (Trin.) Chase	M 140	3.87	3.92	**7.79**	0.11	0.4	0.51						
Schizachyrium condensatum (Kunth) Nees	P 10.787	0.01	0.12	0.13	0.4	0.93	1.33	0.1	0.47	0.56	0.05	0.28	0.33
Schizachyrium gracilipes (Hack.) A. Camus	M 340							0.21	1.17	1.38	0.06	0.66	0.72
Setaria parviflora (Poir.) Kerguélen	M 1278							0.1	0.16	0.25			
Steinchisma decipiens (Nees ex Trin.) W.V. Br.	M 93										0.02	0.09	0.12
Steinchisma laxum (Sw.) Zuloaga	M 18							0.07	0.39	0.46	0.05	0.19	0.24
Trichanthecium caaguazuense (Henrard) Zuloaga & Morrone	M 157	0.11	0.49	0.6				0.05	0.39	0.44			
Trichanthecium parvifolium (Lam.) Zuloaga & Morrone	M 128							0.02	0.7	0.72	0.01	0.09	0.1

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
PONTEDERIACEAE													
Pontederia parviflora Alexander	M 368							0.06	0.16	0.21	0.04	0.09	0.13
PRIMULACEAE													
Anagalis minima (L.) E.H.L. Krause	M 42				0.07	0.27	0.34						
PTERIDACEAE													
Pityrogramma calomelanos (L.) Link	M 224	1.72	2.7	4.42	2.17	2.13	4.3	0.29	0.54	0.84	0.4	0.47	0.87
RUBIACEAE													
Borreria pulchristipula (Bremek.) Bacigalupo & E.L. Cabral	M 168	0.04	0.12	0.16				0.14	0.78	0.92	0.02	0.19	0.21
Hexasepalum radula (Willd.) Delprete & J.H. Kirkbr.	M 92							0.02	0.16	0.17			
SAPINDACEAE													
Matayba elaeagnoides Radlk.	M 338												
SCROPHULARIACEAE													
Melasma stricta (Benth.) Hassl.	M 6				0.02	0.13	0.15						
SOLANACEAE													
Schwenckia juncoides Chodat	M 55							1.01	1.55	2.56	0.08	0.56	0.64
Solanum subinerme Jacq.	P 10.552												
STYRACACEAE													
Styrax camporum Pohl	M 65												

Appendix 1. Continued on next page...

Appendix 1. ...Continued

Family/Species	Col.	Wet grassland						Transition Area					
		Rainy			Dry			Rainy			Dry		
		RC	RF	CV	RC	RF	CV	RC	RF	CV	RC	RF	CV
URTICACEAE													
Cecropia pachystachya Trécul	M 88	0.14	0.25	0.39	0.06	0.13	0.19	0.04	0.16	0.2	0.06	0.09	0.16
XYRIDACEAE													
Xyris jupicai Rich.	M 348	0.06	0.12	0.18	1.27	2.39	3.66	0.21	0.47	0.68	0.13	0.38	0.51
Xyris laxiflora F. Muell.	M 126	0.47	0.74	1.21	0.84	1.06	1.9	0.62	1.71	2.33	0.41	1.03	1.44
Xyris savanensis Miq.	M 351	1.74	1.96	3.7	0.11	0.53	0.64						
Xyris schizachne Mart.	M 353	0.04	0.12	0.16				0.08	0.39	0.47	0.05	0.28	0.34
Xyris tortula Mart.	M 350	0.01	0.12	0.13				0.12	0.23	0.36	0.08	0.19	0.26