Floristic and vegetation structure of a grassland plant community on shallow basalt in southern Brazil

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ABSTRACT

Few studies have adequately described the floristic and structural features of natural grasslands associated with shallow basalt soils in southern Brazil. This study was carried out on natural grazing land used for livestock production in the municipality of Santana do Livramento, in the Campanha region of the state of Rio Grande do Sul, Brazil. The aim of the study was to describe the floristic and structural diversity of the area. The floristic list obtained comprises 229 plant taxa from 40 botanical families, with a predominance of the families Poaceae (62), Asteraceae (28), Fabaceae (16) and Cyperaceae (12). The estimated diversity and evenness in the community were 3.00 and 0.874, respectively. Bare soil and rock outcrops accounted for 19.3% of the area, resulting in limited forage availability. Multivariate analysis revealed two well-defined groups among the sampling units. One group showed a high degree of internal aggregation, associated with deep soils, and was characterized by the presence of tussocks, whereas the other was less aggregate and was characterized by prostrate species growing on shallow soil. Ordination analysis indicated a gradient of moisture and of soil depth in the study area, resulting in different vegetation patterns. These patterns were analogous to the vegetation physiognomies described for Uruguayan grasslands. Overall, the grassland community studied is similar to others found throughout southern Brazil, although it harbors more winter forage species. In addition, the rare grass *Paspalum indecorum* Mez is locally dominant in some patches, behaving similarly to *P. notatum* Fl., a widespread grass that dominates extensive grassland areas in southern Brazil.

Key words: diversity, richness, Pampa biome, forage species, environmental gradient

Introduction

Natural grasslands growing on shallow basalt soils cover approximately 4.5 million ha in southern Brazil (primarily in the Campanha region of the state of Rio Grande do Sul) and Uruguay (Hasenack *et al.* 2010). At present, most of this area is in relatively good conservation status and constitutes the main source of forage for regional beef cattle production (Bilenca & Miñarro 2004). Natural grasslands also provide many other environmental benefits, such as fixation of atmospheric carbon (Guterres *et al.* 2006); nutrient storage and cycling; regulation and maintenance of water cycles and water quality; prevention and control of soil erosion; and scenic beauty (Tornquist & Bayer 2009). In addition, due to the prevailing winds in the grassland-dominated ecosystems of southern Brazil and Uruguay, wind power plants have recently been installed in the region, contributing to clean energy generation. Because natural grasslands play such important roles, increasing our knowledge of these ecosystems and preserving them has become an ethical duty for farmers and researchers alike.

In livestock production systems that rely on heterogeneous and complex environments such as natural grasslands, identifying and understanding the biology of key plant species are prerequisites to inform decisions regarding management and sustainability, because species composition influences plant production dynamics at temporal and spatial scales (Soares *et al.* 2005). The result is the rise of a genuinely symbiotic integrative productive system, which combines the need to produce and the need to continue producing in the future. According to Hodgson (1990), the foundation of the management of natural grazing lands is to reconcile livestock nutritional demands with maintenance of the productive potential of grazed plants. In order to do so, it is imperative to gather knowledge of the composition and structure of the natural grazing land.

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Despite the ecological and economic relevance of grasslands on shallow soils in Brazil, there have been only a few studies evaluating such areas, all of which have been carried out in neighboring Uruguay (Rosengurtt 1979; Berretta 1998; Lezama *et al.* 2006; Lezama *et al.* 2010). The objective of the present study was to characterize the floristic composition and structure of the plant community of natural grasslands on Lithic Ustorthents derived from basalt in southern Brazil, providing a representative floristic list for this formation.

Material and methods

The survey was carried out on private property in a rural area (Santo Antônio Farm, 31°03'29"S; 55°55'26"W, 327 m above mean sea level), in the Coxilha Rica district of the municipality of Santana do Livramento, in the state of Rio Grande do Sul, Brazil, in the physiographic region locally known as Campanha (Stammel 1996). Natural grasslands in the area are historically used as the main forage source for livestock production, as in most of the preserved natural grassland ecosystems in the region (Nabinger *et al.* 2009). According to the Köppen climate classification system, the climate in the study area is type Cfa, theoretically with no dry season, although there is a high probability of soil water deficit during the peak of summer (Leivas *et al.* 2006). The soil in the sampling area is a Lithic Ustorthents (Neossolo Litólico Eutrófico by the Brazilian Soil Classification System, Pedregal mapping unit; EMBRAPA 1999). Physically, the soil has low drainage and water storage capacity, featuring the frequent presence of small loose stones and larger rock outcrops. Grassland vegetation at the study site is heterogeneous, presenting different physiognomic patterns that are visually distinguishable in terms of the overall structure and species composition, as well as the presence of bare soil and rock outcrops. Based on these criteria, the studied site was visually classified *a priori* into four categories, or structural patterns: "soft", "open", "closed" and "indecorum".

In relief depressions with deeper soils, vegetation was dominated by tall erect species adapted to high humidity, which usually bear leaves with small amounts of silica and fibers, thus characterizing the "soft" pattern. At hilltops and on hillsides, overall vegetation height was smaller and encompassed three physiognomic patterns distributed in patches: the "closed" pattern, showing dense vegetation cover, with almost no bare soil or rocks; the "open" pattern, with large amounts of bare soil or rock outcrops; and the "indecorum" pattern, comprising vegetation patches dominated by the grass *Paspalum indecorum*.

Data collection for the structural survey was conducted in 90 square sampling units (SUs) of 0.25 m^2 each, distributed over 77.3 ha of natural grasslands. We used preferential SU allocation to sample the four physiognomic patterns proportional to their representation in the landscape (Matteucci & Colma 1982). An exhaustive floristic list was prepared prior to and during the structural survey by collecting plant specimens outside the SUs throughout the study area. The surveys were carried out during the spring of 2009. Specimens were identified by consulting the specific taxonomic literature (Barros 1960; Burkart 1969, 1974, 1979, 1987; Delprete *et al.* 2004, 2005; Burkart & Bacigalupo 2005; Lourteig 1983; Rosengurtt *et al.* 1970; besides many localized taxonomic revisions and unpublished dissertations and theses) and by consulting specialists. The resulting *a priori* classification of the 90 SUs into one of the four physiognomic patterns was as follows: 36 "closed"; 44 "open"; 12 "soft"; and eight "indecorum". The robustness of this *a priori* classification was tested using multivariate analyses (see below). The sampled area has been historically managed with domestic herbivores. For all species, bare soil and rock present in each SU, cover was estimated using an adaptation of the decimal scale devised by Londo (Londo 1976). Respective scale value/real cover value were: 0.1/<1%, 0.5/1.1-5%, 1/5.1-10%, 2/10.1-20% and so forth in decimal intervals up to 10/ 90.1-100%.

For each species, we calculated absolute and relative frequency; absolute and relative cover; and importance value (IV). For the plant community as a whole, we calculated the Shannon diversity index (H', using the natural logarithmic base) and Pielou's evenness index (J'—Pielou 1969; Müeller-Dombois & Ellenberg 1974; Magurran 1988).

The raw data matrix was submitted to multivariate analyses using MULTIV software (Pillar 1997). Cluster analysis was carried out with the sum of squares as the clustering criterion (Ward 1963; Orlóci 1967). After cluster analysis, we looked for well-defined groups among the SUs using the method proposed by Pillar (1999a). We employed principal coordinate analysis using chord distance between SUs. We evaluated stability and significance of the first five ordination axes after 10,000 iterations of bootstrap resampling (Pillar 1999a; 1999b). The variables "bare soil" and "rock cover" were not included in these analyses but were inserted in the ordination diagram after computing the correlation between their vectors and the ordination scores of SUs (first two axes).

Results and discussion

The floristic survey identified 229 taxa, belonging to 138 genera and 40 families (Appendix 1). The most representative families were Poaceae, with 62 taxa, and Asteraceae, with 28 taxa, accounting for 26.8% and 12.1% of the total species richness, respectively, compared with 6.9% and 5.2%, respectively, for Fabaceae and Cyperaceae, both of which are worth mentioning because most of their taxa constitute important forage sources. Collectively, Poaceae, Asteraceae, Cyperaceae and Fabaceae accounted for 50.9% of the taxa recorded in the survey. Twenty-two other families presented two to seven taxa each, accounting for 43.1% of the total species richness, and another 14 families presented one taxon each, accounting for the remaining 6%. In the structural survey of the 90 SUs, we identified 178 plant taxa (see Appendix 2 for the complete list with frequency and cover values for each variable).

For the plant community studied, the H' was estimated at 3.00 and the J' was estimated at 0.874. In a study of a grassland community on sandy soils, along the banks of a seashore lagoon in southern Brazil, Boldrini *et al.* (2008) found similar diversity (H'=2.98) and slightly lower species richness (183). Working in that same region, Ferreira & Setubal (2009) found higher diversity (H'=3.63) and lower richness (126). In a grassland community on predominantly shallow soils on a granite hill, also in southern Brazil, Ferreira *et al.* (2010) found an H' of 4.5 and identified 282 plant taxa. All of those studies were carried out on sites historically submitted to grazing, burning or both, although some of them are not managed at the present.

Sandy soils and shallow stony soils are restrictive environments for the development of many species. In such environments, a small group of stress-tolerant taxa can dominate the community, thus reducing diversity and evenness. The estimated evenness for our studied community was similar to the 0.87 and 0.86 found by Ferreira & Setubal (2009) and Ferreira *et al.* (2010), respectively, and higher than the 0.68 found by Boldrini *et al.* (2008). The relatively similar diversity, evenness and overall richness among surveys conducted at different sites within the Pampa biome provide further evidence that it constitutes a discrete ecological unit (Ferreira & Boldrini 2011).

Bare soil and rocks accounted for 19.3% of the total sampled area. Similar values have been found for grasslands on shallow basalt soils in Uruguay (Lezama *et al.* 2006). Although this proportion is high, bare soil and rock cover are important, intrinsic features of Litholic Neosols (Stammel 1996) and should be taken into account when estimating forage availability.

Poaceae, the family with most taxa in our survey, accumulated 49.2% of the importance value (IV), compared with 15.35%, 1.57% and 5.46% for Asteraceae, Cyperaceae and Fabaceae, respectively (Fig. 1). The fact that Fabaceae, which ranked third in richness, accumulated more IV than did Cyperaceae, which ranked second, indicates that relative cover and frequency more accurately describe the importance of each botanical family in the community than do the raw values of richness. Similarly, Rubiaceae and Convolvulaceae, both of which had few taxa in our survey, showed relatively high IVs (Fig. 1). This is due to the fact that the mean frequency of taxa from these families was high in the community studied, as well as to morphological features such as leaf architecture, growth habit and plant size, which directly influence the amount of soil covered by each specimen. The remaining 32 families accumulated only 19.08% of the overall IV, although they encompassed a total of 75 taxa.

Taxa with an IV > 1.0 (n = 29) accounted for 63.9% of the total IV. Within this group were taxa defined as forage, including five summer grasses (*Paspalum notatum*, *P. indecorum*, *Mnesithea selloana*, *Andropogon lateralis*, and *Axonopus affinis*); five winter grasses (*Piptochaetium montevidense*, *P. stipoides*, *Vulpia bromoides*, *Briza minor* and *Danthonia cirrata*); one winter legume (*Trifolium polymorphum*); and one summer legume (*Galactia pretiosa*). The co-existence of winter and summer forages enhances the potential of the natural grassland as a forage source for livestock production (Nabinger *et al.* 2009). Still among these taxa, four Asteraceae are worth mentioning (*Micropsis spathulata*, *Soliva pterosperma*, *Chevreulia sarmentosa* and *Baccharis coridifolia*), since they are especially found at sites with high proportional cover of bare soil and rock. Asteraceae species gain functional benefits from traits such as high seed production and adaptations for wind dispersal, which optimize colonization in such "open" micro-environments.

The four physiognomic patterns of grassland vegetation defined *a priori* were unevenly represented throughout the 77.3 ha of the sampling area (see methods), and mean percentages of bare soil, rock cover and grass species representativeness were variable among them (Tab. 1). The "open" pattern was characterized by what is locally known as "*campos duros*" ("hard fields"), with considerable exposure of bare soil, usually accompanied by rock outcrops (Tab. 1), suggesting shallow soil, a condition associated with hilltops and upper hillsides. The "closed" pattern was found mostly in association with the "open" pattern, on hilltops and hillsides, but on apparently deeper soils. Despite the spatial proximity, the two patterns are markedly different regarding the mean proportional cover of bare soil and rocks, and the representativeness of grasses (Tab. 1). The "soft" pattern was mostly found on lower hillsides and in relief depressions near water courses and temporary bodies of water, where the soil is deeper. In this pattern, the mean proportional cover of bare soil is even lower, and the mean IV of grasses is strikingly high (Tab. 1). The "indecorum" pattern comprised SUs in which there was a predominance of *Paspalum indecorum* and almost no rock outcrops but still lower grass representativeness in comparison with that of the "soft" pattern (Tab. 1). In the "indecorum" pattern, *P. indecorum* is dominant even in the presence of species that dominate in other patterns, such as the grasses *Andropogon lateralis* and *P. notatum*, as well as the winter/spring legumes *Trifolium polymorphum* and *Adesmia incana*.

Cluster analysis identified two sharp groups among the 90 SUs (p>0.1). One group comprised all SUs previously included in the "soft" pattern, whereas the other one encompassed SUs included in the "closed" or "open" patterns. There were SUs of the "indecorum" pattern in both groups. In the principal coordinate analysis, the first ordination axis was significant (p<0.1) and the first two axes trended toward stability, denoting sampling sufficiency for pattern detection (Pillar 1998; 1999a; 1999b). In the resulting scatterplot, all 90 SUs were labeled according to the groups obtained in the cluster analysis (Fig. 2). The SUs

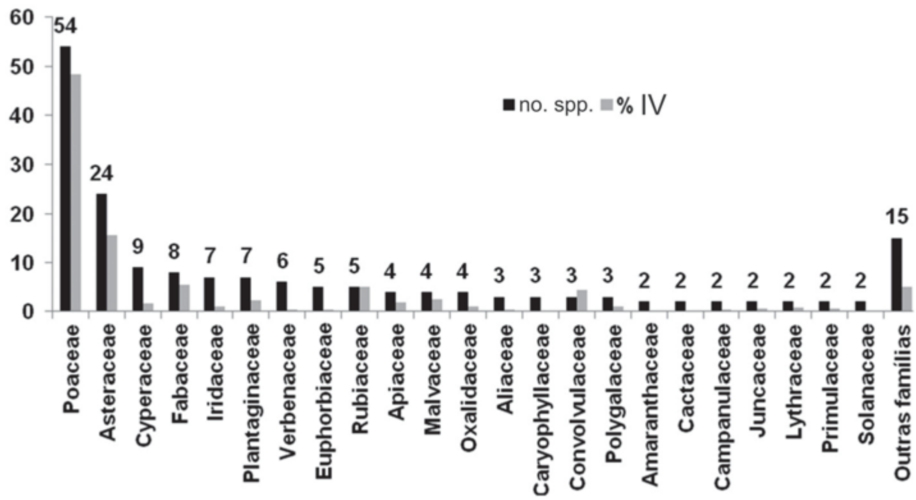

Figure 1. Richness and importance value (IV) of plant families sampled in the structural survey.

Table 1. Proportions of bare soil and rock cover and representativeness of grasses in each *a priori* physiognomic pattern.

Physiognomic pattern	Rock cover (%)	Bare soil (%)	Grasses (accumulated IV) Winter	Summer	Total
Open	12.4	20.5	10	25	35
Closed	0.9	6.4	18	26	44
Soft	0.7	4.4	21	40	61
Indecorum	0.3	4.9	13	36	49

IV – importance value.

in cluster 1 are closer to each other, reflecting a high level of internal aggregation, whereas those in cluster 2 are more widely scattered, suggesting less internal aggregation. The same scatterplot is presented in Fig. 3 but with SUs labeled according to the *a priori* physiognomic patterns, as well as the variables with the strongest correlations (i.e., taxa) and the environmental variables bare soil and rock cover. As can be seen, the "soft" SUs on the upper left quadrant are gradually replaced clockwise by "closed" SUs, which in turn are replaced by "open" SUs. This ordination pattern not only reflects the transition between the predetermined physiognomic patterns but also probably reflects a moisture and soil depth gradient, to which grassland vegetation responds by establishing the patchy pattern observed. On the left-hand side of the scatterplot, there are SUs inserted on deeper and more humid soils, which are replaced clockwise by SUs on shallower and drier soils, up to the "open" SUs located at hilltops. The "indecorum" SUs presented no distinguishable pattern in the scatterplot. There are two plausible explanations for this behavior: apart from the marked dominance of *Paspalum indecorum*, these SUs encompassed plant taxa that were also present in the other patterns; or, unlike those of the other patterns, "indecorum" SUs were not associated with a specific topology. The latter argument suggests that the dominance of *P. indecorum* in some vegetation patches is independent of the observed moisture/soil depth gradient and must result from unobserved biotic/abiotic variables or naturally clumped population distribution. *Paspalum indecorum* is a relatively rare species, which is cited here for the first time in an ecological survey conducted in southern Brazil. It shows striking biological similarities to *P. notatum*, a widespread and typically dominant grass species. Apparently, the two species play similar functional roles, although why they alternately dominate vegetation patches, even at a local scale, is an unanswered question that merits further investigation.

The distribution of variables best correlated with the ordination axes (Fig. 3) corroborates the idea that there is a moisture/soil depth gradient in the study area. *Andropogon lateralis*, *Vulpia bromoides* and *Steinchisma hians*, clustered near "soft" SUs, are species usually associated with deeper soils and more humid conditions, and the last two are C3 grasses. According to Lezama *et al.* (2010), this vegetation pattern constitutes "meso-hydrophytic grazing lands" in Uruguay, usually found in plain-concave portions of the terrain, with similar cover of winter and summer grasses. In our survey, however, the summer/winter grass ratio was 2:1 in the "soft" pattern. This might be explained by the

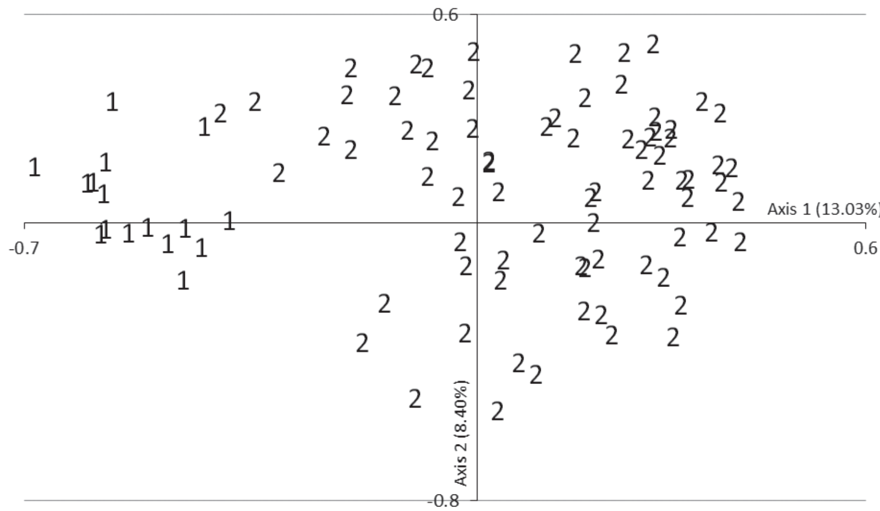

Figure 2. Scatterplot obtained in the principal coordinate analysis of 90 sampling units (SUs) described by 178 plant taxa. SUs are labeled according to sharp groups resulting from a cluster analysis.

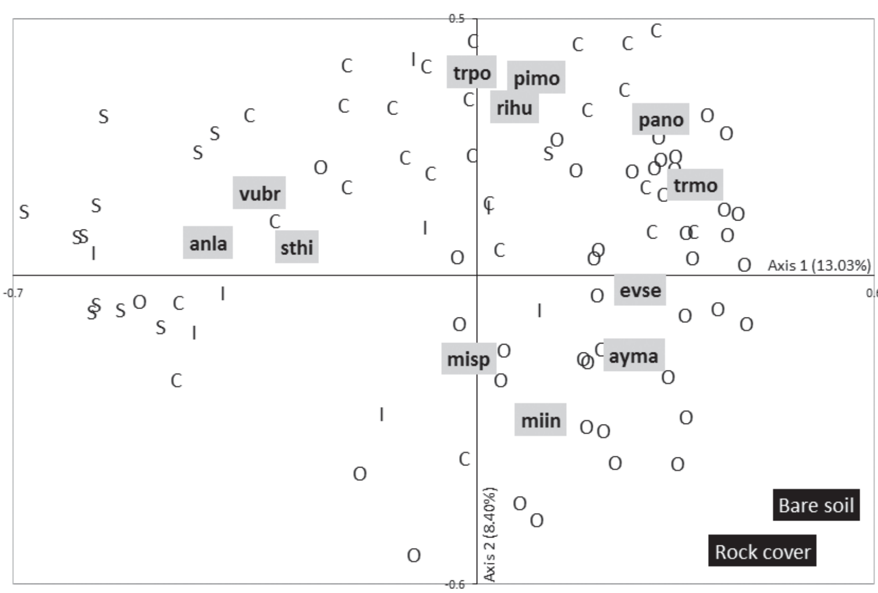

Figure 3. Scatterplot obtained in the principal coordinate analysis of 90 sampling units (SUs) described by 178 plant taxa. SUs are labeled according to the four physiognomic patterns defined *a priori*. Taxa that best correlated with ordination axes and abiotic variables were also plotted.
S – "soft"; C – "closed"; O – "open"; I – "indecorum"; ayma – *Ayenia mansfeldiana*; evse – *Evolvolus sericeus*; miin – *Microchloa indica*; misp – *Micropsis spathulata*; pano – *Paspalum notatum*; pimo – *Piptochaetium montevidense*; rihu – *Richardia humistrata*; sthi – *Steinchisma hians*; trmo – *Trachypogon montufarii*; trpo – *Trifolium polymorphum*; vubr – *Vulpia bromoides*.

geographic position of southern Brazilian grasslands, which are farther north than are the Uruguayan grasslands and, consequently, encompass more tropical summer grasses (Boldrini & Longhi-Wagner 2011).

The "closed" pattern was characterized by *Paspalum notatum*, *Piptochaetium montevidense*, *Richardia humistrata* and *Trifolium polymorphum* (Fig. 3). The first three species are common in natural grasslands throughout southern Brazil (Overbeck *et al.* 2007), as well as in central Uruguay, especially in grazed areas (Altesor *et al.* 2005), and have broad ecological amplitude, thriving under variable conditions, whereas *T. polymorphum* is a pampas species restricted to southernmost Brazil, Uruguay, Argentina and Paraguay, typically found in moderately drained soils.

The "open" SUs were characterized by the presence of *Microchloa indica*, *Evolvulus sericeus*, *Ayenia mansfeldiana*, *Micropsis spathulata* and *Trachypogon montufarii* var. *montufarii* (Fig. 3). All of those species are typically found in open grasslands throughout South America. In Uruguay, this vegetation is referred to as "lithophytic steppe" and is characterized by higher cover of summer species than winter species, usually in high relief positions (Lezama *et al.* 2010). Therefore, our "open" pattern seems to be analogous to this Uruguayan physiognomy, once again providing evidence that supports the classification of South American natural subtropical grasslands as a discrete ecological unit (Ferreira & Boldrini 2011). The gradual substitution of SUs belonging to different patterns and of taxa along the gradient explains why our cluster analysis identified only two well-defined groups.

The variables "bare soil" and "rock cover" were strongly correlated with the ordination axes (Fig. 3). Correlation values were positive for axis 1 and negative for axis 2, so that both variables were plotted towards the "open" (or "well--drained", considering moisture) extremity of the observed gradient. These high correlation values strengthen the interpretation of the observed pattern as a moisture/soil depth gradient. Alternatively, the high correlation values could be interpreted as evidence of a "community openness" gradient, although the two interpretations are not mutually exclusive.

Natural grasslands on basalt-derived Litholic Neosols show high floristic richness and plant diversity, similar to those found at other sites throughout southern Brazil but with greater representation of winter forage species. The presence and local dominance of *Paspalum indecorum*, a species scarcely found in other grassland communities, are also worth mentioning.

We detected an apparently natural structural variability in the vegetation, resulting in patterns that probably arose in function of soil conditions. These patterns match vegetation physiognomies described for Uruguayan grasslands, providing further evidence of an ecological unit comprising South American subtropical grasslands.

Finally, bare soil and rock cover represent a significant area in grasslands growing on Litholic Neosols. Because livestock farming is one of the most important economic activities in the Pampa biome, these variables should be considered when estimating forage availability per area on lands where this soil type is represented in the landscape.

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Appendix 1. Floristic list obtained for the natural grassland in the municipality of Santana do Livramento, Brazil.

Family	Species/Subspecies/Variety
Acanthaceae	*Stenandrium dulce* (Cav.) Nees
Alliaceae	*Ipheion sessile* (Phil.) Traub*
Alliaceae	*Nothoscordum bonariense* (Pers.) Beauverd
Alliaceae	*Nothoscordum gaudichaudianum* Kunth
Alliaceae	*Nothoscordum montevidense* Beauverd
Amaranthaceae	*Chenopodium haumanii* Ulbr.*
Amaranthaceae	*Gomphrena celosioides* Mart.
Amaranthaceae	*Pfaffia gnaphaloides* (L. f.) Mart.*
Amaranthaceae	*Pfaffia tuberosa* Hicken
Amaryllidaceae	*Zephyranthes mesochloa* Herb. ex Lindl.
Amaryllidaceae	*Habranthus tubispathus* (L'Hér.) Traub
Apiaceae	*Ammoselinum rosengurtii* Mathias & Constance
Apiaceae	*Apium leptophyllum* (Pers.) F. Muell. ex Benth.
Apiaceae	*Eryngium echinatum* Urb.
Apiaceae	*Eryngium horridum* Malme*
Apiaceae	*Eryngium nudicaule* Lam.
Apocynaceae	*Oxypetalum microphyllum* Hook. & Arn.
Araliaceae	*Hydrocotyle exigua* Malme
Asteraceae	*Acmella bellidioides* (Sm.) R.K.Jansen
Asteraceae	*Aspilia montevidensis* (Spreng.) Kuntze
Asteraceae	*Aster squamatus* (Spreng.) Hieron.
Asteraceae	*Baccharis coridifolia* DC.
Asteraceae	*Chaptalia piloselloides* (Vahl) Baker
Asteraceae	*Chaptalia runcinata* Kunth
Asteraceae	*Chaptalia sinuata* (Less.) Baker
Asteraceae	*Chevreulia acuminata* Less.
Asteraceae	*Chevreulia sarmentosa* (Pers.) S.F.Blake
Asteraceae	*Conyza monorchis* (Griseb.) Cabrera
Asteraceae	*Conyza primulifolia* (Lam.) Cuatrec. & Lourteig*
Asteraceae	*Elephantopus mollis* Kunth
Asteraceae	*Facelis retusa* (Lam.) Sch.Bip. Asteraceae
	Gamochaeta americana (Mill.) Wedd.
Asteraceae	*Gamochaeta coarctata* (Willd.) Kerguélen
Asteraceae	*Gamochaeta falcata* (Lam.) Cabrera
Asteraceae	*Hypochaeris variegata* (Lam.) Baker
Asteraceae	*Micropsis spathulata* (Pers.) Cabrera
Asteraceae	*Pamphalea bupleurifolia* Less.*
Asteraceae	*Pamphalea heterophylla* Less.
Asteraceae	*Perezia multiflora* ssp. *sonchifolia* (Baker) Vuilleum.
Asteraceae	*Porophyllum linifolium* (Ard.) DC.
Asteraceae	*Pterocaulon alopecuroides* (Lam.) DC.

Continues

Appendix 1. Continuation.

Family	Species/Subspecies/Variety
Asteraceae	*Soliva pterosperma* (Juss.) Less.
Asteraceae	*Sommerfeltia spinulosa* (Spreng.) Less.
Asteraceae	*Stenachaenium campestre* Baker
Asteraceae	*Lessingianthus sellowii* (Less.) H. Rob.*
Asteraceae	*Vernonia* sp. *
Brassicaceae	*Lepidium aletes* J.F. Macbr.
Cactaceae	*Gymnocalycium uruguayense* (Arechav.) Britton & Rose
Cactaceae	*Parodia mammulosa* (Lem.) N.P. Taylor
Campanulaceae	*Triodanis biflora* (Ruiz & Pav.) Greene
Campanulaceae	*Wahlenbergia linarioides* (Lam.) A. DC.
Caryophyllaceae	*Cerastium commersonianum* DC.
Caryophyllaceae	*Cerastium glomeratum* Thuill.
Caryophyllaceae	*Paronychia chilensis* DC. Caryophyllaceae
	Polycarpon tetraphyllum (L.) L.*
Cistaceae	*Helianthemum brasiliense* (Lam.) Pers.
Commelinaceae	*Tradescantia umbraculifera* Hand.-Mazz.
Convolvulaceae	*Convolvulus laciniatus* Desr.
Convolvulaceae	*Dichondra sericea* Sw.
Convolvulaceae	*Evolvulus sericeus* Sw.
Crassulaceae	*Crassula longipes* (Rose) M. Bywater & Wickens*
Cyperaceae	*Abildgaardia ovata* (Burm. f.) Kral
Cyperaceae	*Bulbostylis capillaris* (L.) Kunth ex C.B. Clarke
Cyperaceae	*Carex bonariensis* Desf. ex Poir.
Cyperaceae	*Carex phalaroides* Kunth
Cyperaceae	*Carex sororia* Kunth Cyperaceae
	Cyperus reflexus Vahl
Cyperaceae	*Eleocharis bonariensis* Nees*
Cyperaceae	*Eleocharis dunensis* Kük.
Cyperaceae	*Eleocharis montana* (Kunth) Roem. & Schult.*
Cyperaceae	*Eleocharis sellowiana* Kunth
Cyperaceae	*Eleocharis viridans* Kük. ex Osten
Cyperaceae	*Rhynchospora scutellata* Griseb.*
Euphorbiaceae	*Euphorbia selloi* (Klotzsch & Garcke) Boiss.
Euphorbiaceae	*Euphorbia* sp.
Euphorbiaceae	*Euphorbia spathulata* Lam.
Euphorbiaceae	*Euphorbia stenophylla* Boiss.
Euphorbiaceae	*Tragia geraniifolia* Klotzsch ex Baill.
Fabaceae	*Adesmia bicolor* (Poir.) DC.*
Fabaceae	*Adesmia incana* Vogel
Fabaceae	*Desmodium incanum* DC.*
Fabaceae	*Galactia pretiosa* Burkart

Continues

Appendix 1. Continuation.

Family	Species/Subspecies/Variety
Fabaceae	*Macroptilium psammodes* (Lindm.) S. I. Drewes & R. A. Palácios
Fabaceae	*Macroptilium prostratum* (Benth.) Urb.
Fabaceae	*Mimosa adpressa* Hook. & Arn.*
Fabaceae	*Mimosa amphigena* Burkart*
Fabaceae	*Mimosa burkartii* Marchesi*
Fabaceae	*Mimosa cruenta* Benth.*
Fabaceae	*Mimosa flagellaris* Benth.*
Fabaceae	*Rhynchosia diversifolia* M. Mich. var. diversifolia
Fabaceae	*Rhynchosia senna* Gillies ex Hook.
Fabaceae	*Senna nana* (Benth.) H.S. Irwin & Barneby*
Fabaceae	*Stylosanthes montevidensis* Vogel
Fabaceae	*Trifolium polymorphum* Poir.
Herreriaceae	*Herreria montevidensis* Klotzsch ex Griseb.
Iridaceae	*Calydorea nuda* Baker
Iridaceae	*Cypella herbertii* Hook.
Iridaceae	*Herbertia lahue* (Molina) Goldblatt
Iridaceae	*Herbertia* sp. *
Iridaceae	*Sisyrinchium micranthum* Cav.
Iridaceae	*Sisyrinchium minutiflorum* Klatt
Iridaceae	*Sisyrinchium pachyrhizum* Baker
Iridaceae	*Sisyrinchium scariosum* I.M. Johnst.
Juncaceae	*Juncus biflorus* Elliott*
Juncaceae	*Juncus capillaceus* Lam.
Juncaceae	*Juncus dichotomus* Elliott*
Juncaceae	*Juncus imbricatus* Laharpe*
Juncaceae	*Juncus microcephalus* Kunth
Juncaceae	*Juncus sellowianus* Kunth*
Lamiaceae	*Scutellaria racemosa* Pers.
Linaceae	*Cliococca selaginoides* (Lam.) C.M. Rogers & Mildner
Linaceae	*Linum carneum* A. St.-Hil.*
Linaceae	*Linum erigeroides* A. St.-Hil.*
Lythraceae	*Cuphea carthagenensis* (Jacq.) J.F. Macbr.
Lythraceae	*Cuphea glutinosa* Cham. & Schltdl.
Malvaceae	*Ayenia mansfeldiana* (Herter) Herter ex Cristóbal
Malvaceae	*Krapovickasia flavescens* (Cav.) Fryxell
Malvaceae	*Modiolastrum malvifolium* (Griseb.) K. Schum.*
Malvaceae	*Pavonia glechomoides* A. St.-Hil.
Malvaceae	*Pavonia hastata* Cav.
Malvaceae	*Sida dubia* Saint-Hilaire*
Moraceae	*Dorstenia brasiliensis* Lam.
Onagraceae	*Oenothera mollissima* L.*

Continues

Appendix 1. Continuation.

Family	Species/Subspecies/Variety
Onagraceae	*Oenothera parodiana* Munz
Orchidaceae	*Habenaria parviflora* Lindl.
Orobanchaceae	*Agalinis communis* (Cham. & Schltdl.) D'Arcy
Oxalidaceae	*Oxalis bipartita* A.St.-Hil. subsp. bipartita
Oxalidaceae	*Oxalis eriocarpa* DC.
Oxalidaceae	*Oxalis lasiopetala* Zucc.
Oxalidaceae	*Oxalis* sp.
Plantaginaceae	*Angelonia integerrima* Spreng.
Plantaginaceae	*Gratiola peruviana* L.
Plantaginaceae	*Mecardonia flagellaris* (Cham. & Schlecht.) Rossow subsp.flagellaris *
Plantaginaceae	*Mecardonia tenella* (Cham. & Schltdl.) Pennell
Plantaginaceae	*Plantago brasiliensis* Sims
Plantaginaceae	*Plantago myosuros* Lam.
Plantaginaceae	*Scoparia montevidensis* (Spreng.) R.E. Fr.
Plantaginaceae	*Veronica peregrina* L.
Poaceae	*Agrostis hygrometrica* Nees
Poaceae	*Agrostis tandilensis* (Kuntze) Parodi
Poaceae	*Andropogon lateralis* Nees
Poaceae	*Andropogon ternatus* (Spreng.) Nees
Poaceae	*Aristida echinulata* Roseng. & Izag.
Poaceae	*Aristida murina* Cav.
Poaceae	*Aristida venustula* Arechav. var. *venustula*
Poaceae	*Axonopus affinis* Chase
Poaceae	*Bothriochloa laguroides* (DC.) Herter var. *laguroides*
Poaceae	*Bouteloua megapotamica* (Spreng.) Kuntze
Poaceae	*Briza minor* L.
Poaceae	*Chascolytrum poomorphum* (J. Presl) Essi, Longhi- Wagner & Souza-Chies
Poaceae	*Chascolytrum rufum* J.Presl
Poaceae	*Chascolytrum subaristatum* (Lam.) Desv.
Poaceae	*Calamagrostis viridiflavescens* (Poir.) Steud. var. *viridiflavescens*
Poaceae	*Chloris grandiflora* Roseng. & Izag.
Poaceae	*Mnesithea selloana* (Hack.) de Koning & Sosef
Poaceae	*Cynodon dactylon* (L.) Pers. var. *dactylon*
Poaceae	*Danthonia cirrata* Hack. & Arechav.
Poaceae	*Danthonia montevidensis* Hack. & Arechav.
Poaceae	*Dichanthelium sabulorum* (Lam.) Gould & C.A. Clark var. *sabulorum*
Poaceae	*Eragrostis bahiensis* Schrad. ex Schult.
Poaceae	*Eragrostis lugens* Nees
Poaceae	*Eragrostis neesii* Trin. var. *neesii*
Poaceae	*Eustachys brevipila* (Roseng. & Izag.) Caro & E.A. Sánchez
Poaceae	*Hordeum euclaston* Steud.

Continues

Appendix 1. Continuation.

Family	Species/Subspecies/Variety
Poaceae	*Luziola peruviana* Juss. ex J.F. Gmel.*
Poaceae	*Melica brasiliana* Ard.
Poaceae	*Melica rigida* Cav.
Poaceae	*Microchloa indica* (L. f.) P. Beauv.
Poaceae	*Paspalum dilatatum* Poir.
Poaceae	*Paspalum indecorum* Mez
Poaceae	*Paspalum lepton* Schult.
Poaceae	*Paspalum notatum* Alain ex Flüggé
Poaceae	*Paspalum plicatulum* Michx.
Poaceae	*Paspalum pumilum* Nees
Poaceae	*Paspalum urvillei* Steud.
Poaceae	*Phalaris angusta* Nees ex Trin.
Poaceae	*Piptochaetium bicolor* (Vahl) E. Desv. var. *bicolor*
Poaceae	*Piptochaetium lasianthum* Griseb.*
Poaceae	*Piptochaetium montevidense* (Spreng.) Parodi
Poaceae	*Piptochaetium ruprechtianum* E. Desv.*
Poaceae	*Piptochaetium stipoides* (Trin. & Rupr.) Hack. var. *stipoides*
Poaceae	*Piptochaetium stipoides* var. *chaetophorum* (Griseb.) Parodi
Poaceae	*Poa annua* L.
Poaceae	*Poa lanigera* Nees
Poaceae	*Polypogon chilensis* (Kunth) Pilg.*
Poaceae	*Polypogon elongatus* Lag.*
Poaceae	*Schizachyrium imberbe* (Hack.) A. Camus
Poaceae	*Schizachyrium spicatum* (Spreng.) Herter
Poaceae	*Setaria parviflora* (Poir.) Kerguélen
Poaceae	*Setaria vaginata* Spreng. var. *vaginata*
Poaceae	*Sporobolus indicus* (L.) R. Br.
Poaceae	*Steinchisma hians* (Elliott) Nash
Poaceae	*Stipa charruana* Arechav.*
Poaceae	*Stipa setigera* C. Presl var. *setigera*
Poaceae	*Trachypogon montufarii* (Kunth) Nees var. *montufarii*
Poaceae	*Trachypogon montufarii* var. *mollis* (Nees) Andersson
Poaceae	*Tridens hackelii* (Arechav.) Parodi
Poaceae	*Tripogon spicatus* (Nees) Ekman
Poaceae	*Vulpia bromoides* (L.) Gray
Polygalaceae	*Monnina resedoides* A. St.-Hil.*
Polygalaceae	*Polygala bonariensis* Grondona
Polygalaceae	*Polygala duarteana* A. St.-Hil. & Moq.*
Polygalaceae	*Polygala molluginifolia* A. St.-Hil. & Moq.
Polygalaceae	*Polygala pulchella* A. St.-Hil. & Moq.
Polygonaceae	*Polygonum punctatum* Buch.-Ham. ex D. Don*

Continues

Appendix 1. Continuation.

Family	Species/Subspecies/Variety
Polygonaceae	*Rumex cuneifolius* Campd.*
Primulaceae	*Anagallis minima* (L.) E.H.L. Krause
Primulaceae	*Pelletiera serpyllifolia* (Schreb.) Kuntze
Rubiaceae	*Galium hirtum* Lam.*
Rubiaceae	*Galium richardianum* (Gillies ex Hook. & Arn.) Endl. ex Walp.
Rubiaceae	*Richardia humistrata* (Cham. & Schltdl.) Steud.
Rubiaceae	*Richardia stellaris* (Cham. & Schltdl.) Steud.
Rubiaceae	*Spermacoce brachystemonoides* (Cham. & Schltdl.) Kuntze*
Rubiaceae	*Spermacoce capitata* Ruiz & Pav.
Rubiaceae	*Spermacoce verticillata* L.
Solanaceae	*Bouchetia anomala* (Miers) Britton & Rusby*
Solanaceae	*Calibrachoa humilis* (Fries) Stehmann & Semir*
Solanaceae	*Calibrachoa ovalifolia* (Miers) Stehmann & Semir
Solanaceae	*Nicotiana bonariensis* Lehm.
Turneraceae	*Turnera sidoides* subsp. *integrifolia* (Griseb.) Arbo
Verbenaceae	*Glandularia nana* (Moldenke) Tronc.
Verbenaceae	*Glandularia peruviana* (L.) Small*
Verbenaceae	*Glandularia subincana* Tronc.
Verbenaceae	*Glandularia tenera* (Spreng.) Cabrera
Verbenaceae	*Lippia villafloridana* Kuntze
Verbenaceae	*Verbena filicaulis* Schauer*
Verbenaceae	*Verbena gracilescens* (Cham.) Herter
Verbenaceae	*Verbena montevidensis* Spreng.
Violaceae	*Hybanthus parviflorus* (L. f.) Baill.

*Found only in the floristic survey; the remaining taxa were found in sampling units from the structural survey.

Appendix 2. Plant taxa found in the vegetation structural survey in 90 sampling units, with respective absolute and relative frequency and cover (AF, RF, AC and RC, respectively).

Family	Species/Subspecies/Variety	AF	RF (%)	AC	RC (%)
Acanthaceae	*Stenandrium dulce*	55	2.788	193	1.545
Alliaceae	*Nothoscordum bonariense*	1	0.051	2	0.016
Alliaceae	*Nothoscordum gaudichaudianum*	3	0.152	3	0.024
Alliaceae	*Nothoscordum montevidense*	5	0.253	7	0.056
Amaranthaceae	*Gomphrena celosioides*	4	0.203	7	0.056
Amaranthaceae	*Pfaffia tuberosa*	1	0.051	1	0.008
Apiaceae	*Ammoselinum rosengurtii*	9	0.456	19	0.152
Apiaceae	*Apium leptophyllum*	21	1.064	43	0.344
Apiaceae	*Eryngium echinatum*	1	0.051	2	0.016
Apiaceae	*Eryngium nudicaule*	15	0.760	72	0.576
Apocynaceae	*Oxypetalum microphyllum*	2	0.101	8	0.064
Araliaceae	*Hydrocotyle exigua*	10	0.507	16	0.128
Asteraceae	*Acmella bellidioides*	10	0.507	45	0.360
Asteraceae	*Aspilia montevidensis*	3	0.152	7	0.056
Asteraceae	*Aster squamatus*	2	0.101	5	0.040
Asteraceae	*Baccharis coridifolia*	14	0.710	187	1.497
Asteraceae	*Chaptalia piloselloides*	24	1.216	53	0.424
Asteraceae	*Chaptalia runcinata*	2	0.101	6	0.048
Asteraceae	*Chaptalia sinuata*	9	0.456	18	0.144
Asteraceae	*Chevreulia acuminata*	1	0.051	2	0.016
Asteraceae	*Chevreulia sarmentosa*	45	2.281	263	2.105
Asteraceae	*Conyza monorchis*	3	0.152	5	0.040
Asteraceae	*Elephantopus mollis*	1	0.051	5	0.040
Asteraceae	*Facelis retusa*	23	1.166	41	0.328
Asteraceae	*Gamochaeta americana*	13	0.659	30	0.240
Asteraceae	*Gamochaeta coarctata*	5	0.253	9	0.072
Asteraceae	*Gamochaeta falcata*	15	0.760	27	0.216
Asteraceae	*Hypochaeris variegata*	16	0.811	45	0.360
Asteraceae	*Micropsis spathulata*	59	2.990	296	2.369
Asteraceae	*Panphalea heterophylla*	14	0.710	21	0.168
Asteraceae	*Perezia multiflora* ssp. *sonchifolia*	2	0.101	5	0.040
Asteraceae	*Porophyllum linifolium*	1	0.051	1	0.008
Asteraceae	*Pterocaulon alopecuroides*	1	0.051	1	0.008
Asteraceae	*Soliva pterosperma*	59	2.990	229	1.833
Asteraceae	*Sommerfeltia spinulosa*	2	0.101	20	0.160
Asteraceae	*Stenachaenium campestre*	2	0.101	3	0.024
Brassicaceae	*Lepidium aletes*	4	0.203	5	0.040

Continues

Appendix 2. Continuation.

Family	Species/Subspecies/Variety	AF	RF (%)	AC	RC (%)
Cactaceae	*Gymnocalycium uruguayense*	1	0.051	1	0.008
Cactaceae	*Parodia mammulosa*	1	0.051	5	0.040
Campanulaceae	*Triodanis biflora*	2	0.101	2	0.016
Campanulaceae	*Wahlenbergia linarioides*	10	0.507	14	0.112
Caryophyllaceae	*Cerastium commersonianum*	1	0.051	1	0.008
Caryophyllaceae	*Cerastium glomeratum*	2	0.101	2	0.016
Caryophyllaceae	*Paronychia chilensis*	3	0.152	16	0.128
Cistaceae	*Helianthemum brasiliense*	17	0.862	32	0.256
Commelinaceae	*Tradescantia umbraculifera*	4	0.203	15	0.120
Convolvulaceae	*Convolvulus laciniatus*	8	0.405	39	0.312
Convolvulaceae	*Dichondra sericea*	38	1.926	188	1.505
Convolvulaceae	*Evolvulus sericeus*	47	2.382	126	1.008
Cyperaceae	*Abildgaardia ovata*	2	0.101	2	0.016
Cyperaceae	*Bulbostylis capillaris*	2	0.101	3	0.024
Cyperaceae	*Carex bonariensis*	2	0.101	3	0.024
Cyperaceae	*Carex phalaroides*	17	0.862	37	0.296
Cyperaceae	*Carex sororia*	1	0.051	10	0.080
Cyperaceae	*Cyperus reflexus*	6	0.304	9	0.072
Cyperaceae	*Eleocharis dunensis*	3	0.152	19	0.152
Cyperaceae	*Eleocharis sellowiana*	1	0.051	2	0.016
Cyperaceae	*Eleocharis viridans*	5	0.253	19	0.152
Euphorbiaceae	*Euphorbia selloi*	1	0.051	1	0.008
Euphorbiaceae	*Euphorbia sp.*	1	0.051	1	0.008
Euphorbiaceae	*Euphorbia spathulata*	1	0.051	1	0.008
Euphorbiaceae	*Euphorbia stenophylla*	5	0.253	6	0.048
Euphorbiaceae	*Tragia geraniifolia*	2	0.101	6	0.048
Fabaceae	*Adesmia incana*	1	0.051	75	0.600
Fabaceae	*Galactia pretiosa*	33	1.673	82	0.656
Fabaceae	*Macroptilium psammodes*	2	0.101	4	0.032
Fabaceae	*Macroptilium prostratum*	1	0.051	2	0.016
Fabaceae	*Rhynchosia diversifolia* var. *diversifolia*	11	0.558	30	0.240
Fabaceae	*Rhynchosia senna*	1	0.051	1	0.008
Fabaceae	*Stylosanthes montevidensis*	3	0.152	14	0.112
Fabaceae	*Trifolium polymorphum*	47	2.382	355	2.841
Herreriaceae	*Herreria montevidensis*	1	0.051	2	0.016
Iridaceae	*Calydorea nuda*	1	0.051	1	0.008
Iridaceae	*Cypella herbertii*	2	0.101	4	0.032
Iridaceae	*Herbertia lahue*	3	0.152	4	0.032

Continues

Appendix 2. Continuation.

Family	Species/Subspecies/Variety	AF	RF (%)	AC	RC (%)
Iridaceae	*Sisyrinchium micranthum*	7	0.355	8	0.064
Iridaceae	*Sisyrinchium minutiflorum*	6	0.304	7	0.056
Iridaceae	*Sisyrinchium pachyrhizum*	8	0.405	11	0.088
Iridaceae	*Sisyrinchium scariosum*	4	0.203	9	0.072
Juncaceae	*Juncus capillaceus*	3	0.152	7	0.056
Juncaceae	*Juncus microcephalus*	10	0.507	56	0.448
Lamiaceae	*Scutellaria racemosa*	7	0.355	10	0.080
Linaceae	*Cliococca selaginoides*	1	0.051	2	0.016
Lythraceae	*Cuphea carthagenensis*	7	0.355	11	0.088
Lythraceae	*Cuphea glutinosa*	14	0.710	28	0.224
Malvaceae	*Ayenia mansfeldiana*	26	1.318	123	0.984
Malvaceae	*Krapovickasia flavescens*	12	0.608	20	0.160
Malvaceae	*Pavonia glechomoides*	16	0.811	68	0.544
Malvaceae	*Pavonia hastata*	1	0.051	1	0.008
Moraceae	*Dorstenia brasiliensis*	6	0.304	9	0.072
Onagraceae	*Oenothera parodiana*	1	0.051	1	0.008
Orchidaceae	*Habenaria parviflora*	1	0.051	2	0.016
Orobanchaceae	*Agalinis communis*	2	0.101	3	0.024
Oxalidaceae	*Oxalis bipartita* subsp. *bipartita*	1	0.051	1	0.008
Oxalidaceae	*Oxalis eriocarpa*	5	0.253	19	0.152
Oxalidaceae	*Oxalis lasiopetala*	2	0.101	2	0.016
Oxalidaceae	*Oxalis* sp.	21	1.064	31	0.248
Plantaginaceae	*Angelonia integerrima*	1	0.051	1	0.008
Plantaginaceae	*Gratiola peruviana*	5	0.253	29	0.232
Plantaginaceae	*Mecardonia tenella*	13	0.659	27	0.216
Plantaginaceae	*Plantago brasiliensis*	1	0.051	2	0.016
Plantaginaceae	*Plantago myosuros*	34	1.723	60	0.480
Plantaginaceae	*Scoparia montevidensis*	2	0.101	3	0.024
Plantaginaceae	*Veronica peregrina*	1	0.051	1	0.008
Poaceae	*Agrostis hygrometrica*	1	0.051	1	0.008
Poaceae	*Agrostis tandilensis*	1	0.051	4	0.032
Poaceae	*Andropogon lateralis*	16	0.811	440	3.521
Poaceae	*Andropogon ternatus*	17	0.862	115	0.920
Poaceae	*Aristida echinulata*	11	0.558	121	0.968
Poaceae	*Aristida murina*	10	0.507	49	0.392
Poaceae	*Aristida venustula* var. *venustula*	44	2.230	206	1.649
Poaceae	*Axonopus affinis*	19	0.963	155	1.240
Poaceae	*Bothriochloa laguroides* var. *laguroides*	8	0.405	39	0.312

Continues

Appendix 2. Continuation.

Family	Species/Subspecies/Variety	AF	RF (%)	AC	RC (%)
Poaceae	*Bouteloua megapotamica*	1	0.051	5	0.040
Poaceae	*Briza minor*	27	1.368	132	1.056
Poaceae	*Chascolytrum poomorphum*	8	0.405	15	0.120
Poaceae	*Chascolytrum rufum*	5	0.253	10	0.080
Poaceae	*Chascolytrum subaristatum*	18	0.912	81	0.648
Poaceae	*Calamagrostis viridiflavescens* var. *viridiflavescens*	1	0.051	1	0.008
Poaceae	*Chloris grandiflora*	4	0.203	24	0.192
Poaceae	*Mnesithea selloana*	41	2.078	316	2.529
Poaceae	*Cynodon dactylon* var. *dactylon*	1	0.051	1	0.008
Poaceae	*Danthonia cirrata*	23	1.166	149	1.192
Poaceae	*Danthonia montevidensis*	8	0.405	190	1.521
Poaceae	*Dichanthelium sabulorum* var. *sabulorum*	12	0.608	132	1.056
Poaceae	*Eragrostis bahiensis*	1	0.051	2	0.016
Poaceae	*Eragrostis lugens*	6	0.304	16	0.128
Poaceae	*Eragrostis neesii* var. *neesii*	31	1.571	103	0.824
Poaceae	*Eustachys brevipila*	9	0.456	31	0.248
Poaceae	*Hordeum euclaston*	1	0.051	1	0.008
Poaceae	*Melica brasiliana*	1	0.051	1	0.008
Poaceae	*Melica rigida*	7	0.355	73	0.584
Poaceae	*Microchloa indica*	12	0.608	111	0.888
Poaceae	*Paspalum dilatatum*	7	0.355	46	0.368
Poaceae	*Paspalum indecorum*	27	1.368	647	5.178
Poaceae	*Paspalum lepton*	6	0.304	71	0.568
Poaceae	*Paspalum notatum*	62	3.142	638	5.106
Poaceae	*Paspalum plicatulum*	13	0.659	49	0.392
Poaceae	*Paspalum pumilum*	2	0.101	25	0.200
Poaceae	*Paspalum urvillei*	2	0.101	7	0.056
Poaceae	*Phalaris angusta*	4	0.203	9	0.072
Poaceae	*Piptochaetium bicolor* var. *bicolor*	1	0.051	5	0.040
Poaceae	*Piptochaetium montevidense*	55	2.788	488	3.906
Poaceae	*Piptochaetium stipoides* var. *stipoides*	40	2.027	326	2.609
Poaceae	*Piptochaetium stipoides* var. *chaetophorum*	2	0.101	20	0.160
Poaceae	*Poa annua*	1	0.051	1	0.008
Poaceae	*Poa lanigera*	1	0.051	1	0.008
Poaceae	*Schizachyrium imberbe*	9	0.456	72	0.576
Poaceae	*Schizachyrium spicatum*	13	0.659	75	0.600
Poaceae	*Setaria parviflora*	16	0.811	64	0.512
Poaceae	*Setaria vaginata* var. *vaginata*	2	0.101	5	0.040

Continues

Appendix 2. Continuation.

Family	Species/Subspecies/Variety	AF	RF (%)	AC	RC (%)
Poaceae	*Sporobolus indicus*	1	0.051	2	0.016
Poaceae	*Steinchisma hians*	17	0.862	67	0.536
Poaceae	*Stipa setigera* var. *setigera*	15	0.760	128	1.024
Poaceae	*Trachypogon montufarii* var. *montufarii*	34	1.723	487	3.898
Poaceae	*Tridens hackelii*	1	0.051	1	0.008
Poaceae	*Tripogon spicatus*	1	0.051	4	0.032
Poaceae	*Vulpia bromoides*	38	1.926	278	2.225
Polygalaceae	*Polygala bonariensis*	1	0.051	5	0.040
Polygalaceae	*Polygala molluginifolia*	3	0.152	11	0.088
Polygalaceae	*Polygala pulchella*	24	1.216	43	0.344
Primulaceae	*Anagallis minima*	14	0.710	28	0.224
Primulaceae	*Pelletiera serpyllifolia*	3	0.152	16	0.128
Rubiaceae	*Galium richardianum*	18	0.912	21	0.168
Rubiaceae	*Richardia humistrata*	33	1.673	250	2.001
Rubiaceae	*Richardia stellaris*	38	1.926	164	1.313
Rubiaceae	*Spermacoce capitata*	14	0.710	23	0.184
Rubiaceae	*Spermacoce verticillata*	1	0.051	2	0.016
Solanaceae	*Calibrachoa ovalifolia*	1	0.051	1	0.008
Solanaceae	*Nicotiana bonariensis*	3	0.152	31	0.248
Turneraceae	*Turnera sidoides* subsp. *integrifolia*	12	0.608	22	0.176
Verbenaceae	*Glandularia nana*	1	0.051	1	0.008
Verbenaceae	*Glandularia subincana*	2	0.101	6	0.048
Verbenaceae	*Glandularia tenera*	1	0.051	1	0.008
Verbenaceae	*Lippia villafloridana*	4	0.203	18	0.144
Verbenaceae	*Verbena gracilescens*	2	0.101	2	0.016
Verbenaceae	*Verbena montevidensis*	2	0.101	2	0.016
Violaceae	*Hybanthus parviflorus*	1	0.051	3	0.024