

## Supplementary Material 1

Description of the typical species that characterize the physiognomy of the ecological systems listed in Table 3 and presented in Figure 3.

### Highland grassland (HIG) – Campo de altitude (ALT)



Photo by Ilsi Boldrini

Highland grassland [HIG] is located in the highest region of the state, at elevation above 700 m. The relief is gentle, the soils are deep with low fertility, with a lower proportion of shallow soils and rocky outcrops. The physiognomy and the plant composition of this landscape have been shaped by the seasonal use of fire in association with grassland management with a low animal load. It is characterized by the presence of erect grasses that form clumps, with a predominance of *Andropogon lateralis* Nees (“capim-caninha”), besides *Schizachyrium tenerum* Nees (“capim-mimoso”), *Paspalum maculosum* Trin., *Axonopus pellitus* (Nees ex Trin.) Hitchc. & Chase, *Saccharum angustifolium* (Nees) Trin. (“macega-estaladeira”), and *Sorghastrum pellitum* (Hack.) Parodi. Fabaceae species are frequent, such as *Macroptilium prostratum* (Benth.) Urb, *Betencourtia neesii* L.P. Queiroz (= *Galactia neesii* DC.), and many species of *Lupinus* L. and *Adesmia* DC., the latter in the winter cycle. On shallow soils, the vegetation cover is mainly of small species, such as *Glandularia catharinae* (Moldenke) N. O’Leary & P. Peralta (Verbenaceae) with light purple flowers, the thickly hairy *Paspalum polyphyllum* Nees ex Trin. (Poaceae), and many Cactaceae, among others. The vegetation dynamic is influenced by high precipitation throughout the year, which favors the presence of Cyperaceae species, like *Bulbostylis sphaerocephala* (Boeck.) C.B. Clarke, *Rhynchospora globosa* (Kunth) Roem. & Schult., *R. tenuis* Link, and *R. barrosiana* Guagl. Dry grassland occurs in well-drained areas of the interfluvium, and on less-dissected slopes, with a predominance of summer grasses. Wet grassland is in poorly drained areas, where soils have a high content of organic matter.

## Bush grassland (BUG) – Campo arbustivo (ARB)



Photo by Ilsi Boldrini

Bush grassland [BUG] occurs in the west-facing portion of the Uruguayan-South-Riograndense Shield. Elevation reaches 400-500 m, the terrain is undulating, and soils vary from shallow to deep, with low fertility. Tussocky Poaceae species are common, like “barbas-de-bode” (*Aristida circinalis* Lindm., *A. spegazzini* Arechav., and *A. venustula* Arechav.), *Andropogon ternatus* (Spreng.) Nees., *A. selloanus* (Hack.) Hack, and *Jarava megapotamica* (Spreng.) Peñail., an endemic species of this grassland. It is in this region that Fabaceae are best represented both in the countryside and on the roadside, along with the shrubby vegetation, especially *Lathyrus pubescens* Hook. & Arn., *Rhynchosia diversifolia* M. Mich., *Adesmia punctata* (Poir.) DC., *A. incana* (Poir.) DC., *Betencourtia australis* (Malme) L.P. Queiroz (= *Galactia australis*), and *Eriosema tacuarembense* Arechav. The rupestrian vegetation associated with this formation has many endemic species, especially the ones belonging to the Cactaceae. This ecological system is also rich in shrubs such as Fabaceae *Mimosa ramulosa*, the Asteraceae *Acanthostyles buniifolius* (“chirca”), *Baccharis dracunculifolia* (“vassoura”), *B. articulata*, *B. pentodonta*, *B. rufescens*, and *B. allienus*, the Sapindaceae *Dodonea viscosa* (“vassoura-vermelha”), the blue flowering Plantaginaceae *Scoparia ericacea*, the Apiaceae *Eryngium horridum* (“caraguatá”, “gravatá”), in addition to several Euphorbiaceae species, especially *Croton* L.



## Sandy grassland (SAG) – Campo com areais (ARE)



Photo by Ilsi Boldrini

Sandy grassland (SAG) is located at elevation between 30 and 400 m on gentle relief, in predominantly deep, well-drained sandy soils with low fertility. In this sandy region, the physiognomy is determined by the Poaceae *Axonopus argentinus* Parodi, *Acanthospermum australe* (Loefl.) Kuntze, *Elionurus candidus* (Trin.) Hack. (“capim-limão”), and *Paspalum nicorae* Parodi (= *P. leptum* Schult.). Other species frequently found in this grassland are *Paspalum stellatum* Humb. & Bonpl. ex Flüggé, *P. polyphyllum* Nees ex Trin., *Pappophorum philippianum* Parodi, and *Panicum triholaeoides* Steud.. In this group, Euphorbiaceae is represented by the wine-colored flowered, dense glandular leaves *Jatropha isabelii* Müll. Arg.. The Asteraceae is represented here by (“roseta-de-carneiro”), *Lessingianthus macrocephalus* (Less.) H. Rob., with big pink capitula, and *Baccharis multifolia* A.S. Oliveira, Deble & Marchiori. In areas of arenization, a frequent Fabaceae is the blue-flowered *Lupinus albescens* Hook. & Arn. (“tremoço”), a nucleating species when occurring isolated on the sand, while toxic to animals. This grassland has a different flora if compared to the other ones, by presenting elements with adaptations to an arid environment, with leathery, bright, or reduced leaves, with a very developed underground system. Among the species, we can highlight the Cactaceae *Cereus hildmannianus* K. Schuman and *Parodia ottonis* (Lehm.) N.P. Taylor, the Arecaceae *Butia lallemantii* Deble & Marchiori (“butiá-anão”), the Asteraceae *Asteropsis macrocephala* (Spreng.) Marchesi, Bonifacino & Sancho, *Trixis verbascifolia* (Gardner) S.F. Blake, *Centratherum camporum* (Hassl.) Malme, *Noticastrum acuminatum* (DC.) Cuatrec., *Baccharis albolanosus* A.S. Oliveira & Deble, and *Moquiniastrum cordatum* (Less.) G. Sancho and, the Amaranthaceae *Froelichia tomentosa* (Mart.) Moq. Many of these species are endemic to this grassland and have intense hairiness that gives a grayish color to the landscape.

## Aristida grassland (ARG) – Campo de barba-de-bode (BAR)



Photo by Gerhard Overbeck

Aristida grassland (SAG), locally known as “barba-de-bode”, lies at elevation between 30 and 1000 m on gentle relief. The soils are deep with low fertility. Elevation is higher in the northeastern portion of the grassland area, where they reach 1000 m, decreasing gently to the west until reaching less than 100 m along the Uruguay River. This grassland occurs at elevation above 400 m on gentle relief, until the contact with Araucaria and Subtropical Forest along the main tributaries of the Uruguay and Jacuí rivers. The vegetation of this grassland ecological system is characterized by two vegetation strata. The upper one is formed by *Aristida jubata* (Arechav.) Herter and *A. laevis* Nees and the under stratum is formed by rhizomatous grasses like *Paspalum notatum* Flügge (“capim-forquilha”), especially on well-drained clay soils. In dry sandy soils, we found *Paspalum nicorae* Parodi (= *P. leptum* Schult.). Besides, representatives of other relatively frequent families can be found, such as Rubiaceae, the blue-flowered *Borreria poaya* (A. St.-Hil.) DC. and, the white-flowered *Staelia thymoides* Cham. & Schltdl.. The family Fabaceae is represented by *Stylosanthes leiocarpa* Vogel, the Malvaceae by *Melochia chamaedrys* A. St.-Hil. and the golden-yellow flowered *Waltheria communis* A. St.-Hil. The Verbenaceae is represented by the red-flowered *Glandularia peruviana* (L.) Small.



## Park grassland (PAG) – Campo com espinilho (ESP)



Photo by Ilsi Boldrini

Park grassland (PAG) lies along the Uruguay River, at elevation between 30 and 400 m on gentle relief, fertile soils ranging from imperfectly to poorly drained. The grassland of this region is characterized by flat and low areas where patches of *Paspalum quadrifarium* Lam. are associated with other less robust species like *Bromus auleticus* Trin. ex Nees (“cevadilha”), *Jarava plumosa* (Spreng.) S.W.L. Jacobs & J. Everett and *Nassella neesiana* (Trin. & Rupr.) Barkworth, the Verbenaceae *Phyla canescens* (Kunth) Greene, and the Asteraceae *Grindelia pulchella* Dunal. The lower stratum is continuous, made by a great diversity of grasses like *Paspalum alium* Chase, *P. dilatatum* Chase, *P. pauciciliatum* (Parodi) Herter, *P. jesuiticum* Parodi, *P. acuminatum* Raddi, *Setaria vaginata* Spreng., and *S. fiebrigii* R.A.W.Herrm. In this region, it is possible to find stoloniferous legumes with yellow flowers such as a native peanut, *Arachis burkartii* Handro (“amendoim-do-campo”) and *Adesmia bicolor* (Poir.) DC. (“babosinha-do-campo”). In wetlands, it is common the presence of “gramas-boiadeiras” (*Leersia hexandra* Juss. ex J.F. Gmel. and *Luziola peruviana* Sw.), as well as other less frequent species like the Poaceae *Rhynchoryza subulata* (Nees) Baill. and *Mnesithea balansae* (Hack.) de Koning & Sosef, and the Fabaceae *Aeschynomene montevidensis* Vogel. Associated with this grassland matrix are some sparse woody Fabaceae *Vachellia caven* (Molina) Seigler & Ebinger (“espinilho”), *Prosopis affinis* Spreng., *P. nigra* (Griseb.) Hiron., *Parkinsonia aculeata* L. (“cina-cina”), and the Verbenaceae *Aloysia gratissima* (Gillies & Hook.) Tronc.



## Shallow soil grassland (SSG) – Campo de solos rasos (SOL)



Photo by Eliseu Weber

Shallow soil grassland (SSG) lies at elevation between 30 and 400 m with gentle relief and shallow soils. Vegetation is associated with very shallow, stony basalt soils with low moisture retention. Water deficit in the summer is quite peculiar in this stressful environment. Vegetation grows in small tufted grasses like *Aristida murina* Cav., *A. echinulata* Roseng. & Izag., *A. venustula* Arechav., *A. uruguayensis* Henrard, *Bouteloua megapotamica* (Spreng.) Kuntze, *Chloris grandiflora* Roseng. & Izag., *Eustachys brevipila* (Roseng. & Izag.) Caro & E.A. Sánchez, *Microchloa indica* (L. f.) P. Beauv., *Schizachyrium spicatum* (Spreng.) Herter, *Tridens hackelii* (Arechav.) Parodi, and *Tripogon spicatus* (Nees) Ekman. In outcrop areas, we found Asteraceae like *Micropsis spathulata* (Pers.) Cabrera, *Soliva sessilis* Ruiz & Pav. (= *S. pterosperma*), and *Sommerfeltia spinulosa* (Spreng.) Less. and Fabaceae like *Adesmia incana* (Poir.) DC., *Indigofera asperifolia* Bong. ex Benth., *Mimosa burkartii* E. Marchesi, *Rhynchosia diversifolia* M. Mich., and *Senna nana* (Benth.) H.S. Irwin & Barneby. From other occurring families are of note the species *Lippia coarctata* Tronc., a yellow-flowered Verbenaceae, *Nierembergia linariifolia* Graham, a large-spotted blueish-white flowered Solanaceae, unique to this type of formation and toxic to herbivores, *Convolvulus laciniatus* Desr. (Convolvulaceae), an Euphorbiaceae with heavily-cropped leaves, the densely hairy *Ditaxis acaulis* Herter ex Arechav. and various *Oxalis* species (Oxalidaceae). In addition to these, the Asteraceae *Baccharis coridifolia* Spreng. (“mio-mio”) and the Apiaceae species *Ammoselinum rosengurtii* Mathias & Constance, and *Eryngium echinatum* Urb. are also common.



## Shortgrass grassland (SHG) – Campo graminoso (GRA)



Photo by Ilsi Boldrini

Shortgrass grassland (SHG) occurs at elevation between 30 m and 400 m with gentle relief, fertile soils on the far southwest of the State. In this ecological system, the physiognomy is dominated by herbaceous species, essentially grassy, with a predominance of *Paspalum notatum* Fluggé (“capim-forquilha”), with a rhizomatous habit, and others with a tufted habit like *Andropogon lateralis* Nees, *Mnesithea selloana* (Hack.) de Koning & Sosef, *Paspalum dilatatum* Poir. (“capim-melador”), and *Aristida uruguayensis* Henrard.. Several hibernal species stand out with high participation in the floristic composition like *Melica argyrea* Hack. ex Stuck. and *M. rigida* Cav., and those popularly known as “flechilhas”: *Nassella hyalina* (Nees) Barkworth, *N. neesiana* (Trin. & Rupr.) Barkworth, *N. philippii* (Steud.) Barkworth, *N. rosengurtii* (Chase) Barkworth, and *Jarava plumosa* (Spreng.) S.W.L. Jacobs & J. Everett, *Piptochaetium bicolor* (Vahl) E. Desv., *P. uruguense* E. Desv., *P. ruprechtianum* E. Desv., and *P. lasianthum* Griseb. Among these erect grass species, Cyperaceae species like *Carex phalaroides* Kük. grow in very humid places, which is very common among grass clumps, and *Eleocharis dunensis*. Among Fabaceae species, we often found *Trifolium polymorphum* Poir. (“trevinho”), *Adesmia bicolor* (Poir.) DC. (“babosinha-do-campo”), *A. securigerifolia* Herter, and *A. punctata* (Poir.) DC. forming yellow spots due to their flowers and the prostate-stoloniferous habit.

## Coastal grassland (COG) – Campo litorâneo (LIT)



Photo by Eduardo Vélez

Coastal grassland (COG) is associated with the lowlands of the Atlantic coastal plain. The central and southern parts of this grassland landscape are in contact with the Granitic Shield area located west of Patos Lagoon and Mirim Lake. The soils are predominantly hydromorphic and very conditioned by the micro-relief. A special characteristic of this grassland landscape is that 41 % is covered by water bodies, mainly the Patos Lagoon and the Mirim Lake, followed by a set of smaller lakes and lagoons. Most of these water bodies are surrounded by wet areas. The main grass species in this grassland are small, prostrate stoloniferous and rhizomatous, and plant species that promote a good ground cover such as *Ischaemum minus* J. Presl, *Axonopus affinis* Chase (“grama-tapete”), *A. obtusifolius* (Raddi) Chase, *Paspalum pauciciliatum* Mez, *P. modestum* Mez, *P. pumilum* Nees, and *Panicum aquaticum* Poir. Cyperaceae is another family that stands out in this grassland landscape, constituting dense populations, as is the case of *Eleocharis bonariensis* Nees, *E. viridans* Kük. and *Rhynchospora emaciata* (Nees) Boeck. On the other hand, some species have isolated individuals, such as *Cyperus polystachyus* Rottb., *Rhynchospora holoschoenoides* Rottb., *R. barrosiana* Guagl., and *Scleria distans* Poir.. Many Fabaceae are common in this landscape, standing out *Stylosanthes leiocarpa* Vogel, *Indigofera sabulicola* Benth., *Desmodium adscendens* (Sw.) DC., *Adesmia latifolia* (Spreng.) Vogel, *Vigna longifolia* (Benth.) Verdc., and *V. luteola* (Jacq.) Benth.. In wetter depressions the following species are frequent: *Mimosa bimucronata* (DC.) Kuntze (“maricá”), *Eryngium chamissonis* Urb., *Baccharis spicata* (Lam.) Baill., and *Centella asiatica* Urb.



## Inland sub-montane grassland (ISG) – Campo sub-montano interior (CSI)



Photo by Ilsi Boldrini

Inland sub-montane grassland (ISG) occurs predominantly in areas with elevation between 30 m and 400 m with gentle relief. In this typology, deep soils with low or high fertility predominate. When grassland is well managed, the presence of uncovered soil is low, since dominant species in the lower stratum are prostrate, represented by *Paspalum notatum* on the top and slopes of the “coxilhas” and by *Axonopus affinis* and *Paspalum pumilum* in the humid lowlands, *Andropogon lateralis* is a constant presence, standing out in the upper stratum, along with other Andropogoneae, such as *Andropogon selloanus* (Hack.) Hack. (“cola-de-burro”), *Schizachyrium microstachyum* (Desv. ex Ham.) Roseng., B.R. Arrill. & Izag. and *Saccharum angustifolium* (Nees) Trin. The most common Fabaceae is *Desmodium incanum* (“pega-pega”). In overgrazed grasslands, the plant community becomes scarce with large proportions of uncovered soil where the seeds of the numerous Asteraceae settle, especially *Soliva sessilis* (= *S. pterosperma*) (“roseta”), *Vernonanthura nudiflora* (Less.) H. Rob. (“alecrim-do-campo”), *Senecio brasiliensis* (“maria-mole”), as well as *Senecio selloi* (Spreng.) DC., *S. heterotrichus* DC., *Pluchea sagittalis* (Lam.) Cabrera and *Conyza bonariensis* (L.) Cronquist (“buva”). In well-drained areas, *Aristida jubata*, *A. filifolia* (L.) Cronquist and *Eryngium horridum* Malme form clumps that make up the upper story of the plant community.

## Atlantic sub-montane grassland (ASG) – Campo sub-montano atlântico (CSA)



Photo by Ilsi Boldrini

Atlantic sub-montane grassland (ASG) lies in elevation between 30 m and 400 m on gentle relief, on the pre-cambrian shield, between the Bush grassland and the Coastal grassland, in the far south of Rio Grande do Sul. The vegetation of this grassland presents high grazing pressure with a constitution marked by summer species and scarce hibernal species. Among the summer grasses, we highlight *Cynodon dactylon* (L.) Pers. (“bermudinha”, “grama-paulista”), *Sporobolus indicus* (L.) R. Br. (“capim-touceirinha”), *Andropogon ternatus* (Spreng.) Nees, *Aristida murina* Cav., *Mnesithea selloana* (“cola-de-lagarto”), *Paspalum notatum* (“capim-forquilha”), *P. plicatulum* Michx. and *Bothriochloa laguroides* (DC.) Herter. Among the winter ones stand out *Piptochaetium montevidense* (Spreng.) Parodi (“cabelo-de-porco”) and *P. stipoides*. In addition to these, *Baccharis crispa* Spreng. (“carqueja”), and *Adesmia securigerifolia* Herter appear in wetter areas. Small Asteraceae such as *Chevreulia sarmentosa* (Pers.) Blake and *Micropsis spathulata* (Pers.) Cabrera are also common.