乔木之外
MORE THAN TREES

玛丽安娜 · 西凯拉 景观设计师
伊莎贝尔 · 施密特 生态学博士，巴西利亚大学生态学院助理教授
亚历山大 · 桑派奥 济科 · 曼德斯生物多样性保护机构生态学和环境管理博士
阿玛利亚 · 罗布雷多 景观设计师，乌拉圭共和国大学讲师
Mariana SIQUEIRA Landscape Architect
Isabel SCHMIDT PhD in Ecology and Assistant Professor at the Ecology Department, University of Brasília
Alexandre SAMPAIO PhD in Ecology and Environmental Manager at Chico Mendes Institute for Biodiversity Conservation
Amalia ROBREDO Landscape Architect, Lecturer at The University of the Republic, Uruguay



© Mariana Siqueira

1. 位于韦阿戴鲁斯高地中的塞拉多草原在雨季时的景象

1. A Cerrado field at Chapada dos Veadeiros in rainy season

在巴西，当人们听到“热带稀树草原”一词，总是会首先联想到一种在非洲才会存在的景观。然而有趣的是，世界上生物多样性最丰富的热带稀树草原正是位于巴西的塞拉多草原，生长在这里的生物群落不仅装点出美丽的风景，同时也具有重要的生态意义（图1）。

塞拉多草原占地近200万平方公里，占据了巴西近1/4的国土，南美洲三大水域的集水区均分布其中[1]。尽管这里每年近一半时间都不会降雨，但有限的水源仍滋养出了茂盛的植物群落，这主要得益于覆盖地表的禾本科草本层植物群。除了其所具有的长根系可使水分充分渗透至地下，这些植物叶片的蒸腾作用亦较弱，因而减少了水分散失。

尽管具有上述特性及其他重要生态功能，草本层在塞拉多草原的生态恢复和景观设计项目中却一直被忽视。事实上，草本层具有极高的生物多样性：在塞拉多草原记录在册的12 000余种植物物种中，草本和灌木所占比重超过60%（而乔木则不足40%）；此外，特有种的比例更是高达40%[1]（图2）。

在巴西，热带稀树草原修复项目通常参照森林恢复方法，主要依赖于树苗栽种。然而，在确定生态修复的方法时，我们需要考虑到热带草原与森林生态演替过程的不同。仅仅依靠植树并不会促进热带稀树草原生态系统的恢复。

同时，当涉及到使用塞拉多草原的本土植物时，巴西的本土景观设计项目往往只考虑乔木物种。花园设计项目则通常选用需要更多灌溉和改良土壤的外来草本和灌木物种，同样浪费了利用本土植物展现塞拉多草原独特性的机会。

当我们看到本地文化是如何拒绝将乔木以外的植物视为“本土植物”时，便不难理解巴西人未将塞拉多视作一片热带稀树草原的原因。

1 “恢复塞拉多”项目

自2012年起，一个以生态学家和公共机构组成的名为“修复塞拉多”的项目团队，致力于探索恢复巴西热带稀树草原的新方法。考虑到热带稀树草原的生态演替规律，需同时引入各种不同形式的植物种群，而直接播种是最行之有效的方法[2]。

通过与巴西韦阿戴鲁斯高地国家公园合作，修复塞拉多团队得以逐步扩大试验范围，并已取得一定成效。迄今为止，其已将原先遍植外来入侵草种的105hm^{2}牧地恢复为了热带稀树草原。

由于公园内禁止使用除草剂，如何控制包括臂形草（*Urochloa decumbens*）、须芒草（*Andropogon gayanus*）和糖蜜草（*Melinis minutiflora*）在内的外来草种的生长，成为恢复塞拉多团队面临的主要挑战。在过去几年中，项目团队在清理入侵草和改良土壤方面进行了不懈探索。在旱季开始时进行计划性烧除（图3），而后犁耕土壤，是目前最有效的方法。

在做好土壤准备后，随着雨季的到来，播种也相继开始。2016年，项目团队在60hm^{2}的区域内播撒了超过12吨生长习性各异的本土植物混合种子（图4）。

初步结果显示，通过直接播种，项目团队成功种植了约80种乔木、灌木及草本[3]（图5）。相较于种植树苗，直接播种成本更加低廉，且在植被多样性、种植成活率等方面更具优势。

恢复塞拉多团队最有趣的成就之一，是在韦阿戴鲁斯高地地区建立起了一个种子采集网络。由于该项目赋予了植物种子以经济价值，现在已有约60个家庭加入到了收集植物种子的行列（图6）。

2 “塞拉多花园”项目

当领略到塞拉多草原的草本之美并认识到其所具有的生态意义后，我们相信，景观和花园设计师势必会将塞拉多草原的草本物种运用到其项目之中。

然而，塞拉多的本土植物难以栽植几乎成为一种共识。虽然其中的一些物种确实如此，但不应因此停止探索其他更多物种的栽

https://doi.org/10.15302/J-LAF-20170514
收稿时间 RECEIVED DATE / 2017-10-17
中图分类号 / Q94, TU986.2
文献标识码 / B

摘要

位于巴西中部的塞拉多草原占据了近1/4的国土，是世界上生物多样性最丰富的热带稀树草原。尽管拥有丰富而美丽的植物资源，塞拉多景观的闻名程度却远不及同样位于巴西的热带雨林，在巴西的本土文化中也鲜被提及。

长期以来，巴西本土的生态修复和景观设计项目往往都只考虑乔木，而忽略草本及灌木。而塞拉多草原恰好以草本及灌木见长，其种类多达7 000余种，占据了60%以上的生物多样性，并拥有多种基本生态功能。

当前，这一情况正在发生转变。在本文所呈现的“恢复塞拉多”和“塞拉多公园”这两个相互关联的实践中，都展开了对不同的植物组织形式（草本、木本和藤本）在生态修复及景观设计项目中进行应用的探索。此外，本文还呈现了两个项目团队尝试进行的两组试验，以展示理解巴西热带稀树草原并同其一同发挥效益的可能性。

关键词

生态修复；景观设计；自然风格种植；本土植物；热带稀树草原；塞拉多

ABSTRACT

Right at the center of Brazil, covering almost 22% of its area, lies the world's most biodiverse savanna, the Cerrado. Despite of the richness and beauty of its flora, Cerrado's landscapes are not as celebrated as the country's rainforests, and tend to be neglected in cultural expressions.

Historically, ecological restoration and landscape design projects have considered only the trees of the biome, leaving behind grasses, forbs and shrubs that not only characterize the savanna, but also represent more than 60% of the diversity (close to 7,000 species) of the Cerrado, which hold many fundamental ecological functions.

This situation is now beginning to change. This article presents two interrelated projects, Restaura Cerrado and Jardins de Cerrado, which focus on different plant forms (herbaceous, woody and liana species) in restoration and gardening initiatives. Two experiments are conducted with efforts to explore new possibilities of understanding the Brazilian savanna and of working with it.

KEY WORDS

Ecological Restoration; Landscape Design; Naturalistic Planting; Native Plants; Savanna; Cerrado

译 张健 陆小璇
TRANSLATED BY Angus ZHANG Xiaoxuan LU

种可能。人们可以在苗圃中寻得乔木的树苗，但本土草本及灌木等其他植物形式的幼苗却由于信息不足、供需链缺失而无法获取。

幸运的是，这一情况正在发生转变。修复塞拉多团队正在向人们证明，大多数草本和灌木物种都是能够直接播种的。多年以来，塞拉多种子网络仅将乔木种子作为商品进行交易，而如今更多其他物种的种子也已投入市场。由此，当地本土草本物种在花园项目中不受重视的情况将迎来转变。

在这一背景下，塞拉多花园项目团队旨在发掘具有潜在景观用途的本土植物并研究其繁殖方法，同时通过实践和教育将巴西大草原的特征转译并融汇到景观设计之中（图7）。长期以来，人们并不知道圣保罗的部分区域最初也是由塞拉多草原发展而来——该发现来源于艺术家丹尼尔·卡巴雷的一项研究（图8）——鉴于此，该项目更深远的使命在于向公众展示塞拉多草原植物群的美丽，并以此激发和促进人们对其进行保护。



© Mariana Siqueira

2

2.1 植物狩猎

塞拉多花园项目团队常常在韦阿戴鲁斯高地开展定期野外考察，以发掘具有潜在景观用途的植物——我们将此类活动称为“植物狩猎”。

植物狩猎旨在寻找那些适用于私人花园及公园的植物样本，尤其是那些在旱季条件下仍具有较高观赏价值的物种，这也使得这种狩猎过程格外艰难。相较于对植物的观赏价值并不做过多要求的生态恢复项目，景观设计项目则有着截然不同的标准——在景观设计中，对美感的追求可谓重中之重。

塞拉多花园团队的终极挑战是改变人们对于热带稀树草原到冬天会草木枯亡的普遍认知。野外考察已经证明了这种看法并不正确（图9）。另一项挑战是通过设计向人们证明黑色、棕色、银色和金色（图10）也可以成为花园中诱人的色彩，而一些裸露的籽头也可以像花朵般美丽。

在野外考察中，探究具有潜在景观用途的植物所生存的群落环境非常重要，我们需要注意各个植物样本所在群层间的交错关系，并了解处于相邻或上下位置关系的不同植物在群落中如何生长。

我们会对所选的植物样本进行测量，并进行地理定位和拍照，以便于未来进行后续追踪和种子采集。若条件允许，我们会尽可能保留一份样本，并将其制作为标本，以供后续鉴定参考。目前，收集来的大多数植物的信息仍严重缺乏。

2.2 繁殖试验

本土植物的繁殖试验现已展开，包括直接播种和育苗两种方式。项目团队在韦阿戴鲁斯高地修建了一座小型苗圃，该苗圃由种子采集协会会长克劳多米罗·德·阿尔梅达运营。相较于苗圃中的其他植物，大量菊科、豆科和紫葳科植物已展现出较高的发芽

2. 塞拉多草原上的三种标志性植物群系：谷精草科（白色烟花状）、禾本科（金色浮动禾草）和菊科（粉色点状）。
3. 在生态修复项目中，计划性烧除是抑制外来物种生长的第一步。

2. Three emblematic botanic families of the Cerrado: Eriocaulaceae (white fireworks), Poaceae (golden floating grasses) and Asteraceae (pink dots).
3. Controlling of alien species for ecological restoration project starts with prescribed burning.



© Mariana Siqueira
3

率和成活率（图11）。在2017~2018年间的雨季，我们计划将这些新奇的本土植物幼苗栽植到花园中。

2.3 自然风格的塞拉多花园

要将大草原的特征引入建成环境，仅将新物种移栽到花园之中远远不够，还必须建立起兼具观赏性和生态稳定性的植物群落。在这方面，来自英国谢菲尔德大学景观系的专家团队（包括派特·欧多夫、诺埃尔·金斯伯里、詹姆斯·希契莫夫、奈杰尔·杜内特等）在温带国家建造的当代自然风格花园，为构思塞拉多花园提供了灵感来源与方法参照。这一过程通常被称为“新常青运动”。

因为热带稀树草原与温带草原的植物群落具有相似之处，例如二者都具有连续的禾本科草本层、鲜明的季节特征、由季节变化造成的植物物候学的巨大变化（如落叶、营养结构休眠、地上部分死亡和再生长、有利环境下的新结构生长等），所以当代自然风格花园的园艺经验能够为我们在热带所做的尝试提供洞见。

新常青运动认为，植被的季节性变化应得到有效因借——因为塞拉多草原呈现出明显的降雨和干旱周期，项目尤其需要充分利用这种变化。

在当前的巴西，遍植多年生草本的自然风格花园仍被视为一种新奇类型，且有待大量调查研究的支撑。而在此方面，塞拉多花园项目团队有幸得到了阿根廷景观设计师阿玛利亚·罗布雷多的指导。

3 两组试验

3.1 巴西利亚植物园试验

2015年底，巴西利亚植物园联合修复塞拉多项目团队及景观设计师马里亚纳·斯奎拉，开展了15种本土草本及灌木的萌芽、定植和生长试验。雨季开始时，这些种子被播种到180块1m × 1m的地块中，其中一半在第一个旱季中得到了灌溉。在播种前，又将已灌溉和未灌溉部分随机分配，之后对其中的一半施用肥料。

虽然试验的结果仍在分析中，但可以发现，尽管灌溉的确促进了一些植物种类的生长，但其并非植物定植的基本影响因素——对于公共花园的管理，尤其是对于当下正在经受水危机的巴西利亚地区来说，无疑具有突破性的意义（图12，13）。

3.2 巴西利亚国家公园试验

受巴西利亚国家公园委托，恢复塞拉多项目团队将在公园内开展一处小型的示范性修复项目，而塞拉多花园项目团队则负责对这一项目进行“美化”。团队按照自然风格花园的标准，将20种本土植物（主要为草本和灌木）依照高度、颜色和结构等进行组合，配植在公园各处（图14）。像往常一样，团队在2016年雨季开始时完成了播种。预计到2018年5月，即在播种后的第二个雨季结束后，将可以对一些结果展开分析。

在2017和2018年的雨季开始时，我们将在5座不同的花园中播种，就其中一些与塞拉多种子网络接洽，并在其中两座花园中尝试使用试验苗圃中的苗木。

随着时间的累积，修复塞拉多与塞拉多花园项目团队获得了越来越多的公众关注。随着人们对于塞拉多草原乔木之外的其他物种的认知不断提升，我们也欣喜地看到对巴西热带稀树草原草本层的恢复正在不断地被文化界和生态界所接受和认可。**LAF**

注释

修复塞拉多项目团队由奇科·蒙德斯生物多样性保护组织、巴西利亚大学生态学院、巴西农业研究公司塞拉多分公司及遗传资源与生物技术中心、塞拉多种子网络、立足塞拉多社团组成。目前，该项目由联邦储蓄银行和塞拉多关键性生态系统合作基金联合资助。

In Brazil, when hearing the word “Savanna”, people often think of African landscapes. It is ironic that Brazil holds the world’s most biodiverse savanna, the Cerrado, a biome of great beauty and ecological importance (Fig. 1).

The Cerrado covers an area of around 200 million hectares, 22% of the national territory of Brazil, and is home to the watersheds of the three largest water basins in South America[1]. Even though it rains less than half of a year, the biome flourishes with water due to its flora, namely the herbaceous-gramineous layer that covers the soil. The long roots of these plants allow for water infiltration while its leaves do not transpire much.

Despite this distinctive and many other important ecological functions, the herbaceous layer of the Cerrado has long been neglected in ecological restoration and landscape design projects. Its biodiversity, though, is extremely high in that of over 12,000 plant species described in the biome, more than 60% are grasses, forbs, and shrubs, instead of trees. There is also a high proportion of endemic species that 40% of the Cerrado plants are found nowhere else in the world[1] (Fig. 2).

In Brazil, savanna restoration projects usually employ methods of forest restoration, mainly planting tree saplings. Forests and savannas, however, present different processes of ecological succession, which should be considered when deciding the method of restoration. Planting trees, on itself, will not foster the recovery of a savanna ecosystem.

Most landscape design projects center on trees, when it comes to the use of Cerrado’s native plants. Similarly, gardens are usually designed with exotic forbs and shrubs that might demand frequent irrigation and soil amendment. Both of these two types of landscape design fail to celebrate the uniqueness of the Cerrado.

When the local culture denies every native plant that is not a tree, it becomes easy to understand why Brazilians are not aware that the Cerrado is, indeed, a savanna.

4. 播种机中满载着由80种植物种子和土壤组成的混合物。
5. 修复前后对比：左侧为布满外来草种的牧草地，右侧为遍植各类本土植物的修复地块。
6. 收获某种稻类植物的种子

4. Broadcast seed spreader filled with a mix of seeds of 80 species and soil.
5. Before and after: pasture of alien grasses (left) and diverse native species on restored plot (right).
6. Harvest of seeds of *Loudetiopsis chrysothrix*



4 © Fernando Tatagiba



5 © Alexandre Sampaio



© Amalia Robredo

1 Restaura Cerrado

Since 2012, Restaura Cerrado, a project team consists of ecologists collaborated with public institutions, has been experimenting with new ways of restoring the Brazilian savanna. The practice is based on two simple premises that different plant communities should be introduced all at once, taking the ecological succession of the savanna into consideration; and that direct seeding is the way to go[2].

A partnership with Chapada dos Veadeiros National Park has allowed the group to progressively scale up their experiments, accomplishing so far 105-hectare savanna had been restored where was previously planted with exotic invasive grasses for livestock.

Since herbicides are forbidden in the Park, the main challenge for Restaura Cerrado was how to control the alien grasses, including signal grass (*Urochloa decumbens*), gamba grass (*Andropogon gayanus*), and molasses grass (*Melinis minutiflora*), etc. The exploration of different methods for removing these plants and preparing the soil for seeding was the experimental objective over the past few years. Up to now, prescribed burning at the beginning of every dry season (Fig. 3), followed by soil plowing sessions is the most effective strategy known.

Once the soil is prepared and rainy season begins, it is time for seeding. In 2016, over 12 tons of a seed mixture that combines native plants of different habits were spread over an area of 60 hectares (Fig. 4).

Preliminary results show the possibility of direct seeding of about 80 species of trees, shrubs, forbs and grasses[3] (Fig. 5), which not only is cheaper than using saplings, but also allows for more diversity on the planting palette and a higher survival rate.

One of the most interesting achievements of Restaura Cerrado is the creation of a network of seed harvesters at Chapada dos Veadeiros region. Today, about 60 families participate in harvesting seeds of plants that often had no economic significance before the project (Fig. 6).

2 Jardins de Cerrado

Given the beauty and the ecological importance of the Cerrado's herbaceous layer, it is hard to believe that gardens still dismiss it.

However, there is a general assumption that Cerrado's native plants are just too hard to cultivate. Because this is true to some species, too many others remain unexplored. Saplings of trees can be found in nurseries, but the same cannot be said about other plant communities. There is a lack of information, supply and demand for local grasses, forbs and shrubs.

Fortunately, things now begin to change. Restaura Cerrado is trying to prove that it is possible to directly seed many of these species. Cerrado's Seeds Network, after years of commercializing only seeds of trees, is now making other stuff available too. Whatever kept the native herbaceous layer invisible is finally being challenged.

In this context, Jardins de Cerrado project aims not only to find native plants



7

with potential landscape use and to investigate on the possibilities of their reproduction, but to facilitate translating of the spirit of the Brazilian savanna into landscape design through practice and education (Fig. 7). Considering that few people know the fact that in the area where the city of São Paulo begun, there used to be Cerrado, rather than forests, as is revealed from the work of the artist Daniel Caballero (Fig. 8), the underlying mission of the project is to present the beauty of the Cerrado's flora to the public to inspire and promote its conservation.

2.1 Plant Hunting

The project team of Jardins de Cerrado made regular field expeditions, usually to Chapada dos Veadeiros, seeking plants with potential landscape use — the so-called plant hunting.

The goal in this plant hunting is to find species that can fit in garden designs, whether public or private. In this particular case, the challenge is to find plants that look good even during dry season. Differing from restoration, in which aesthetics is not a priority, landscape design emphasizes its search of beauty.

The Jardins de Cerrado project aims to first challenge the biased perception of people that in the savanna everything is "dead" during winter. The results of the field expeditions have proved it untrue (Fig. 9). Another challenge is to demonstrate through design that black, brown, silver and gold colors (Fig. 10) are also appealing and some seedheads can be as attractive as flowers.

It is important to notice the communities where these plants grow in the wild, to take note of the layers that intertwined between specimens, and to see how they live one next or on top of the other.

Once a specimen is selected, it should be measured in width and height, and be geo-referenciated and photographed for future follow up and seed collection. Permitted in the area, it is better to collect a sample and



Psidium guineense
巴西番石榴



Imperata brasiliensis
巴西茅草



Bromelta balansae
烈焰红心凤梨



Lantana fucata
黄花马璎丹

8

© Daniel Caballero

7. 讲座、工作坊和实地考察旨在引导公众认识到塞拉多草原草物种的魅力和生态意义。
8. “广袤无垠的塞拉多”是由艺术家丹尼尔·卡巴雷罗主持的项目，该项目的一项发现震惊了圣保罗的市民——圣保罗的前身不只是一片森林，也囊括了塞拉多草原的一部分。
9. 在旱季时，人们可以发现各种各样的花卉和籽头。
10. 在冬季，巴西利亚热带稀树草原的景观以金色调为主。

7. Lectures, workshops and expeditions aim to raise public's awareness of the beauty and the importance of the herbaceous layer of the Cerrado.
8. Cerrado Infinito, a project by artist Daniel Caballero, surprises people in São Paulo as it reveals that there were both forest and Cerrado's fields where the city begun.
9. Great diversity of flowers and seadheads can be found during dry season.
10. In winter, golden tones prevail in the Brazilian savanna landscapes.



© Amalia Robredo
9-1



© Mariana Siqueira
9-2



© Mariana Siqueira
10

herborize for future determination. However, for the majority of these plants, there is a severe lack of information.

2.2 Reproduction Experiments

Experiments on native plants reproduction are carried out, with both direct seeding and nursery initiatives. For the latter, a small nursery was built at Chapada dos Veadeiros, run by Claudomiro de Almeida Cortes, the president of the Seed Harvesters Association. A good deal of plants of the Asteraceae, Fabaceae and Bignoniaceae families, among others, have presented higher rates of germination and establishment (Fig. 11). Experiments with the introduction of these native plants plugged into gardens are bound to be proceeded during the rainy season between 2017 and 2018.

2.3 Naturalistic Cerrado gardens

Introducing new species into garden design is not enough to translate the spirit of the savanna into built environments. Ornamental and ecologically stable plant communities must be created as well. In this respect, contemporary naturalistic gardens created in countries of temperate zones by professionals (Piet Oudolf, Noel Kingsbury, James Hitchmough, Nigel Dunnett and others) from the Landscape Department of the University of Sheffield, have been proved to be good sources of inspiration and methodology for the conception of Cerrado gardens. This trend is often referred to as the New Perennials Movement.

There are similarities between the flora of savannas and grasslands of temperate zones, which suggest that experiences of such gardens can provide insights to our tropical endeavor, concerning the presence of a continuous herbaceous-gramineous layer, strong seasonality, and the fact that seasonality causes dramatic variations in plant phenology (including loss of leaves,


© Dani Azul
11


© Mariana Siqueira
12

dormancy of vegetative structures, death of aerial parts and subsequent regrowth, and production of new structures in favorable periods).

The New Perennials Movement claims that the seasonal changes of vegetation should be celebrated — an idea that can be rather useful in our context, since the Cerrado presents marked cycles of rainfall and drought.

Naturalistic gardens with grasses and perennial forbs are still novel in the Brazilian context and deserve a good deal of investigation. In this respect, the project team can rely on the mentorship of Argentinean landscape designer Amalia Robredo.

3 A Couple of Experiments

3.1 Experiment at the Brasília Botanical Garden

At the end of 2015, the Brasília Botanical Garden, together with Restaura Cerrado and landscape architect Mariana Siqueira, launched an experiment of plant germination, establishment and growth for 15 native grasses, forbs and shrubs. They were seeded at the beginning of the rainy season into 180 plots (1 m × 1 m), where half received irrigation during the first dry season and half (that including both irrigated and non-irrigated parts, randomly distributed) were fertilized once before seeding.

While the results are still being analyzed, it is visually noticeable that, although irrigation did allow some of the species to grow better, it was not fundamental for plant establishment. It is such a groundbreaking discovery for public gardening management, especially as water crises starts to hit Brasília (Fig. 12, 13).

3.2 Experiment at the Brasília National Park

In another experiment, Restaura Cerrado was commissioned to do a small demonstrative restoration at Brasília National Park and Jardins de Cerrado was invited to make this restoration "look beautiful." The distribution of the 20 native species, mainly grasses and shrubs, was elaborated according to compositions of heights, colors and structures as if it was a naturalistic garden (Fig. 14). As usual, seeding happened at the beginning of the rainy season (in 2016). It is estimated that


© Mariana Siqueira
13

11. 试验苗圃中的本土灌木幼苗
12. 在巴西利亚植物园中进行的15种本土植物的萌芽、定植和生长试验。
13. 播种在试验场地中的蒿类植物显示出其在自然风格花园设计中的巨大潜力。
14. 在巴西利亚国家公园的一处试验场地中，生态修复和花园设计均被纳入考量。

11. Plugs of native shrubs in the experimental nursery
12. Experiments on germination, establishment and growth of 15 native plants at Brasília Botanical Garden.
13. *Chresta sphaerocephala* seeded at the experiment — great potential for naturalistic garden design.
14. Ecological restoration and garden design are combined in an experiment at Brasília National Park.

after the second rainy season is completed (around May, 2018), some results will be possible to be analyzed.

As the rainy season of 2017 and 2018 begins, 5 different gardens will be seeded, some of them in partnership with Cerrado's Seeds Network. Two of these gardens will also receive plants from our experimental nursery.

Month after month, Restaura Cerrado and Jardins de Cerrado gain more public interest, and there is a positive atmosphere towards establishing the herbaceous layer of the Brazilian savanna as something worth of cultural and ecological acknowledgment. **LAF**

NOTES

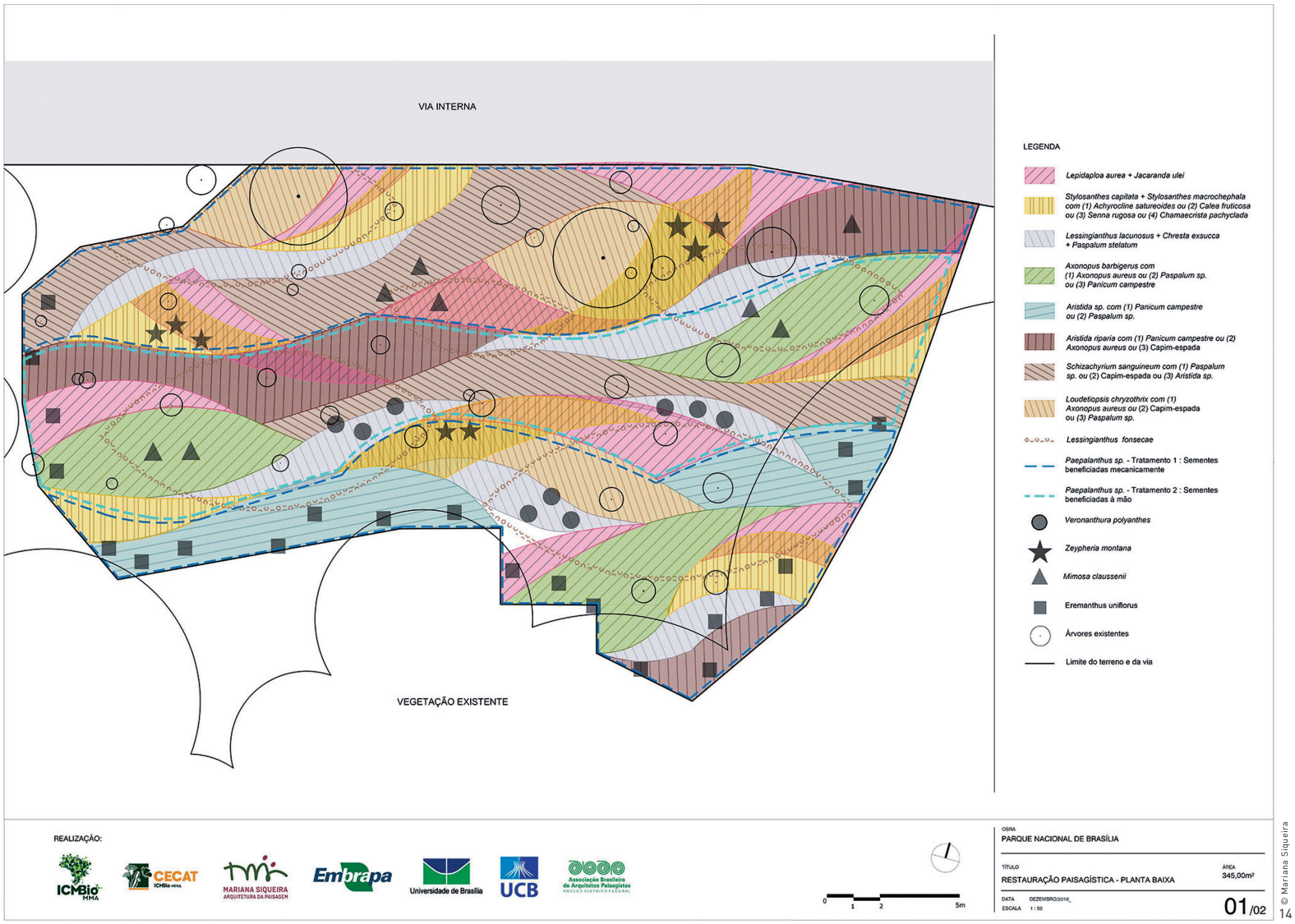
Restaura Cerrado is composed of the following institutions: Instituto Chico Mendes de Conservação da Biodiversidade, Department of Ecology of Universidade de Brasília, Embrapa Cerrados and Embrapa Cenargen, Rede de Sementes do Cerrado and Associação Cerrado em Pé. Currently, its projects are funded by Caixa Econômica Federal and CEPF (Critical Ecosystems Partnership Fund)-Cerrado.

REFERENCES

[1] Ministério do Meio Anbiente. (2012). O Bioma Cerrado. Retrieved from http://www.mma.gov.br/biomas/cerrado

[2] Sampaio, A. B., Vieira, D. L. M., Cordeiro, A. O. de O., Aquino, F. de G., Sousa, A. de P., Albuquerque, L. B. de, ... Ogata, R. (2015). Guia de Restauração do Cerrado : Volume 1: Semeadura Direta. Retrieved from https://ainfo.cnptia.embrapa.br/digital/bitstream/item/141879/1/Restauracao-semeadura-direta-cerrado-PDF-WEB.pdf

[3] Pellizzaro, K. F., Cordeiro, A. O. O., Alves, M., Motta, C. P., Rezende, G. M., Silva, R. R. P., ... Schmidt, V. B. (2017) . ¨Cerrado¨ restoration by direct seeding: Field establishment and initial growth of 75 trees, shrubs and grass species. Brazilian Journal of Botany, 40(3), 681-693.



© Mariana Siqueira