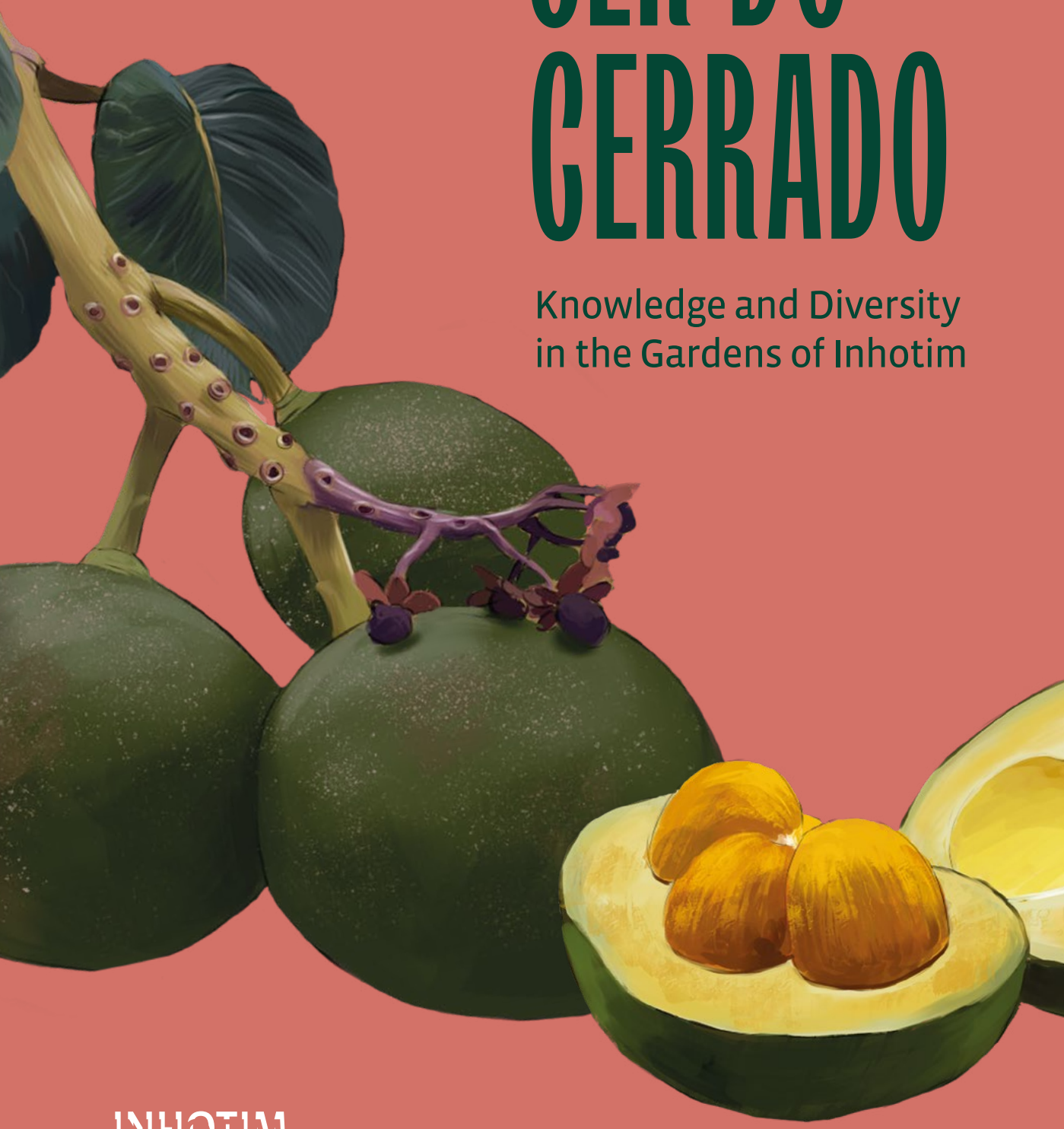
SER DO CERRADO

Knowledge and Diversity in the Gardens of Inhotim



INHOTIM

INSTITUTO INHOTIM

The Instituto Inhotim is a contemporary art museum and botanical garden located in Brumadinho, Minas Gerais, in a transitional zone between the Atlantic Forest and the Cerrado biomes. With around seven hundred works of art exhibited both outdoors and in galleries amid a botanical garden featuring native and exotic species from around the world, Inhotim offers visitors a unique experience that blends art and nature. In 2010, Inhotim was officially recognized as a Botanical Garden, and since then it has fulfilled the important mission of conserving plant species, promoting environmental awareness, and popularizing science.

Fruit of the pequi tree (*Caryocar brasiliense*), a very common species in the Cerrado region of Minas Gerais.

Pequi tree (*Caryocar brasiliense*).
This tree, with its twisted trunks,
bears the pequi nut, a typical
fruit of the Cerrado.

SER DO CERRADO

Knowledge and Diversity in the Gardens of Inhotim

1st English edition, 2025

PRODUCED BY

SER DO CERRADO | INHOTIM

SUPPORTED BY

semente

MPMG Ministério Público do Estado de Minas Gerais

The Cerrado is an elder lord
Profound wisdom
There, brave flowers endure
Everlasting through the dry season

Trails and sweeping plateaus
Sertão of Central Brazil
A sky as vast as the world
Without beginning, without end

Home of the cradle of waters
Dry climate, sometimes rainy
It was there that Rosa warned:
Living is a perilous thing

Whoever claims the Cerrado
Is lifeless brush, without grace
Knows nothing of its culture
Nor the people it gave birth to

Keyane Dias

Fruits of *Butia capitata*, a palm tree endemic to the Cerrado in Minas Gerais, Bahia, and Goiás, classified as Vulnerable (CNCFlora).

It is with great enthusiasm that we present the first English edition of *Ser do Cerrado: Knowledge and Diversity in the Gardens of Inhotim,* a publication that celebrates the project *Ser do Cerrado*, of profound significance to Instituto Inhotim. This new edition coincides with a pivotal moment for our institution, as recent advancements in governance have reaffirmed and expanded our commitment to environmental stewardship and to the territory we inhabit.

Ser do Cerrado emerged from a productive collaboration with the Public Prosecutor's Office of Minas Gerais, through the Plataforma Semente initiative. Since its inception, the project has attracted widespread media attention, sparked great interest among our visitors, and inspired our internal teams. Above all, it stands as a landmark endeavor—illuminating the stories, ecological intricacies, and cultural richness of a remarkable yet still underappreciated biome. In doing so, it has strengthened Inhotim's role in environmental education and scientific outreach.

As a direct result of this initiative, we expanded our botanical research on Cerrado flora, incorporating 140 new native species into our collection. We also launched a robust environmental education program, encompassing workshops, mediated visits, lectures, and special activities that explore the histories, communities, and plant species of the Gerais. Notably, we hosted a dedicated edition of the *Jovens Agentes Ambientais* (Young Environmental Agents) program focused exclusively on the Cerrado, bringing the youth of Brumadinho even closer to this universe.

Building on these efforts, Inhotim has made significant strides in its work centered on the Cerrado and broader ecological conservation. We established a new department devoted to environmental initiatives and have reaffirmed our identity as a botanical garden—enhancing our relevance to the territory we occupy.

Today, Instituto Inhotim invests more than ever in the conservation of rare, endemic, and threatened species in the region. Of Inhotim's 140 hectares, seventy-five hectares consist of high-diversity forest fragments, representing 56.4 percent of our total area. These fragments contribute

to landscape connectivity by linking an additional sixty hectares of surrounding forest, facilitating ecological corridors for fauna and flora, and supporting the integrity of local ecosystems.

Originally conceived as a private collection, Inhotim is now undergoing a transformative shift—from a space primarily focused on collecting to an institution equally dedicated to the conservation of local biodiversity. We recognize there is much to learn through the plants and landscapes of our territory—and also much to share with the world. And when we speak of territory, we are speaking above all of the Cerrado, since Inhotim lies at the meeting point of this biome with another equally essential one: the Atlantic Forest.

We therefore celebrate the Cerrado, the *Ser do Cerrado* project, and the institutional partnerships that make such ambitious and transformative initiatives possible.

Paula Azevedo
Managing Director–President
Instituto Inhotim

Recognizing the ecological and social value of the Cerrado, the *Centro de Apoio Operacional do Meio Ambiente* (Environmental Operational Support Center; CAOMA) of the Public Prosecutor's Office of the State of Minas Gerais (MPMG) has launched the *Ser do Cerrado* project, which is part of the MPMG's General Strategic Action Plan, and provides for initiatives to value, conserve, and ecologically restore representative areas of the biome in Minas Gerais.

On December 7, 2021, the MPMG—through CAOMA—in partnership with the National Council of the Public Prosecutor's Office (CNMP) and Instituto Inhotim, officially launched the project. Among its main objectives is to promote the conservation of Cerrado species by incorporating plants from this biome into the collection of the Inhotim Botanical Garden and conducting environmental education activities to raise public awareness about the ecological and cultural importance of the biome.

The project stems from a compensatory measure outlined in a *Termo de Ajustamento de Conduta* (Conduct Adjustment Agreement) signed by the mining company Mineradora Itaminas. Its implementation is being monitored by Plataforma Semente and the MPMG.

The integration of the various organizations dedicated to environmental protection—whether from civil society or the private sector—strengthens the environmental stewardship of the Cerrado, which is considered a conservation priority due to its high level of devastation in Brazil.

Finally, the establishment of a dedicated space within Instituto Inhotim for the Public Prosecutor's Office to fulfill its constitutional mandate as a guardian of the environment not only strengthens our institutional ties with society but also affirms the active role of Public Prosecutors in safeguarding Brazil's biomes, including the Cerrado.

Carolina Frare Lameirinha
Carlos Eduardo Ferreira Pinto
Public Prosecutors (MPMG)

FOREWORD

The first edition of the *Ser do Cerrado*[1] project—carried out between 2022 and 2023 in partnership with the Public Prosecutor's Office of Minas Gerais and Plataforma Semente—marked a significant milestone for Instituto Inhotim. Grounded in the principle that knowledge is fundamental to conservation, the initiative fostered a series of actions that placed the Cerrado at the forefront of dialogue with diverse audiences.

As part of this effort, we published the inaugural edition of the book *Ser do Cerrado: Saberes e diversidade nos jardins do Inhotim* (Ser do Cerrado: Knowledge and Diversity in the Gardens of Inhotim) and launched a dedicated digital platform—the *Território Temático Ser do Cerrado* (Ser do Cerrado Themed Territory) —available on Inhotim's website. Both resources were designed to disseminate information on the biological and cultural richness of the biome, reaffirming Inhotim's enduring commitment to nature and environmental education.

Now, with the project being renewed for 2025 and 2026, we are pleased to present this first English edition, which is a translation of the recently published second edition in Portuguese. Both editions incorporate updated data on the deforestation of the Cerrado and species extinction risk—metrics showing that the threats to the biome have not only persisted but have intensified in recent years.

It is our hope that these pages will serve as an invitation to reflect and act, encouraging every reader to protect and celebrate the Cerrado.

We hope these pages serve as both an invitation to reflect and a call to action, encouraging every reader to protect and celebrate the Cerrado.

Enjoy your reading!

1 *Ser do Cerrado* is both the title of this book and the name of the project from which it originated. It can be translated as "Being of the Cerrado" or "To be from the Cerrado," but the title *Ser do Cerrado* carries a rich, layered meaning that resonates deeply with the project's purpose. In Portuguese, the word "ser" can function as both a verb ("to be") and a noun ("a being"). This dual meaning is central to the project's approach. It speaks to the idea of "a being" or "living beings" by encompassing all life forms within the ecosystem—its plants, wildlife, and human inhabitants—and highlighting their interconnectedness. At the same time, it refers to a permanent state of existence, suggesting a deep, inherent belonging, a sense of identity and origin that reflects what it means to be native to this biome—whether plant, animal, or human.

GETTING TO KNOW THE CERRADO

The small, white flowers of the copaíba (*Copaifera langsdorffii*) attract bees, the primary pollinators of this species native to the Cerrado.

GETTING TO KNOW THE CERRADO

The Cerrado is one of Brazil's six officially recognized biomes and occupies a vast expanse of the country's central plateau. It spans all five geoeconomic regions, encompassing eleven states and the Federal District. Bordering nearly every other Brazilian biome, the Cerrado forms extensive transition zones with the Amazon Rainforest, Caatinga, Atlantic Forest, and Pantanal. Covering approximately 2,036,448 square kilometers, it accounts for nearly 25 percent of Brazil's total land area. In the state of Minas Gerais, the Cerrado is the dominant biome, occupying 57 percent of the territory.

Known as the Brazilian savanna, the Cerrado resembles other intertropical vegetation formations around the world, such as those found in central Africa, coastal India, and northern Australia. However, unlike the African and Australian savannas, the Cerrado is distinguished by its perennial river systems, which ensure high water availability even during the dry season. These water reserves feed a complex hydrographic network, making the biome critical to Brazil's freshwater supply and hydroelectric energy production.

Unlike many biomes characterized by uniform vegetation over large areas, the Cerrado exhibits exceptional heterogeneity in plant formations across short geographic distances. This diversity is shaped by the biome's geological, climatic, and hydrological factors. As a result, the Cerrado hosts a mosaic of distinct vegetation types, each supporting unique ecological communities. It is recognized as the most biodiverse tropical savanna on Earth, containing approximately 30 percent of Brazil's known species and around 5 percent of global biodiversity.

Flora in the Cerrado is adapted to a seasonal rainfall regime, with a pronounced dry season from April to September and a rainy season from October to March. Over millions of years, plant species have developed specialized traits to withstand disturbances like wildfires, droughts, and frosts. Each vegetation type is accompanied by a corresponding faunal assemblage, adapted to its specific conditions. Thus, the biome's phytophysiognomies support an impressive quantity of living beings—more

than 12,000 plant species, 837 bird species, approximately 10,000 butterfly and moth species, 800 fish species, and 227 mammal species—numbers that continue to grow as further research is conducted.

For certain insect groups, the Cerrado holds remarkable global significance: it harbors 13 percent of the world's butterflies, 35 percent of bees—both key pollinators of native flora—and 23 percent of termites, which play essential roles in soil formation and functioning (MMA 2021).

This diversity of plant and animal species offers an immense potential for sustainable use and management, informed by the traditional ecological knowledge of the human populations that inhabit the biome. Indigenous peoples and traditional communities of the Cerrado utilize native fruits, medicinal plants, fibers, oils, timber, and other natural resources, perpetuating and innovating cultural practices that date back to the earliest human presence in the region, approximately twelve thousand years ago.

Despite its importance to Brazil's socioecological context, the Cerrado has been treated as a second-class biome, often wrongly associated with being a poor and unattractive area. Its recent history is marked by the invasion and degradation of its natural lands, driven by economic expansion into Brazil's interior, a process that has been taking place since the 1960s and has caused enormous damage to the biome.

THE PHYTOPHYSIOGNOMIES OF THE CERRADO

When we think of the Cerrado, the image that often comes to mind is a vast expanse of open fields dotted with sparse trees and gnarled trunks—a quintessential tropical savanna. While this iconic landscape is indeed part of the Cerrado, the biome encompasses a much broader array of vegetation types.

Phytophysiognomy refers to the structural and visual characteristics of vegetation in a given area. The Cerrado's complex evolutionary history and expansive geographic range make the classification of its phytophysiognomies particularly challenging. This complexity arises from the biome's wide environmental variability—including differences in fire regimes, climatic conditions, soil fertility, and drainage capacity. For instance, areas with higher water and nutrient availability tend to support taller and denser tree cover. In contrast, regions with shallow soils or prolonged dry seasons exhibit more open, grassland-like formations, with scattered shrubs and small trees.

Due to these variations, the Cerrado is best understood as a mosaic of phytophysiognomies, ranging from *Campo Limpo* (Open Grassland) to *Cerradão* (Dense Woodland). Below, we outline the primary grassland, savanna, and forest formations that characterize the biome, based on the classification by Ribeiro and Walter (2008).

Three distinct phytophysiognomies define the Cerrado's grassland formations. Campo Limpo is dominated by grasses, with an absence of trees and minimal shrub presence. *Campo Sujo* (Shrubby Grassland) is characterized by herbaceous species interspersed with sparse shrubs and subshrubs. *Campo Rupestre* (Rocky Grassland) generally occurs at elevations above nine hundred meters, and herbaceous-shrub vegetation also predominates. However, the presence of rocks and shallow soil increases hydric stress in the environment and leads to the occurrence of many species endemic to this phytophysiognomy. Across all grassland formations, grasses are a prominent feature.

The savanna formations of the Cerrado biome are primarily composed of four distinct phytophysiognomies: *Palmeiral* (Palm Grove), *Vereda* (Cerrado Palm Swamp), *Cerrado Sentido Restrito* (Strict Sense Cerrado), and *Parque de Cerrado* (Cerrado Park). The Palmeiral can occur on both well-drained and poorly drained soils and is characterized by the dominant presence of tall palm species. This phytophysiognomy includes four subtypes: *Babaçual* (Babassu Grove), with a predominance of babassu palm (*Attalea speciosa*); *Buritizal* (Buriti Grove), dominated

by the buriti palm (*Mauritia flexuosa*); *Guerobal* (Gueroba Grove), where the gueroba palm (*Syagrus oleracea*) prevails; and *Macaubal* (Macaúba Grove), where the macaúba palm (*Acrocomia aculeata*) predominates. The Vereda also features the buriti palm as the dominant species, but unlike the Palmeiral, it occurs in saturated grasslands where the water table rises to the surface, typically along riverbanks. The Cerrado Sentido Restrito is structured by species from both the arboreal and herbaceous-shrub layers. It is marked by small, twisted trees and clear signs of fire adaptation. The trees are sparsely distributed, with canopies that do not overlap—preventing the development of a continuous canopy layer.

Based on the structure of the woody layer, the Cerrado Sentido Restrito is further divided into four subtypes: *Cerrado Denso* (Dense Cerrado), *Cerrado Típico* (Typical Cerrado), *Cerrado Ralo* (Sparse Cerrado), and *Cerrado Rupestre* (Rocky Cerrado). Of these, tree species predominate only in the Cerrado Denso, where they can account for up to 70 percent of vegetation cover. In the subtypes Cerrado Típico, Cerrado Ralo, and Cerrado Rupestre, tree cover can reach up to 50 percent, 20 percent, and 20 percent, respectively. The difference is that the Cerrado Rupestre, like the Campo Rupestre, occurs in higher elevations, on rocky outcrops and shallow soils. In the Parque de Cerrado formation, trees are concentrated on elevated terrain, which may be almost imperceptible or visually prominent in the landscape, forming distinctive mounded features known locally as *murundus* (mounds).

In the forest formations of the Cerrado, tree species dominate, forming a continuous canopy. Among the forest phytophysiognomies found within the biome are *Mata Ciliar* (Riparian Forest), *Mata de Galeria* (Gallery Forest), and *Mata Seca* (Dry Forest). While these formations occur in the Cerrado, they are not exclusive to it.

Here, we focus on the Cerradão, a forest formation unique to the Cerrado, which occurs on well-drained soils and is not associated with watercourses. In the Cerradão, average tree height ranges from eight to fifteen meters, creating light conditions that support the development of an understory layer composed of small shrubs and herbaceous plants. The species composition of the Cerradão shares similarities with that of the Cerrado Sentido Restrito—particularly the Cerrado Denso and Cerrado Típico—but the soil characteristics and structural configuration give it a distinctly forest-like appearance.

The distribution of plants in the Cerrado is determined by factors such as climate, soil fertility and acidity, water availability, geomorphology and topography, fire regimes, anthropogenic factors, and the complex interaction between all these factors. These interacting conditions have driven the natural selection of many species that occur in the Cerrado, leading to the evolution of highly specialized traits. The biodiversity of the biome is striking not only because of the sheer number of species but also due to the high number of endemic species—that is, species that occur naturally only in this biome and nowhere else in the world. To illustrate: more than one-third of the native plants, 28 percent of reptiles, and 17 percent of amphibians found in the Cerrado are exclusive to this biome.

THE CERRADO IS A BIODIVERSITY HOTSPOT

Biodiversity hotspots are natural regions characterized by exceptionally high and unique biological richness that face severe anthropogenic threats. These characteristics make these ecosystems priority areas for biodiversity preservation and conservation.

The concept of biodiversity hotspots was introduced in 1988 by British ecologist Norman Myers, who initially identified just ten regions worldwide. Subsequent revisions and updates by Myers and other researchers expanded the list. Today, thirty-four regions across the globe are considered biodiversity conservation priorities. Collectively, these areas account for only 2.3 percent of the Earth's surface, yet they contain approximately 50 percent of all known plant species and 42 percent of all known vertebrate species.

It is important to note that for a region to qualify as a hotspot, it must harbor at least 1,500 endemic species and be threatened by a high rate of deforestation of its native vegetation. Based on these criteria, Brazil has two hotspots: the Cerrado and the Atlantic Forest.

In the Cerrado, the concentration of endemic species is particularly striking. Of the 12,076 species of plants and vertebrates recorded in the biome, 4,689 are endemic. However, in terms of area, the biome has already lost nearly half of its native vegetation: from 1985 to 2023, 38 million hectares of Cerrado were deforested.

THE PHYTOPHYSIOGNOMIES OF THE CERRADO

Grasslands Formations

Savanna Formations

Forest Formation

Campo Limpo
(Open Grassland)

Campo Sujo
(Shrubby Grassland)

Campo Rupestre
(Rocky Grassland)

Cerrado Rupestre
(Rocky Cerrado)

Vereda
(Cerrado Palm Swamp)

Palmeiral
(Palm Grove)

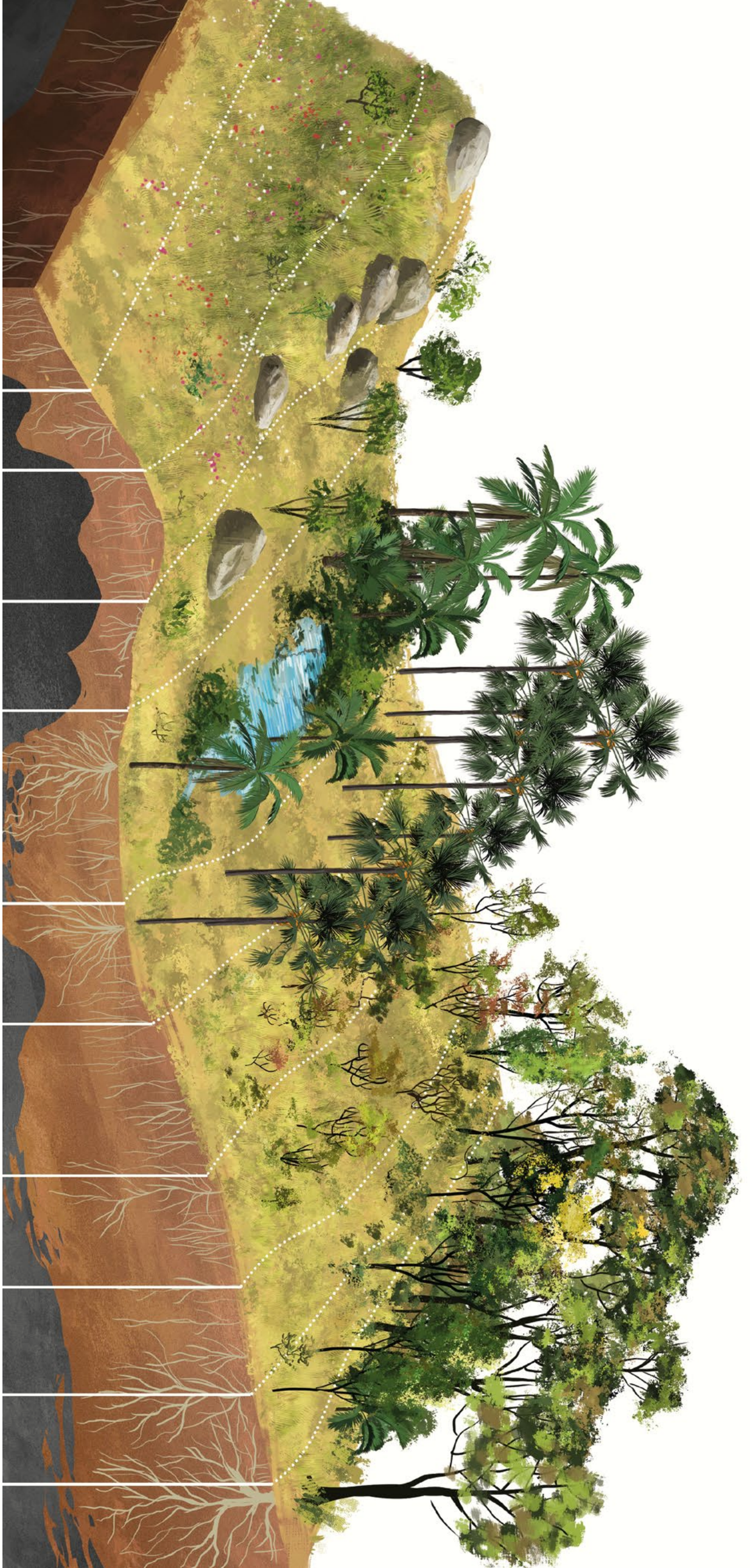
Parque do Cerrado
(Cerrado Park)

Cerrado Ralo
(Sparse Cerrado)

Cerrado Típico
(Typical Cerrado)

Cerrado Denso
(Dense Cerrado)

Cerradão
(Dense Woodland)



Barbacenia delicatula is a species endemic to Minas Gerais and one of the rare plants of the Cerrado found in the Inhotim Botanical Garden.

EVOLVING AND RESISTING

Environmental conditions are among the primary drivers of habitat formation and species diversity across the planet. Because plants cannot move long distances like animals, they must adapt to the resources present in their immediate environment and withstand the bad weather that may occur. In each habitat, plant species exhibit morphological and physiological traits that enable them to survive and reproduce. These traits are the result of evolutionary processes shaped by natural selection.

Over millions of years of evolution and ecological resilience, the vegetation of the Cerrado has developed a suite of adaptive strategies. Below are some of the most notable adaptations found in Cerrado flora:

Underground Storage System: One of the most remarkable adaptations is hidden from view—beneath the soil surface. Many Cerrado species possess highly developed underground storage structures, including xylopodia, rhizophores, and tuberous roots. These structures enable plants to survive extended periods without rain, during which their above-ground parts may desiccate entirely, and to recover after fire events. Even when leaves and branches are completely burned, the subterranean structures remain largely intact. Some species have deep and extensively branched root systems that penetrate several meters into the soil, accessing moisture from deeper layers near the water table.

Tortuous Stems: In contrast to forests, competition for light is not as intense or decisive for plant survival in grasslands and savannas. As a result, trees in the Cerrado tend to exhibit nonrectilinear, tortuous trunks, with branches extending outward in all directions, forming quite broad crowns and low boles. Another factor contributing to the tortuous trunks is fire, which can cause irreversible damage to the apical meristems—the stem tips responsible for vertical growth—triggering the activation of axillary buds (responsible for lateral growth).

Suberous Stems: Cerrado trees possess suberous bark, which enables their survival of fire events. This thick layer of cork tissue acts as a thermal insulator, protecting the internal living tissues of the plant. When fire spreads, the outer bark may char, but the inner layers manage to maintain lower temperatures.

Thick, Hard, and Shiny Leaves: Cerrado leaves are thicker and tougher due to the presence of a thick cuticle composed of lipids, which helps the plant lose less water to the atmosphere. Very shiny leaves, which reflect sunlight, are also common.

Leaves with Stomata on the Abaxial (Lower) Surface: Cerrado plants are exposed to intense solar radiation on the upper surface of their leaves, which makes them increase transpiration. By having stomata confined to the lower surface of their leaves, these plants minimize water loss.

Hairiness: Various Cerrado plants possess trichomes—surface structures resembling hairs. These trichomes serve several functions: they defend the plant against herbivory, reduce water loss through transpiration, and decrease light incidence on the plant.

Other adaptations relate to phytophysiological processes in plant metabolism. Through C4 metabolism, for example, some grasses can fix carbon and increase water-use efficiency, favoring their survival in water-scarce conditions. Other species have developed mechanisms to cope with the excess aluminum in the soil. Aluminum makes it difficult for plants to absorb nutrients and generally stunts plant growth, but some Cerrado plants can absorb aluminum and sequester it in their leaves without experiencing toxicity or developmental issues. Furthermore, many plants have become dependent on fire to complete their life cycles, flowering and germinating only after exposure to fire.

The biological clock of Cerrado plants has also adjusted to increase their chances of species survival. For example, have you noticed that ipê trees bloom during the dry season? At this time, it is common for trees to shed their leaves, thus conserving water that would otherwise evaporate through the leaves during photosynthesis. The water saved helps the plants perform the challenging task of producing flowers, fruits, and seeds. Continuing the reproductive cycle, the seeds disperse in the subsequent months, with germination timed to coincide with the first rains, when they will have water available for growth.

Now that you understand a bit more about the adaptive characteristics of plants, why not take a closer look at the vegetation around you?

The Brazilian squirrel (*Sciurus aestuans*) feeds on the nuts of the *Syagrus coronata* palm at Inhotim's *Viveiro Educador* (Educational Nursery).

The trunk of the ipê-do-cerrado (*Handroanthus ochraceus*) is covered by a thick layer of dead cells, the suber, which acts as thermal insulation in the event of fires.

FIRE!

By now it is clear that fire is an important presence in the Cerrado. It shapes the landscape and plays a vital role in the reproductive cycles of some plant species. Several factors help explain the prevalence of fire in the Cerrado.

As we discussed earlier, the Cerrado climate is marked by two distinct seasons: rainy summers and dry winters. During the summer, lightning strikes may occur just before rainfall or at the tail end of storms. Lightning is very frequent in Brazil—on average, seventy-eight million lightning strikes per year. During the dry season, temperatures rise, air humidity drops, and plants shed their leaves, resulting in the accumulation of dry biomass on the ground. These conditions contribute both to the ignition and spread of fire.

Fires are often used for pasture renewal in cattle-raising areas and other agricultural activities. Accidental ignitions can also occur—such as those caused by falling balloons or improperly discarded cigarette butts. However, it's important to recognize that fire is not solely anthropogenic. Natural fires have occurred long before human existence. In the Cerrado, other natural factors such as spontaneous combustion, rock friction, and even the rubbing of some animal's fur against dry vegetation can trigger fires.

It is worth remembering that the Cerrado flora evolved alongside natural fires and, over millennia, adapted to this environmental condition. One example is that fire helps trigger seed germination in certain species. The rapid rise in temperature causes cracks in impermeable seed coats, allowing water to penetrate, initiating germination.

Other species exhibit post-fire resprouting and flowering, rapidly transforming the gray landscape into a true garden. This green garden attracts herbivores seeking fresh forage and even carnivores hunting insects and reptiles affected by the fire. With the return of flowers, a feast of nectar and pollen emerges for many insects. The action of pollinators then leads to the production of fruits and seeds, which serve as food for many other animals. And thus, the fauna that had fled the fire gradually returns, drawn by the availability of food.

However, fires are not always beneficial for the Cerrado. Large-scale fires, frequent burns, or fires occurring outside the natural seasonal window can have detrimental effects on the Cerrado. Depending on the stage of development of the plant when the fire occurs, it may either stimulate reproduction or cause mortality. In such cases, rather than helping, fire can lead to biodiversity loss and harm the flora and fauna of the Cerrado. Therefore, it is necessary to exercise caution and carefully study the environment before managing the fire.

A true upside-down forest. Many trees of the Cerrado have extremely deep, highly branched root systems, much larger than their canopies.

CRADLE OF WATERS

Until now, we have explored the Cerrado through the lens of its extraordinary biodiversity, reflected in the number of endemic species uniquely adapted to its diverse vegetation types, or phytophysiognomies. But the biome also plays a critical role in regulating South America's hydrological systems. If Brazil is the world's richest country in freshwater, then the Cerrado is its reservoir.

Situated in the heart of Brazil and defined by its plateaus, the Cerrado harbors countless springs and recharge zones that feed the main river basins of Brazil and South America. It is no wonder that the Cerrado is known as the Cradle of Waters. Eight of Brazil's twelve principal hydrographic regions originate in the Cerrado: Amazon Basin (Xingu, Madeira, and Trombetas Rivers); Tocantins-Araguaia Basin (Araguaia and Tocantins Rivers); Northeast Atlantic East Basin (Itapecuru River); Parnaíba Basin (Parnaíba, Poti, and Longá Rivers); São Francisco Basin (São Francisco, Pará, Paraopeba, das Velhas, Jequitaí, Paracatu, Urucuia, Carinhanha, Corrente, and Grande Rivers); East Atlantic Basin (Pardo and Jequitinhonha Rivers); Paraná Basin (Paranaíba, Grande, Sucuriú, Verde, and Pardo Rivers); and Paraguay Basin (Cuiabá, São Lourenço, Taquari, and Aquidauana Rivers).

To illustrate the biome's hydrological importance: the São Francisco River Basin, which originates in the Serra da Canastra range in Minas Gerais and flows to the Atlantic Ocean—providing vital water resources to Brazil's semiarid region—relies on the Cerrado for 94 percent of its water volume.

The Cerrado also shelters three major aquifers: Bambuí, Urucuia, and Guarani. These subterranean reservoirs are composed of porous and permeable geological formations that store water, playing a fundamental role in maintaining river discharge. The Bambuí Aquifer, located in northern Minas Gerais, straddling the Cerrado and the Caatinga biomes, covers 180,000 square kilometers and lies within the São Francisco Basin. The Urucuia Aquifer, entirely within the Cerrado, covers 120,000 square kilometers across western Bahia and has fragments in Tocantins, Goiás, Piauí, Maranhão, and northwest Minas Gerais. Finally, the Guarani Aquifer, with roughly 1.2 million square kilometers, is the largest transboundary freshwater aquifer in the world, with half of its area situated within the Cerrado.

In the Central Plateau, specifically in Planaltina (Federal District), lies the Águas Emendadas Ecological Station, a fully protected nature conservation unit that is home to a Vereda nearly six kilometers long, from which streams flow into both the Tocantins and Paraná river basins.

It is also in the Cerrado that the headwaters of the rivers forming the Pantanal are located—a biome whose hydrological flow is crucial to its ecosystem function, providing breeding and feeding grounds for local biodiversity.

The hydrological cycle of the Cerrado includes various processes such as evaporation, transpiration, precipitation, surface runoff, infiltration, and groundwater flow. Water evaporates from oceans and inland water bodies, forming clouds that, under certain conditions, precipitate as rain or hail. Upon reaching the ground, water can either run off the surface or infiltrate the soil. The highly porous and permeable soils of the Cerrado facilitate the infiltration of precipitated water and thus enhance the biome's water recharge potential. These soils act as a veritable water-absorbing sponge. The water that infiltrates into the soil of the plateaus feeds both the water table and the springs that sustain rivers and Veredas.

Vegetation cover plays a crucial role in facilitating water infiltration into the soil. Plants protect the surface layers of the soil from the impact of raindrops, prevent erosion and crust formation, and increase soil macroporosity, which expands water absorption capacity. Additionally, the vegetation of the Cerrado has relatively little above-ground biomass and draws less water from the soil compared to forests. Therefore, the biome's ability to provide ecosystem services related to water production depends directly on the existence and preservation of large areas of native vegetation.

The Cerrado supplies water to all regions of Brazil, making it a fundamental resource for urban water supply and important sectors of the economy. Furthermore, considering that hydropower accounts for 75 percent of Brazil's energy matrix, the waters of the Cerrado are of utmost importance for the country's energy production. It is in this biome that the Paraná, São Francisco, and Tocantins Rivers are born, and where Brazil's major hydroelectric plants are located.

The Cerrado accounts for 60 percent of Brazil's annual agricultural production. Consequently, it is the biome with the highest concentration of center pivot irrigation systems in the country. These systems are located primarily in western Minas Gerais, southeastern Goiás, the Federal District, and western Bahia. The Cerrado has the three municipalities with the largest concentration of pivots in Brazil: Unaí (Minas Gerais), Paracatu (Minas Gerais), and Cristalina (Goiás). Together, they have 2,558 pivots, occupying an area of approximately 191,000 hectares (ISPN 2020). Farming, particularly large-scale operations, is responsible for nearly 70 percent of the country's water consumption, and technologies such as center pivots are the most water intensive as well as the most inefficient.

The waters of the Cerrado also support leisure, recreation, and tourism. They improve the quality of life of people and generate revenue for tourist destinations. From simply admiring the landscape to engaging in water sports, swimming, hiking, and fishing, the attractions offered by the many rivers, streams, lakes, rapids, and waterfalls of the Cerrado are countless.

The buritirana (*Mauritiella armata*) is a species that grows in wetland areas, such as riverbanks and *Veredas* (Cerrado palm swamps).

Fruit of the copaíba or diesel tree (*Copaifera langsdorffii*). Known for its antibiotic, anti-inflammatory, and antiseptic properties, this species is widely used for medicinal purposes.

TRADITIONAL PEOPLES AND COMMUNITIES OF THE CERRADO

Human occupation of the Cerrado predates the arrival of the Portuguese in Brazil by millennia. Multiple pieces of evidence show that human populations inhabited the central region of the country over ten thousand years ago. It suffices to recall that the oldest known human fossil in the Americas, Luzia, was found in a cave in Pedro Leopoldo (Minas Gerais), dating back eleven thousand years. What is clear is that the diversity of the Cerrado goes beyond the abundance of fauna and flora species—it is also expressed in the different cultures the biome harbors.

In addition to Indigenous peoples, Quilombola communities—descendants of Afro-Brazilian runaway slaves—and rural populations also established themselves in the biome and developed ways of life connected to the local nature. In his contribution to the book *Farmacopéia Popular do Cerrado* (2009, 29), Anthropologist and Professor Dr. Ricardo Ferreira Ribeiro summarizes the centuries-long history of human occupation in the Cerrado, highlighting the profound synchronicity these peoples have with the natural resources of the biome:

> By gathering fruits and palm hearts, hunting and fishing, the first inhabitants learned to extract from the Cerrado what was necessary for their survival. Around two thousand years before Christ, these Peoples of the Cerrado were already living off their small farms, planting corn and peanuts, making clay pots, producing fabrics, mats, and ropes from embira fiber. In this way, these peoples developed a way of life different from that of the inhabitants of the coastal mangroves and forests, the Amazon Rainforest, the cold fields of the South, or the highlands of the Andes. When the Portuguese arrived in Brazil, they encountered the Tupi people of the coast, who were enemies of the Tapuias, the Jê-speaking Indians, descendants of those ancient inhabitants of the Cerrado.

At the onset of colonization, the central region of Brazil was not widely explored, due to difficult access and the Treaty of Tordesillas, which limited Portuguese westward expansion. However, beginning in the 17th century, the pursuit of enslaved labor, gold, and other riches led to increased exploration of Central Brazil, especially in the states of Minas Gerais, Mato Grosso, and Goiás. The colonial explorers known as bandeirantes, from São Paulo, were the first to make contact with the Indigenous peoples of the Cerrado. These peoples did not accept

captivity or the invasion of their territory and waged a long resistance movement. Their large villages gradually moved deeper into the interior of Brazil to escape enemy attacks and the diseases they brought.

While they learned from the Indigenous peoples how to live off hunting, fishing, fruit gathering, honey, medicinal plants, and so many other natural resources of the Cerrado, the bandeirantes also brought innovations to these backlands or hinterlands regions known as sertões: cattle and the mining of gold, diamonds, and other precious stones. The bandeirantes established farms and multiplied herds of cattle, which roamed freely across the grasslands, growing semi-wild and supplying meat, leather, and tallow to the burgeoning mining towns. These towns gradually increased the population in the Cerrado, especially with the arrival of enslaved people brought from Africa to mine in Brazilian lands. The enslaved Black people who escaped founded quilombos, autonomous communities, far from the farms, beyond the reach of colonial authorities. The Brazilian interior also became a refuge for people who, for various reasons, chose to settle in more remote areas of the country. With a lifestyle different from that of the coastal cities, a sertaneja society, a social group with a distinct society and culture inhabiting the sertão, began to take shape in the Cerrado.

In the 19th century, the distances between the coast and the sertões were shortened by steamboats, railways, and telegraph lines that penetrated the Cerrado. During this period, the first textile mills appeared, contributing to the establishment of cotton as a commercial crop. By the early 20th century, products from the Cerrado, such as rubber from the mangabeira (*Hancornia speciosa*) and maniçoba (*Manihot* spp.) trees, were being exported via the São Francisco River. Around the same time, Zebu cattle were brought from India to boost meat production for export. Along with this, a new model of livestock farming was established in the Cerrado: cattle were no longer free ranged across open rangelands, and barbed wire fencing began to demarcate the pastures. Thus, only those who could measure and fence their land—namely, the large-scale farmers—secured their territory.

But the most profound transformation began in the 1950s, with the construction of Brasília, Brazil's new capital, and the opening of highways connecting it to all corners of the country. From that point forward, human occupation of the Cerrado increased dramatically, and consequently, environmental degradation. In the ensuing decades, the modernization of agriculture turned the biome into a new and promising agricultural frontier in Brazil. Based on monoculture, agribusiness was responsible for expelling traditional rural communities from the countryside and for promoting an accelerated loss of the natural and cultural biodiversity of the Cerrado.

The traditional peoples and communities of the Cerrado have sustained, and continue to sustain, their livelihoods mainly from family farming, crafts, and extractivism. They possess profound knowledge of nature, transmitted orally across generations, which is reflected in their strategies for the use and management of natural resources. These groups live in symbiosis with nature, with its cycles and natural resources, from which they build their ways of life (Ribeiro 2005).

The use of low-impact environmental technologies, sustainable resource management, and a spiritual connection to nature—expressed through symbols, myths, and rituals associated with the activities they perform—are characteristics that make traditional peoples and communities the true guardians of the Cerrado (Aguiar and Lopes 2020). Unfortunately, many of these groups have witnessed the devastation of the biome surrounding them, becoming practically islands of preserved areas. Typically, these groups have inhabited the same territory for several generations and self-identify as a distinct culture.

Decree No. 6040 issued on February 7, 2007, which established the National Policy for the Sustainable Development of Traditional Peoples and Communities, defines them as: "culturally distinct groups who recognize themselves as such, who have their own forms of social organization, who occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral, and economic reproduction, utilizing knowledge, innovations, and practices generated and transmitted by tradition" (Decree 6040, Art. 3, § 1). This Policy complements other legal frameworks that safeguard the rights of traditional peoples.

Under Brazil's 1988 Constitution and Convention 169 of the International Labour Organization (2004), to which Brazil is a signatory, traditional communities are guaranteed the right to self-identification and to their territories, and they must be consulted on projects that impact them. In Minas Gerais, State Law No. 21147, enacted in 2014, promotes the sustainable development of traditional peoples and communities. It recognizes the self-affirmation of identity of these populations and guides the land regularization of their territories.

Although different legal instruments have been created by federal and state governments—such as the Sustainable Development Projects and Agro-Extractive Projects created by the Instituto Nacional de Colonização e Reforma Agrária (National Institute for Colonization and Agrarian Reform; INCRA); the conservation units that regulate the use of the territory by communities; and the Terms of Authorization for Sustainable Use—the legal framework remains fragile, and traditional communities face increasing threats. Ensuring that these peoples remain in their territories means conserving the Cerrado, its riches, and the services it provides to society.

With its unmistakable flavor and aroma, the pequi (*Caryocar brasiliense*) is one of the emblematic symbols of the Cerrado.

PEOPLES OF THE MINAS GERAIS CERRADO

Minas Gerais, Brazil's fourth-largest state by land area, spans over 586,000 square kilometers—of which approximately 57 percent is covered by the Cerrado. Across these lands, there are various traditional communities and peoples. In addition to Indigenous peoples, there are Quilombolas, descendants of Afro-Brazilian runaway slaves; Geraizeiros, traditional inhabitants of northern Minas Gerais Cerrado region; Raizeiras, traditional healers; Sempre-vivas Flower Gatherers; Veredeiros, inhabitants of the Cerrado palm swamps known as Veredas; Comunidades de fundo e fecho de pasto, traditional communities with collective land use; Vazanteiros, floodplain farmers, and many other groups that form the socio-biodiversity of the Cerrado in Minas Gerais.

These groups have inhabited certain territories for several generations and bear distinct cultures. Despite their differences, they all share a deep harmony with the ecosystems. They are people whose ways of life are intrinsically linked to the biome, who conserve biodiversity, and who live because the Cerrado lives.

INDIGENOUS PEOPLES

Diversity is the defining characteristic of Brazil's Indigenous peoples, with no single culture defining the more than three hundred ethnic groups identified across the country. Ways of life can vary greatly from one people to another and from one village to another, but Indigenous peoples share a deep respect and sense of belonging to the territories they inhabit.

As heirs to ancestral knowledge, Indigenous peoples use natural resources without putting ecosystems at risk. In their practices of hunting, fishing, extractivism, agriculture, animal husbandry, and craft production, they combine sustainable techniques and resource management practices, serving as true guardians of biodiversity.

In Minas Gerais, approximately twenty Indigenous ethnic groups from the Macro-Jê and Guarani linguistic families occupy territories from north to south of the state. Among them are the Aranã, Kaxixó, Krenak, Maxakali, and Xakriabá peoples, who inhabit the Cerrado of Minas Gerais and resist so that their ways of life can continue to exist.

To learn more about the peoples of Minas Gerais, visit the website of the Centro de Documentação Eloy Ferreira da Silva (Eloy Ferreira da Silva Documentation Center; CEDEFES): www.cedefes.org.br.

QUILOMBOLAS

The word *quilombo* originates from the Kimbundu language and means "a society formed by young warriors who belonged to ethnic groups uprooted from their communities." Born of resistance to the slave-owning system that persisted in Brazil for over three hundred years, Quilombola communities are predominantly Black, rooted in African cultural heritage and productive systems focused mainly on the survival of their members. These ethnic groups self-identify through the relationships they maintain with the land, kinship, territory, ancestry, their traditions, and their own cultural practices.

Abandoned by the Brazilian state after abolition, formerly enslaved people and their descendants organized themselves as best they could, peacefully, in unoccupied or donated lands. Many communities established themselves in the Cerrado, where thousands of groups still fight today for the official recognition of their identity, cultural, and territorial rights, as defined by the Constitution.

Minas Gerais is one of the Brazilian states that most extensively used enslaved labor, whether for gold mining or agricultural production. For much of the 19th century, the state held the largest enslaved population in Brazil. For this reason, today it is among the states with the highest number of Quilombola communities, alongside Bahia and Maranhão. Later in this publication, we will discuss the Pontinha Community, located in Cerrado areas of the municipality of Paraopeba.

In Brumadinho, near Inhotim, communities such as Sapé, Marinhos, Rodrigues, and Ribeirão maintain Quilombola traditions and ways of life alive. These are just a few of the more than one thousand Quilombola communities identified in the List of Black Quilombola Communities in Minas Gerais, a document regularly updated by the Centro de Documentação Eloy Ferreira da Silva (Eloy Ferreira da Silva Documentation Center; CEDEFES).

To learn more about Quilombola communities across Brazil, visit the website of the Coordenação Nacional de Articulação das Comunidades Negras Rurais Quilombolas (National Coordination of Black Rural Quilombola Communities; CONAQ): www.conaq.org.br.

SCIENCE AND TRADITION HAND IN HAND IN PONTINHA

In the Quilombola community of Pontinha, in Paraopeba, central region of Minas Gerais, most men and women make their living from the extraction of the minhocuçu. This giant earthworm belongs to the species *Rhinodrilus alatus* and is endemic to the Cerrado of Minas Gerais. For decades, it has been used as fishing bait throughout Brazil.

Despite its popularity, the law considers a crime the extraction, trade, transportation, or use of the minhocuçu without authorization from environmental agencies. This is because until 2010, the species was considered endangered. Minhocuçu extraction has also sparked conflicts with landowners in the region, often involving law enforcement and regulatory agencies.

With the goal of promoting the sustainable use of the minhocuçu and reducing existing conflicts, the Minhocuçu Project was created in 2004. It brought together different sectors of society and proposed common agreements on the harvesting periods, collection sites, and techniques used. The guidelines were followed and conflicts in the region were reduced significantly.

One of the proposed strategies was to avoid harvesting the minhocuçu during its reproductive season. But how would the community support itself during that time? The solution came with the realization that the minhocuçu's breeding season coincides with the fruiting period of the pequi tree *(Caryocar brasiliense)*, a symbolic tree of Minas Gerais, typical of the Cerrado, with great cultural and socioeconomic value. This led to the creation of the Pequi Project in 2013. Since then, the project has been developing a series of actions to support the sustainable use of Cerrado fruits as an alternative source of income for the Pontinha community. Today, the products from the project—sweets, creams, farofa, and delicious pequi nuts—are sold at regional fairs and events under the registered brand "Pontinha de Sabor."

Over nearly twenty years, the collaboration between UFMG and the Pontinha community has yielded countless lessons and mutual benefits. The community has embraced the knowledge brought by academic research, just as the university and other institutions learned from the people of the region about the earthworms, the pequi, and the Cerrado.

Openness to dialogue and everyone's participation in the search for solutions were key to achieving lasting results. Just like these projects, other initiatives can be carried out among neighborhood stakeholders to clarify misunderstandings, mediate conflicts, and find positive solutions that align with environmental protection.

GERAIZEIROS

In northern Minas Gerais and southern Bahia—where the term Gerais is used to refer to the plateaus, slopes, and valleys of the Cerrado regions—rural communities make a living by cultivating diverse crops, raising livestock, and extractivism. They are the Geraizeiros, traditional Cerrado populations who have wisely adapted to the characteristics of the biome and its production possibilities.

The Geraizeiro way of life has been shaped by Indigenous, African-descendant, and Portuguese influences, with communal land use as a defining feature. These farmers typically live on the same land their parents and grandparents inhabited, from which they obtain everything needed to survive. Livestock is raised in open rangelands, following an age-old logic that acknowledges nature's ability to feed the herds. Family and community subsistence is secured through the cultivation of diverse crops such as corn, beans, cassava, fruits, and vegetables. Surplus products are sold at markets and fairs in neighboring communities.

Since the 1970s, the expansion of eucalyptus monocultures has led to land expropriation, grilagem or land grabbing, and numerous environmental impacts that directly affect these traditional communities. Since then, the Geraizeiros have faced repeated expulsions and appropriation of their territory, and to this day they live under severe legal insecurity. They continue to fight for the rights guaranteed to them by law and resist in defense of their existence and a way of life that honors nature and its cycles.

VEREDEIROS

At the tri-border region of Minas Gerais, Bahia, and Goiás, the Veredeiros have lived for at least a century in the Veredas and *chapadas* (plateaus) near watercourses. There, they cultivate crops, raise free-range livestock, and collect typical Cerrado fruits, drawing from the biome the essential resources for their subsistence.

Veredeiro communities are characterized by an agro-extractivist production system, with rotational planting in the moist soil of the Veredas, extractivism, and free-range cattle farming. During the rainy season, they allow their cattle to roam freely across the chapadas; during the dry season, they take advantage of the still-humid fields around the Veredas. It is also near the Veredas that they typically build their homes to benefit from the cooler and more humid microclimate provided by the ecosystem.

Although dispersed along waterways, the Veredeiros organize into groups bonded by a sense of locality, kinship ties, work and land management, exchanges of native seeds, and reciprocal relationships. In this way, they strengthen a Veredeiro identity intimately connected to the territory, while developing community strategies to maintain their ways of life and conserve the agrobiodiversity of the Cerrado. The Veredeiros have also organized politically: the *Associação Central das Comunidades Veredeiras* (Central Association of Veredeiro Communities; ACEVER) was established in 2019 to advocate for their rights as traditional peoples.

Just like other traditional peoples and communities, the Veredeiros face conflicts related to access to land and natural resources. Added to this are the degradation of micro-watersheds due to the implementation of eucalyptus monocultures, rampant deforestation, charcoal production, intensive wildfires, and the silting and landfilling of the Veredas.

It should be emphasized that the Veredas play a fundamental role in sustaining life in the semiarid region, as they are part of a hydrographic network that extends across the country and beyond. Therefore, recognizing the knowledge and rights of Veredeiros is an important step in the fight against the degradation of the Veredas.

VAZANTEIROS

The Vazanteiro communities are composed of men and women who primarily inhabit the floodplains of the São Francisco River and its tributaries. Also known as "Velho Chico," the river originates in Minas Gerais and runs through the country before reaching the Atlantic Ocean in Alagoas. It is considered one of Brazil's main sources of development, mainly due to its importance for agriculture.

The Vazanteiros have lived and worked in the floodplains of the São Francisco River for over four hundred years. They have Indigenous and Black roots and are also strongly influenced by riverside life. In the *Carta-Manifesto das Mulheres e Homens Vazanteiros* (Manifesto Letter of Vazanteiro Women and Men 2006), they define themselves as follows: "They call us Vazanteiros because our agriculture is linked to the cycles of flooding, high water, low water, and drought of the São Francisco River. We are a people who live on its islands and banks, managing its 'rising lands,' making a living from fishing, agriculture, extractivism, and animal husbandry."

These communities have their own way of life and spread across the territory according to the natural water cycles, seeking to maintain access to lands fertilized by organic matter along riverbanks and islands. The low-lying areas, known as baixões, are where the soil is most fertile and moist. This is where they build settlements and grow root vegetables, leafy greens, fruits, and pasture.

Furthermore, the *vazantes* (seasonal floodplains) and wetlands—featuring groves of buriti (*Mauritia flexuosa*) and babassu (*Attalea speciosa*) palms—ensure the livelihood of extractivists who are also part of these communities. The know-how of the Vazanteiros is intertwined with environmental conservation, as they are part of the place and live by managing nature, drawing from it their food, medicine, livelihood, and inspiration for the continuous preservation of their ways of life.

In recent decades, the construction of reservoirs for hydroelectric plants along the São Francisco River Basin has systematically reduced and destroyed floodplain vazante areas, causing profound changes in the organization and way of life of the Vazanteiros. In the same manifesto letter, they state: "We are like the river; we are of the river; we suffer with it when its springs dry up, its bed fills with sand, its waters diminish, lose strength, are dammed, polluted, degraded." For all these reasons, these communities have resisted the advance of agribusiness and have fought to be recognized. In doing so, they aim to secure their rights to land, to water, and to the use of their territories.

The *Centro de Agricultura Alternativa do Norte de Minas* (Alternative Agriculture Center of Northern Minas Gerais; CAA/NM) is an organization of smallholder family farmers from northern Minas Gerais, comprised of representatives from various traditional peoples and communities.

Visit the website below to learn more about Geraizeiros, Veredeiros, and Vazanteiros: www.caa.org.br.

RAIZEIRAS

Traditional folk medicine is expressed through various healing practices that result from the alliance of the medicine of Brazil's Indigenous peoples, African peoples, and the Portuguese colonizers who arrived in Brazil. The Raizeiras, female traditional healers, and Raizeiros, male traditional healers of the Cerrado are recognized in their communities for providing health care through natural resources and spirituality.

These guardians of traditional medicine possess ancestral knowledge about the sustainable use of plants and are skilled in identifying Cerrado environments, locating medicinal plants, harvesting the medicinal parts of the plants, and preparing and indicating homemade remedies to treat illnesses. Composed mostly of women, these groups are present in communities in the states of Goiás, Mato Grosso, Maranhão, Tocantins, Bahia, and Minas Gerais.

Drawing on knowledge passed down through generations, and the exquisite handling of more than three hundred plant species, the biodiversity of the Cerrado is transformed into medicine for families. The Raizeiras use roots, bark, resins, oils, leaves, clays, and various other natural resources to produce homemade remedies that are sold at low cost or donated free of charge. The health care provided by Raizeiras usually takes place in their own homes.

In addition to creating a supportive health care network in local communities, Raizeiras also produce knowledge as they research plants and the methods of their medicine. The work of these peoples has given rise to a traditional pharmacopeia of the Cerrado—Brazilian intangible heritage in the process of registration with the *Instituto do Patrimônio Histórico e Artístico Nacional* (National Institute of Historic and Artistic Heritage; IPHAN).

Articulação Pacari (Pacari Network) brings together individuals and community organizations that work with Cerrado folk medicine. The network conducts the collective registration of traditional knowledge for its protection and transmission and also promotes the development of political tools to ensure the right to practice traditional medicine and make sustainable use of the biodiversity of their territories. Among the key publications published by the Pacari Network are: *Farmacopéia Popular do* Cerrado (Traditional Pharmacopeia of the Cerrado 2009), and the *Protocolo Comunitário Biocultural das Raizeiras do* Cerrado (Biocultural Community Protocol of the Raizeiras of the Cerrado 2014). They are both available online.

SEMPRE-VIVAS FLOWER GATHERERS

In Minas Gerais, dozens of rural communities living in the Diamantina region, in the southern Serra do Espinhaço Mountain Range, survive by collecting sempre-vivas, everlasting flowers. Once collected and dried, these flowers retain their shape and color and can be sold fresh or as raw material for artisanal crafts and floral arrangements.

The flower-gathering activity is led predominantly by women and holds more than just economic importance for families in the region. Associated with small-scale farming and the raising of heritage livestock breeds, this agricultural practice forms a cultural identity that is passed down through generations. During harvest season, the flower gatherers head to the high-altitude grasslands, where they stay in temporary shelters. After collection, the flowers are brought back to homes in the community, dried naturally in the sun, and stored for sale.

For the sempre-vivas gatherers, their trips to the fields carry meanings that go beyond labor and economics. It's where communities meet, forging important interactions and bonds in a ritual that fosters a sense of belonging to their community's collective identity.

Organized under the *Comissão em Defesa dos Direitos das Comunidades Extrativistas Apanhadoras de Flores Sempre-vivas* (Commission for the Defense of the Rights of the Extractivist Communities of Sempre-Viva Flower Gatherers; CODECEX), the sempre-vivas gatherers fight for the recognition of their practices and for the right to use the resources they depend on to sustain their way of life.

The traditional management of the sempre-vivas includes leaving a significant portion of the plants untouched in the fields to allow for natural seed dispersal, as well as returning to the native fields the seeds that fall on the floors of their homes during flower preparation for transportation and sale. These practices aim above all to maintain the genetic diversity of the plant populations and to ensure the conservation of these flower species.

In 2020, the Food and Agriculture Organization of the United Nations (FAO) designated the unique production system of the sempre-vivas gatherers as a Globally Important Agricultural Heritage System (GIAHS). This designation honors traditional communities that preserve centuries-old land management techniques and develop a sustainable relationship with nature in their territories. It was the first GIAHS designation awarded to Brazil.

Conserving the Cerrado also involves guaranteeing the rights of traditional peoples and communities. Indigenous peoples, Quilombolas, smallholder farmers, and other traditional communities have joined forces in their struggle to protect their way of life, the sovereignty of their territories, and their access to land. Based on the belief that humans are part of the environment and should contribute to ecosystem sustainability, various nongovernmental organizations and community organizations have been fighting for the rights of Brazil's traditional peoples.

Actinocephalus polyanthus is one of the species of "everlasting" flowers gathered by traditional communities. This species has significant ecological importance, as it provides shelter and food for many animals in the habitats in which it occurs.

Leaf of *Thaumatophyllum bipinnatifidum*, a native species from the *Araceae* family, widely used in landscaping.

THREATENED CERRADO

Despite the undeniable importance of the Cerrado for the ecosystem balance of Brazil and South America, the biome is under severe threat. Nearly half of its vegetation has already been destroyed. With 48.3 percent of its original area converted into agricultural fields, pasturelands, roads, hydroelectric dams, and cities, the Cerrado is the second most degraded biome in Brazil due to human activities.

The agribusiness model, sustained by a developmentalist discourse, has been responsible for the clearing of vast areas of original Cerrado vegetation over the last fifty years. The biome, once envisioned as the world's breadbasket, has been transformed into a testing ground for large-scale agriculture. As a result, this model has generated irreparable socio-environmental impacts.

So coveted for agricultural production, the Cerrado has been overlooked by legislation. The 1988 Constitution failed to recognize the biome as part of Brazil's natural heritage; and the New Forest Code of 2012, while requiring that landowners within the Cerrado in the Legal Amazon region must preserve 35 percent of vegetated area, mandated only 20 percent preservation in other Cerrado regions. Subsequently, some states have enacted laws to protect the biome. In Minas Gerais, for example, there are laws that prohibit the cutting of the ipê-amarelo *(Handroanthus albus)* and the pequi trees (*Caryocar brasiliense*). However, these measures are still insufficient to contain the threats facing the biome.

The main problem is the loss of native vegetation, primarily driven by its conversion into farming land. Today, soybean monoculture alone occupies 10 percent of the Brazilian Cerrado. Monoculture leads to environmentally unsustainable activities, such as the overexploitation of natural resources and the use of pesticides, in addition to reducing the ecosystem's resilience.

The loss of native vegetation leads to biodiversity decline, a problem exacerbated by the Cerrado's high levels of endemism. According to the study *Contas de Ecossistemas: Espécies ameaçadas de extinção* (Ecosystem Accounts: Species Threatened with Extinction) published by IBGE in 2023, 1,199 species are at risk of extinction in the biome—not counting those that may become extinct before we even identify their ecological roles, their properties, or their potential.

Even with the exponential growth in academic research on the Cerrado over the past twenty years, the biome remains understudied compared to tropical forests. Its complex vegetation and geological formations, as well as its vast biodiversity, are not widely known, leaving

many species vulnerable to extinction before they are even cataloged by science.

The pace of destruction of natural areas is alarming. The latest report *Mapeamento Anual de Cobertura e Uso da Terra* (Annual Mapping of Land Cover and Use), published by MapBiomas, shows that in 2023 the Cerrado lost 117.4 hectares of native vegetation per hour, totaling 1,028,378 hectares—representing 41.45 percent of all deforestation in Brazil that year. The loss of vegetation also has negative impacts on the soil—such as increased erosion, compaction, and nutrient leaching—disrupting the water cycle.

Another problem caused by deforestation is landscape fragmentation, which has serious implications for environmental balance and ecosystem services. With little connectivity between patches of native vegetation, reserves become more vulnerable to changes caused by climate change, illegal extraction, and uncontrolled fires. Furthermore, the isolation of habitat fragments limits seed dispersal and gene flow, further reducing the resilience of wildlife populations. One alternative to minimize the effects of natural habitat fragmentation is the creation of ecological corridors that allow for wildlife movement and resource exchange between patches of native vegetation.

As previously discussed, the vegetation of the Cerrado is resilient, having evolved over millions of years to cope with the biome's typical adversities. However, the introduction of exotic species has caused new disturbances. Grasses such as capim-gordura or molasses grass (*Melinis minutiflora*) and *Brachiaria* spp. are examples of invasive species introduced to the Cerrado to boost pasture productivity for livestock farming. Easily dispersed by wildlife and wind and with a high capacity for biomass accumulation, these grasses alter the fire regime, making wildfires more intense and destructive—transforming a natural ecological process into a driver of degradation.

Criminal wildfires are another threat to the Cerrado. They are used not only to clear land pasture but also as a tactic to invade natural areas or intimidate communities, causing numerous social and environmental problems. Land disputes are frequent in the Cerrado, as few traditional communities have formal recognition of their land rights, and they face increasing pressure from agribusiness and mining interests to expand their production areas.

The use of pesticides is yet another issue affecting the Cerrado. It is worth noting that since 2008, Brazil has been the world's largest consumer of pesticides, largely due to the large-scale agriculture practiced in the country's central region. These substances harm not only the native vegetation but also wildlife (especially pollinators), water sources, and people. Their impacts are felt by rural and extractivist communities, who see their crops lose productivity, native species disappear, and who experience the harmful health effects of pesticides in their own bodies.

Exotic species used in the cultivation of planted forests in the Cerrado cause problems for the biome's hydrological production. This is evident with pine and eucalyptus plantations in Cerrado's wetland areas, which disrupt water infiltration into the water tables and reduce groundwater recharge. With the arrival of these species and the implementation of center pivot irrigation systems in monocultures such as grains and sugarcane, farming families who have lived in these areas for generations have seen the dry season worsen and have been forced to abandon their lands in search of alternative livelihoods. Furthermore, misguided expansion projects—which lack an understanding of the hydrological cycle in the biome—put at risk areas essential for maintaining the balance of the Cerrado.

Another threat is the mistaken perception that forests are more beautiful or more important than grasslands and savannas. It is important to broaden our perspective and realize that there are other forms of beauty beyond towering trees with green foliage. The low-lying and shrubby vegetation of the Cerrado also holds great beauty—neither greater nor lesser than that of forests, just different. Moving beyond a purely aesthetic view of nature, we must learn about the unique characteristics of each biome and recognize the importance of diversity. After all, every species plays a role in maintaining the planet's dynamic balance, and destroying the Cerrado weakens that balance.

The solutions to the problems threatening the Cerrado are multifaceted and require both individual and collective action. First, we need to raise awareness and educate people—after all, we do not value or protect what we do not know. Next, we must promote conscious consumption—seeking to know the origin of the products we consume, choosing to buy from local producers, and supporting the work of producers and manufacturers committed to environmental sustainability. Electing political representatives who understand the importance of keeping the Cerrado alive and who respect the traditional peoples who have lived there for hundreds of years is another individual action in defense of the Cerrado.

Collectively, the existence of public policies aimed at the socio-environmental sustainability of the Cerrado and the enforcement of regulations on economic activities carried out in the biome are essential to halting its devastation and reducing conflicts. Of all the global hotspots, the Cerrado has the smallest percentage of fully protected areas. Only 8.21 percent of the biome's territory is legally protected by conservation units (MMA 2021). It is also worth noting that 67 percent of the remaining native vegetation lies within private property. Therefore, the responsibility of the private sector in conserving the most biodiverse savanna in the world is crucial. With this in mind, the demarcation of traditional peoples' lands and the creation of conservation units are essential for preserving this biome.

Cultivating an appreciation of the Cerrado also involves learning about and recognizing its wealth and wisdom. In a context of climate change and resource scarcity, we have much to learn from the resilience and resistance of the Cerrado and its peoples. Protecting the Cerrado is not only important for the future—the losses are already being felt now, and the time to act is also now.

Fruit of the gueroba (*Syagrus oleracea*), a palm tree typical of the Cerrado.

INTERVIEWS

GISELDA DURIGAN

DIANA AGUIAR

MARIA AUXILIADORA (DODORA) DRUMOND

GISELDA DURIGAN

Forest engineer with a PhD in Plant Biology. Completed a postdoctoral fellowship at the Royal Botanic Garden in Edinburgh, Scotland. Research scientist at the Instituto de Pesquisas Ambientais do Estado de São Paulo and professor in the graduate programs in Forest Science at the Universidade Estadual Paulista (UNESP) and in Ecology at the Universidade Estadual de Campinas (UNICAMP). Member of the editorial boards of the journals *Restoration Ecology* and *Applied Vegetation Science*. Conducts research in the Cerrado and Atlantic Forest regions, focusing primarily on plant ecology and its applications in the conservation and restoration of ecosystems.

Interview conducted on August 5, 2022,
and moderated by Sílvia Almeida.

Inhotim: What sparked your interest in studying the Cerrado biome? How did your journey with the Cerrado begin?

Giselda Durigan: I was born in Maracaí (São Paulo), an Atlantic Forest region, with fertile, clayey soils, excellent for agriculture. I had a rural childhood where the Cerrado didn't exist, but the forest fragments on the farm were my playground. When I was nine years old, my parents decided to move us to Assis (São Paulo) so the children could continue their studies, which we had started in a rural school. I remember an adventure from that time when an uncle invited us to pick gabiroba, a fruit from the Cerrado. Picking gabiroba was a tradition in that region, on the edge of the Cerrado in southern Brazil, and that was my first contact with the biome. Of course, I loved the gabiroba! But I was puzzled by the sandy soil that didn't dirty our shoes and the sunny landscape of the Cerrado, with its dry aspect, sparse and small, tortuous trees. Everything was so different from the forests of my childhood. For me, it was another universe. I had inherited from my farmer father the image of the Cerrado as bad land, unsuitable for agriculture. But I valued those tasty little fruits that didn't exist in the forests. The years went by, and I witnessed the arrival of scientific and technological development—and with it, deforestation. Back then, in the 1960s, the Amazon and the Atlantic Forest were beginning to be protected as they were seen globally as places we could no longer afford to deforest, and the 1965 Forest Code already set limits. Because of this, driven by advances in agricultural research, deforestation moved into the Cerrado, which was reduced by half in the following fifty years, having lost more than one million square kilometers in the country becoming known as the "breadbasket of the world." In my region, for example, the gabiroba fields no longer exist, replaced by soy or sugarcane.

My love of nature and familiarity with rural production led me to choose Forest Engineering as my profession. At the conclusion of my master's degree, I passed a public service exam and joined Instituto Florestal, a government research institution in São Paulo. Since 1984,

I have been working at the Assis unit—back in the Cerrado, which I barely knew. I can't say, however, that it was love at first sight with the Cerrado, but rather one of those chances that life throws your way, steering you down unexpected paths. The love grew little by little.

My scientific interest at the time was in ecology and ecosystem conservation in general. And suddenly, I found myself in the Cerrado and began working there. Naturally, the first step to take was to learn about the native species. I soon realized that no one was able to identify the plants of the Cerrado in the field, except for a few fruit-bearing species like gabiroba and cajuzinho, or plants used for medicinal purposes such as carobinha, catuaba, and barbatimão. This lack of knowledge, therefore, was the trigger for my entire involvement with the Cerrado of Assis, which over the years has expanded to other regions of Brazil and, more recently, to all the savannas of the world, through interaction with specialists from different continents.

IN: What were the steps along your journey studying the Cerrado from that starting point?

GD: I started by photographing the plants I didn't know. I would bring the photographs to every event, technical meeting, and course, hoping to find other researchers who could help me identify the species. It remained difficult. That's when I decided to pursue my PhD at Unicamp, under the guidance of Professor Hermógenes Leitão Filho, who helped me greatly in developing my plant identification skills. I learned how to use taxonomy books, visit a herbarium, how to search for what I was looking for, and how to understand the differences between plants. This learning happened step by step, at a time when there were no books with plant photographs and no Internet with its fantastic and accessible databases and images.

The importance of this kind of material became very clear to me, and I began producing them so that other people could identify plants more easily.[2] Even back then, I began feeling pressure from the demand for ecosystem restoration, which required scientific backing. My first restoration experiments were set up in the late 1980s, both in the Atlantic Forest and the Cerrado. Forest restoration was progressing successfully in Brazil since it was already known how to produce seedlings and with which techniques to plant them. But the Cerrado, once again, was a mystery: no one could obtain seeds, no one could make them germinate. Seeds would germinate in the nursery, but when the first rainy season came, the seedlings would die in the waterlogged beds because Cerrado plants prefer well-drained soils. And even when we managed to produce the seedlings, how could we ensure they would survive and grow once planted?

In savannas, the ground layer of vegetation is even more important than the trees.

Growth is usually so slow that a seedling may take ten years failing to break through the fifty-centimeter-thick brachiaria grass layer, which is the biggest obstacle to restoring the Cerrado. The difficulties and lack of knowledge about the Cerrado were so great that, over my career, I gradually moved away from forest restoration—which today, fortunately, has an army of specialists in Brazil, respected worldwide. And it was in search of a globally respected expert on the Cerrado that, at the turn of the millennium, I decided to spend a year in Scotland, interacting with the legendary Jimmy Ratter. Together, we published an article[3] in 2006, demonstrating the widespread densification of the Cerrado, which became a benchmark for similar studies in other savannas around the world. After dedicating himself to the Cerrado for several decades, traveling from north to south of Brazil, there is a consensus that Jimmy Ratter knew the Cerrado more deeply than any of us Brazilians. Knowledge, it should be noted, that he was always willing to share.

After twenty years of research into Cerrado restoration, I learned that vegetation often regenerates naturally and that it's also possible to plant trees and shrubs from a good number of species. However, the result observed was far from replicating the natural vegetation of the Cerrado, which is a savanna. In savannas, the ground layer of vegetation is even more important than the trees. Grasses, for example, are fundamental to the functioning of the ecosystem because they fuel the fire, which is essential to maintaining the open physiognomies of the Cerrado and stimulating plant reproduction.

So, since 2010, I also began looking down at the ground, bringing along my students with their master's and doctoral research. We spent

2 Some of the books produced: G. Durigan, *Plantas do Cerrado Paulista: Imagens de uma paisagem ameaçada* (Plants of the São Paulo Cerrado: Images of a Threatened Landscape) (Páginas & Letras Editora e Gráfica, 2004). / V. S. Ramos et al., *Árvores da Floresta Estacional Semidecidual: Guia de identificação de espécies* (Trees of the Semideciduous Seasonal Forest: A Species Identification Guide) (Edusp, 2008). / G. Durigan, *Espécies Indicadoras de Fitofisionomias na Transição Cerrado-Mata Atlântica no Estado de São Paulo* (Indicator Species of Phytophysiognomies in the Cerrado–Atlantic Forest Transition in the State of São Paulo) (Government of the State of São Paulo, Secretariat for the Environment, Coordination of Biodiversity and Natural Resources, 2012). / G. Durigan et al. *Plantas Pequenas do Cerrado: Biodiversidade negligenciada* (Small Plants of the Cerrado: Neglected Biodiversity) (Government of the State of São Paulo, Secretariat for the Environment, Instituto Florestal, 2018).

3 G. Durigan and J. A. Ratter, "Successional Changes in Cerrado and Cerrado/Forest Ecotonal Vegetation in Western São Paulo State, Brazil, 1962–2000," *Edinburgh Journal of Botany* 63, no. 1 (2006): 119–130.

several years focused on biological invasions and conducting experiments in search of a solution to the problem. First, it was necessary to eradicate the *Pinus* trees,[4] which invade wet grasslands, and the African grasses, which invade grasslands and savannas on dry soils.[5] Then, it was necessary to learn how to restore the native vegetation that had been devastated by the invaders.[6]

To understand the environmental impact of biological invasions, it was necessary to understand what was being lost. And then, a new taxonomic challenge became clear to us: identifying the small plants, because they are the ones expelled by the invaders, suffering dramatic biodiversity losses with countless cases of local extinction. However, while tree identification guides were multiplying, herbs, subshrubs, and grasses remained unknown. Unconsciously, people place great value on trees, but they don't even realize that small plants exist. Today, I know that we value and are capable of fighting for the things we know, but not for those we ignore. This realization gradually led me from the forest to the savanna, from the savanna to the grassland, and from trees to small plants—always trying to expand and disseminate the knowledge of what was less understood, in pursuit of balance.

IN: You've been studying ways to restore degraded areas of the Cerrado and argue that we must consider the ecosystem as a whole to achieve effective restoration. How can we encourage a broad view of ecosystems, even among laypeople?

GD: If we want to understand the conservation and restoration of the Cerrado, we must first forget what we've learned about forest restoration. First and foremost, it's essential to grasp a basic lesson: the typical Cerrado is a savanna and, as such, it needs to have a ground layer predominantly formed by grasses, with more or less scattered trees and shrubs. We need to train our eyes to see the Cerrado landscape as if through the eyes of a giant anteater, for example. The anteater doesn't like to spend its day in the darkness of the *Cerradão* (Cerrado woodland forest), nor does it like being completely exposed all the time. Like the anteater, emblematic animals of the Cerrado—such as the maned wolf, the rhea, or the giant armadillo—enjoy the mosaic but especially need the open areas, which are disappearing. Therefore, Cerrado restoration must recreate a diverse landscape where a giant anteater would feel happy.

There are plants that are exclusive to open areas on dry soils, others that are exclusive to *Veredas* (Cerrado palm swamps), and some that prefer the Cerradão. Just as with animals, plant diversity also depends on the mosaic. That's why the goal, both for conservation and restoration of the Cerrado, should be to maintain this patchwork. It is not desirable for everything to become grassland, nor for everything to become Cerradão. Where there are genuine soil constraints (very shallow, rocky soils with prolonged water deficit), only small plants will manage to survive, and a grassland will form. But there will be room for trees in other, more favorable areas. Therefore, every effort from those who conserve and those who restore must aim to preserve a bit of everything, each in its rightful place. We need to preserve closed habitats and open grasslands, and everything that exists between these two extremes. We cannot neglect extremely fragile and important elements within this mosaic, such as the Cerrado's wetland areas (Veredas, Campos de Murundus, etc.), which are very poorly understood and are being irresponsibly destroyed.

Cerrado restoration must recreate a diverse landscape where a giant anteater would feel happy.

IN: Is there misinformation circulating about the Cerrado? What misconceptions would you like to clarify?

GD: There are several misconceptions in the ecology and restoration of the Cerrado, and they tend to reinforce each other. In ecology, one of the most common mistakes is to treat natural grasslands, where trees are rare or absent, as degraded areas that need to be reforested. In the same vein is the mistaken belief—held even by licensing agencies—that every riverbank must have riparian forest. Based on these misconceptions, vast areas of grasslands and Veredas have been mapped as "environmental liabilities." This automatically leads to one of the most common restoration mistakes—namely, replicating, in the Cerrado, the

4 For more information, see: G. Durigan et al., *Invasão por* Pinus *spp: Ecologia, prevenção, controle e restauração*. (Invasion by *Pinus* spp.: Ecology, Prevention, Control and Restoration) (Instituto Florestal, São Paulo, 2020).

5 The experiment to control the brachiaria invasion was published in the article: G. B. Assis et al., "Effectiveness and Costs of Invasive Species Control Using Different Techniques to Restore Cerrado Grasslands, *Restoration Ecology* 29 (2021). e13219.

6 The results of restoration experiments in dry and wet Cerrado grasslands were published in: N. A. Pilon et al., "Native Remnants Can Be Sources of Plants and Topsoil to Restore Dry and Wet Cerrado Grasslands," *Restoration Ecology* 27, no. 3 (2019): 569–580.

techniques used to restore forests,[7] with initiatives that can have catastrophic outcomes. An example of this has been the disastrous planting of trees in intact Veredas in the Chapada dos Veadeiros (featured in a *New York Times* article published on July 13, 2022), under the pretense of "restoration." To restore savanna, it is necessary, before anything else, to restore the ground layer that covers the land, made up of small plants and native grasses. And to ensure the long-term maintenance of this ground cover.

Still within the context of restoration, initiatives that begin with soil preparation through plowing and harrowing the land often cause serious concern. The first mistake here is that this operation destroys any remnants of native plants that could potentially regrow. Additionally, this soil disturbance severely harms the edaphic fauna, microorganisms, and soil aggregation—which are poorly understood by those working in restoration in Brazil. If you closely examine a block of soil that hasn't been plowed and harrowed, you can see countless small channels created by earthworms, ants, and other creatures too tiny to see. Other channels are formed by fine roots, especially from grasses, which grow deep, die, and renew continuously. These channels are fundamental for rainwater absorption and soil aeration—thus essential for groundwater recharge, and plant germination and growth. On the other hand, soil that has been disturbed by plowing and harrowing loses its structure, its water infiltration capacity, and the animals and microorganisms that ensure ecosystem health. If rainwater cannot infiltrate, erosion processes intensify. Soil disturbance also accelerates the loss of carbon stored in the soil. Without microorganisms, the nutrition of many plants is compromised. With rare exceptions (where the soil is truly compacted), disturbing soil in the Cerrado will always have negative consequences. Restoration plantings in this biome—whether by seeds or seedlings—should be done without soil disturbance.

Another widespread misconception is the belief that Cerrado trees increase river water levels and rainfall. It is impossible for both things to happen simultaneously in the same place. Rainwater can only have two destinations: it either infiltrates and recharges water bodies or it returns to the atmosphere through evapotranspiration. If the amount of water extracted from the soil by trees increases, groundwater recharge will necessarily decrease, and vice versa. In short, the more trees there are, the lower the river flow will be. Of the rainfall that falls on Cerradão, for example, 25 percent to 30 percent never even reaches the ground.[8]

This portion of the rainfall is retained by the tree canopies and evaporates back into the atmosphere (a process known as *interception)*. Of the 70-75 percent of rain that reaches the ground and infiltrates, most is extracted by the trees, which feed the "flying rivers" (airborne moisture transport). If instead of Cerradão, there's a eucalyptus plantation, water extraction from the soil will be even higher. The consequence is that groundwater tables will drop, and springs may even dry up. Therefore, if a grassland area becomes denser and turns into Cerradão, or if we plant trees at high density in an area that was naturally grassland, there will indeed be an increase in the volume of water vapor released into the atmosphere. However, the water table will also drop, with springs drying up and severely compromising water yield in that watershed.[9] By converting these changes into ecosystem services, there will be a global benefit in returning water to the atmosphere, but water yield to meet local demands—such as irrigation, watering livestock that depend on that stream, artesian wells that supply towns, and even hydroelectric power plants that depend on river flow—will be compromised.

The current obsession with carbon sequestration through tree planting worldwide needs to be reexamined in regions where forests didn't originally exist.

When trees are planted and biomass increases where vegetation was not forest, water yield in regions with seasonal climates is threatened. According to a 2005 global study,[10] on average, streamflow is reduced by 52 percent, and 13 percent of streams dry up completely in the dry season when open grasslands are replaced by tree plantations.

The current obsession with carbon sequestration through tree planting worldwide needs to be reexamined in regions where forests didn't originally exist, given the risk of this occurring at the expense of water supply. Furthermore, it's worth noting that, despite the lower aboveground biomass, soils in the Cerrado generally store more carbon than

7 We have been fighting to raise awareness about this mistake, which is also occurring in other savannas around the world. See scientific articles: J. W. Veldman et al., "Tyranny of Trees in Grassy Biomes, *Science* 347, no. 6221 (2015): 484–485. / J. W. Veldman et al., "Where Tree Planting and Forest Expansion Are Bad for Biodiversity and Ecosystem Services," *BioScience* 65, no. 10 (2015): 1011–1018.

8 To quantify these processes, we measured all rainfall over sixteen months, across a physiognomic gradient in the Cerrado. See: E. A. Honda and G. Durigan, "Woody Encroachment and Its Consequences on Hydrological Processes in the Savannah," *Philosophical Transactions of the Royal Society B: Biological Sciences* 371, no. 1703. 20150313.

9 We seek to explain all of this in the article: E. A. Honda and G. Durigan, "A Restauração de Ecossistemas e a Produção de Água (Ecosystem Restoration and Water Production)," *Hoehnea* 44 (2017): 315–327.

10 See: R. B. Jackson et al., "Trading Water for Carbon with Biological Carbon Sequestration," *Science* 310, no. 5756 (2005): 1944–1947.

forest soils, particularly in the vast carbon stock of organic soils and peatlands in wetland areas.

IN: Perhaps because it is so different from the green, humid tropical forest image, the Cerrado is often overlooked, seen as an ugly, lifeless environment unworthy of protection. What are the threats to the preservation of the Cerrado?

GD: The biggest threat to the Cerrado is the expansion of agriculture, livestock farming, and silviculture. It's eucalyptus advancing in Mato Grosso do Sul and the MATOPIBA region (Maranhão, Tocantins, Piauí, and Bahia); soy and corn expanding, especially in the country's central-west region; sugarcane in São Paulo in recent decades; and the replacement of the magnificent natural Cerrado pastures that existed until the mid-20th century with Brachiaria pastures. These are the direct threats posed by the conversion of natural areas, and the Brazilian savanna is by far the one that has lost the most area compared to other savannas worldwide.

However, conversion leads to other forms of degradation that are not detected when losses are quantified by satellite, especially biological invasions. More than half of the remaining Cerrado fragments are already being invaded by African grasses. Gradually, these species replace the native ground layer, leading to significant biodiversity losses. On a smaller spatial scale, but with even greater severity, *Pinus* species are invading wetland areas. The invasive trees form a very dense canopy, and a thick layer of needles covers the soil. This carpet and the lack of light kill off native plants and prevent the germination of new ones.

The Cerrado is the only major savanna region on the planet with perennial rivers, making agriculture possible, which relies on irrigation. But unplanned land use and inadequate practices after conversion can kill the goose that lays the golden egg. Few people realize that the Cerrado has abundant water year-round thanks to its wetlands, which are fundamental to the water security of the entire country! The Cerrado's wetlands act like sponges, retaining rainwater during the rainy season and slowly releasing it over the several months of drought, thus ensuring the perennial springs of the Cerrado.

Wetland areas are highly resilient and resistant, provided their natural hydrological pulses remain unaltered! These ecosystems are maintained by water table fluctuations, which even make it difficult for invasive plants to take hold. However, drainage for cultivation, excessive water abstraction for irrigation, or eucalyptus silviculture across extensive portions of a watershed are examples of impacts that can radically alter hydrological pulses, potentially "killing" the wetland areas, which cover large portions of the territory within the Cerrado biome.[11]

IN: It's counterintuitive to think that fire can be beneficial to plants, yet that is what happens with some Cerrado species. How do species cope with fire?

GD: Fire existed on the planet millions of years before humans did. So, fire is not a human artifact. Humans changed the fire regime, increasing or decreasing its frequency, but fire already existed. The plants we see today evolved over millions of years, with genotypes and species that couldn't survive fire being periodically eliminated. Adaptation happens generation by generation. When the first fire came, it destroyed all the plants that couldn't withstand it. Those that survived and reproduced left descendants, most of which were resistant to fire. Subsequent burns repeated this selection process over millions of years. Therefore, the plants currently found in the Cerrado, endemic to this biome, don't die from fire. In most cases, Cerrado plants possess robust subterranean structures that ensure their ability to resprout numerous times after burning. Many species flower abundantly and disperse seeds quickly, increasing their chances of germinating and establishing themselves in the fire-cleared ground.[12] Likewise, endemic Cerrado animals have also been selected to protect themselves or escape from fire. But people generally find it very hard to believe that fire can be good and necessary. The media doesn't help at all when it reports that "fire destroyed thousands of hectares of Cerrado...."

In most cases, Cerrado plants possess robust subterranean structures that ensure their ability to resprout numerous times after burning.

When we set up our controlled burn experiment, I was troubled by doubts about the fire's effect. There were already enough studies showing benefits for the plants. However, I feared the death of animals. So, I invited experts in birds, ants, frogs, snakes, lizards, and mammals

11 Concerned about the situation and future of the Cerrado wetlands, we recently published an article aimed at clarifying their importance, functioning, and threats: G. Durigan, et al., "Cerrado Wetlands: Multiple ecosystems deserving legal protection as a unique and irreplaceable treasure," *Perspectives in Ecology and Conservation* (2022).

12 Over the course of a year following our experimental fires, we monitored plants in the burned areas to understand their post-fire response strategies: N. A. Pilon et al., "The Diversity of Post-Fire Regeneration Strategies in the Cerrado Ground Layer," *Journal of Ecology* 109, no. 1 (2021): 154–166.

to join the team.[13] These experts reassured me, saying that, just like the plants, the fauna of the Cerrado had also adapted to survive fire over millions of years of evolution. In fact, during the fires, I saw proof of this: lizards entering armadillo burrows, snakes and mammals fleeing to unburned areas, and even a tiny mouse that appeared to be suicidal by running toward the fire line. But what it actually did was cross the fire line unharmed and hide under the ashes on the other side, as if it had always known that the fire would no longer burn there. Animals have a wisdom for dealing with fire that's in their DNA. Only those that are not adapted will perish, those that have lost this ability for some reason, and need to be eliminated so that the capacity for survival persists within the species. This is natural selection; this is how species evolve, this is how it happens for both fauna and flora.

IN: You advocate for the use of fire in conservation units to maintain the biodiversity of the Cerrado. Is there such a thing as a bad fire?

GD: There is certainly such a thing as a bad fire. Any fire that burns what shouldn't be burned, or that burns at an inappropriate time, is detrimental. In various conservation units in Brazil, integrated fire management is practiced primarily to prevent so-called catastrophic fires. What is a catastrophic fire? A fire is considered catastrophic when it occurs under extreme conditions of high temperature, low relative humidity, and strong winds, spreading rapidly and with high intensity over large areas without control. I would consider a fire catastrophic when even under normal weather conditions, it affects an entire conservation unit. If there's only monoculture surrounding that area, the wildlife in that conservation unit will be left without shelter and food for a very long time. In that case, the fire will be fatal for the wildlife, even if after two months the vegetation becomes a vast garden. Equally bad is fire that reaches a Vereda after a prolonged drought and can burn peat for months, emitting carbon and leaving behind a trail of sterilized land.

Any fire that burns what shouldn't be burned, or that burns at an inappropriate time, is detrimental.

However, some claim that fire is always bad simply because it reduces tree biomass. This is a mistaken perception, the result of a biased view that ignores the diversity and ecological importance of small plants. For every tree species in the Cerrado, there are six species of non-tree plants.[14] And these non-tree plants, for the most part, cannot survive in shaded areas. So, removing fire from the Cerrado condemns all these species to extinction, along with, naturally, the wildlife associated with open environments.

Controlled burns in protected areas are generally conducted to avert a "bad fire." But I also advocate fire management as a means to preserve the open physiognomies of the Cerrado and, with them, most of its endemic plant and animal species. In my view, therefore, fire is always good when it occurs naturally or when managed wisely, resulting in the preservation of the Cerrado's mosaic of physiognomies.

For a long time, it was believed that the Cerrado grasslands would never turn into Cerradão because the soil's nutritional constraints would not allow it. However, this myth has been repeatedly debunked, with scientific evidence showing that grasslands can become Cerradão in roughly thirty years. In many regions of São Paulo, Mato Grosso do Sul, Mato Grosso, Goiás, and Maranhão, fire suppression tends to cause the disappearance of the Cerrado's open physiognomies in most of the remnants. Why does this happen? Tropical savannas worldwide are ecosystems maintained by disturbance—something that many people still fail to understand. Disturbances—fire and large herbivores—are natural. Some still believe that biomass is limited solely by soil and climate in all ecosystems on the planet. In fact, there's a potential biomass determined by soil and climate which, in savannas of Africa, Australia, India, or Brazil, is greater than the existing biomass. Studies using modeling, based on a hypothetical situation of a world without fire, show that almost all these savannas would become forests.[15] But then there would be no savannas on the planet, nor elephants, giraffes, rhinos, zebras, or the iconic Cerrado animals like the giant anteater, the maned wolf, etc. Therefore, disturbance is an ecological necessity. Fire is part of the processes that maintain the ecosystem. Fire is a factor in maintaining biodiversity in the tropical savannas of the planet. For the biodiversity of the Cerrado and other savannas worldwide, there is already scientific evidence showing that total fire suppression causes more losses than fires themselves.

13 In this study, we demonstrate that fire does not decrease plant and animal diversity and may even increase diversity for some groups. See: G. Durigan et al., "No Net Loss of Species Diversity after Prescribed Fires in the Brazilian Savanna," *Frontiers in Forests and Global Change* 3, no. 13 (2020).

14 See: R.C. Mendonça et al., "Flora Vascular do Cerrado: *Checklist* com 12.356 espécies" [Vascular Flora of the Cerrado: Checklist with 12,356 species], in S.M. Almeida, S.P. Sano, and J.F. Ribeiro, eds., *Cerrado: Ecologia e Flora* (Cerrado: Ecology and Flora) (Embrapa Informação Tecnológica, 2008), 422–442.

15 W. J. Bond, F. I. Woodward, and G. F. Midgley, "The Global Distribution of Ecosystems in a World Without Fire," *New Phytologist* 165, no. 2 (2005): 525–538.

IN: The Cerrado is the biome with the fewest designated protected areas. Is this still a way to preserve the Cerrado?

GD: I believe that having more protected areas effectively designated as conservation units is one of the ways to save the Cerrado. But this would require immediate action while there's still time to select the best areas to optimize conservation. An efficient network of protected areas would need to be representative of different biogeographic regions and, in the case of the Cerrado, would also need to ensure the representation of its physiognomies in the different regions. However, it is important to highlight that in Brazil, conservation on public lands has suffered due to a lack of resources to properly manage these areas to achieve their objectives. In other words, merely creating conservation units is not enough. Additional measures are necessary to encourage and enable conservation on private lands. Areas where intact Cerrado vegetation still exists, without invasive grasses, should be untouched.

Areas where intact Cerrado vegetation still exists, without invasive grasses, should be untouched.

IN: The losses seem irreversible. Is it still possible to preserve the Cerrado?

GD: The losses seem irreversible, indeed. The conversion of Cerrado vegetation to intensive land use requires the eradication of all remnants of pre-existing native plants and involves profound changes in soil properties. After years of using these practices, it is almost impossible to restore anything resembling what once existed. By applying the restoration techniques currently available, we can at best remediate the situation in degraded areas, restoring part of the biodiversity and ecosystem services of the Cerrado.

It's also not possible to reverse the transformation of an area that was once grassland but, due to long-term fire suppression, became Cerradão. Our fire experiment has already shown that, unfortunately, this is a path of no return. Even if burned, the Cerradão won't revert to savanna; it will function instead as a burned forest, overgrown with vines and bamboo, and remaining in a degraded state, very different from the Cerrado.

Cerrado species did not evolve to be able to quickly colonize an open area. They are not like forest species, which can quickly colonize an adjacent abandoned agricultural or pasture area that in a very short time reverts to forest. In the Amazon, there are many such areas where simply removing the cattle and leaving the land fallow for about ten years is enough for a forest to form. Cerrado plants evolved and adapted over millions of years to survive: after fire, logging, herbivory, or frost, they resprout and seem to strengthen with each disturbance episode. However, if they are shaded, they gradually lose the ability to resprout, they stop flowering and fruiting, and they exhaust their underground reserves until they disappear.

Preserving all of the remaining Cerrado is, in theory, possible. However, it is highly unlikely, especially because much of the remnant areas can still be legally deforested, as they exceed the minimum required for each property. A new law would be needed, similar to the one that protects all remnant areas of the Atlantic Forest, to begin with. And it would also be necessary to strengthen the enforcement system for illegal conversion to such an extent that it would, in fact, curb degradation. Perhaps market laws themselves could be more effective mechanisms if importing countries were to refuse to accept products from the Cerrado unless deforestation is brought under control.

IN: So, is maintaining diversity the approach to protecting the Cerrado?

GD: That's it! From the standpoint of both plant and animal diversity and the variety of ecosystem services—especially those related to water—maintaining the Cerrado's diverse physiognomies is essential. Ideally, we should preserve a little bit of everything. And, of course, we should not interfere with what nature has taken millions of years to build.

IN: After nearly thirty years researching the Cerrado, does anything about this biome still surprise you?

GD: Always, always! I'm now starting a major project focused exclusively on natural grasslands. It's a five-year thematic project, funded by *Fundação de Amparo à Pesquisa do Estado de São Paulo* (São Paulo Research Foundation; FAPESP), with over thirty researchers involved. We're studying *Campos de Altitude* (high-altitude grasslands) enclaved within the Atlantic Forest and Cerrado grasslands, in both drylands and wetlands, across several states. We decided to explore the biodiversity of these grasslands and to deepen our understanding of the factors that explain their existence and attributes: why do they still exist where everything around them has already become forest? Why are they so different from one another in species composition? We're exploring factors related to soil, climate, and fire history in search of answers. We need to understand the extremes that can lead species to extinction, the

factors that promote greater diversity, and we may even speculate about the future of these grasslands under different climate change scenarios. We have found grasslands across such a wide range of environmental conditions that it is difficult to grasp how they can be so structurally similar. But even though from a distance everything looks like grassland, up close we realize that the plants that make up these grasslands are very different from place to place. The number of species we've recorded in a single location is huge! I find it fascinating getting to know new ecosystems and am intrigued by the challenge of unraveling why they are the way they are.

IN: *Ser do Cerrado* is the name of the project Inhotim is carrying out together with the Public Prosecutor's Office of Minas Gerais. We want to bring the Cerrado closer, to show that it is a fundamental part of Brazilians' lives. For you, what does it mean *Ser do Cerrado*?

GD: *Ser do Cerrado* means returning to the origins of humanity. The human animal emerged on this planet in savanna landscapes. All of human evolution—from walking upright, to developing hunting and gathering habits, and mastering the use of fire—all of this could only have happened in a savanna setting. In the Cerrado, you won't hold a clump of grass the way you would hug a large tree. On the other hand, you embrace the entire landscape. The pleasure that the human animal feels when standing in the vastness of a grassland, of a savanna, is an ancestral thing which brings peace of mind, security, and well-being. So, *Ser do Cerrado* means finding our place, and that means being part of the ecosystem. When you are overcome by this awareness, it becomes easier to love, value, and fight for the Cerrado. If we want to save the Cerrado that still stands, the way is to awaken in people the affection, the desire to protect it. But for that, the first step is getting to know it!

The pleasure that the human animal feels when standing in the vastness of a grassland, of a savanna, is an ancestral thing which brings peace of mind, security, and well-being.

The small yellow flowers of *Butia capitata* are borne in clusters and have a fruity aroma.

DIANA AGUIAR

Associate professor at the Instituto de Humanidades, Artes e Ciências Professor Milton Santos at the Universidade Federal da Bahia (UFBA), where she is a tenured faculty member of the Graduate Program in International Relations (PPGRI). She holds a PhD in Urban and Regional Planning (UFRJ) and a master's degree in international relations (PUC-Rio). Served for nearly fifteen years as an advisor and researcher for various social organizations, such as the Campanha Nacional em Defesa do Cerrado, the Comissão Pastoral da Terra, the Federação de Órgãos para Assistência Social e Educacional, and the Transnational Institute. She is a researcher with the Rede Interinstitucional Climatizando, which was awarded support from the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) Universal program. She is a member of the Collective of Agrarian Scholar-Activists from the South (CASAS) and a member of the review board for the international *Journal of Peasant Studies*.

Interview conducted on August 10, 2022,
and moderated by Sílvia Almeida and Lorena Vicini.

Inhotim: Looking at your background, we see that you have explored various fields of knowledge, across different cities and countries. How did your story with the Cerrado begin?

Diana Aguiar: My background is in International Relations. I'm from the city of Salvador, and I arrived at the Cerrado in the most unusual way. In 2015, I was working at a social organization called *Federação de Órgãos para Assistência Social e Educacional* (Federation of Organizations for Social and Educational Assistance; FASE). Before I joined, FASE was already working in coordination with social organizations in Mozambique, an African country that was confronting the arrival of a cooperation program between Mozambique, Brazil, and Japan called PROSAVANA, which had the objective of so-called "developing the African savanna." PROSAVANA intended to replicate the development model of the Brazilian Cerrado, the way it was done by another program, *Programa de Cooperação Nipo-Brasileiro para o Desenvolvimento Agrícola dos Cerrados* (Japan-Brazil Cooperation Program for the Agricultural Development of the Cerrados; PRODECER), which was created in 1979 with the goal of promoting the occupation of the Cerrado through export crops, especially soy. PRODECER operated during part of the Brazilian Military Dictatorship and became one of the foundations of the predatory occupation of the Cerrado, as we have been witnessing in recent decades. Before I joined FASE, some representatives of the Mozambican peasant movement had already reached out to the organization, expressing deep concern about PROSAVANA, because they knew the Brazilian Cerrado was a place of massive monoculture occupation. They wanted to understand what this could mean for northern Mozambique, which is precisely a savanna region and was even seen as a pilot program that could be replicated across African savannas in general. So, when I came on board, I inherited this cooperation between Brazilian and Mozambican organizations, which involved various peasant organizations from La Via Campesina in Brazil, other social organizations, as well as political advocacy and cooperation with

Itamaraty (Brazil's Ministry of Foreign Affairs), JICA (Japan International Cooperation Agency), and the Mozambican government. So, there were people from Japan, Mozambique, and Brazil working together to confront the threat PROSAVANA posed to Mozambican smallholder family farmers. PROSAVANA was canceled in 2020 for a number of reasons, but during this process, in January 2016, we organized a meeting at FASE to discuss the next steps of this campaign, which was coordinated between the three countries. It was then that the *Comissão Pastoral da Terra* (Pastoral Land Commission; CPT) presented to us the idea of creating a campaign in defense of the Cerrado. They were already active in the biome and wanted to expand that work beyond CPT and bring allies into this campaign, which was officially launched later in 2016. Through the campaign, we were contacted by some organizations from Colombia, because there was a strong intention from the Colombian government to replicate the "miracle of the Brazilian Cerrado," and they wanted to understand what the Cerrado is, how this historical process of occupation unfolded, and how they could face the threats that were emerging.

The geological formation of the Cerrado, its very own geohistory, shows that where the Amazon now stands, it was once Cerrado. Approximately twelve thousand years ago, the Amazon began to grow over what used to be the Cerrado, eventually reaching its current contours. Because of this, there are islands of Cerrado within the Amazon and throughout the border region between Colombia and Venezuela. There is also Cerrado in Bolivia, across the border from Mato Grosso. So, in 2019, we organized an ecological exchange with Indigenous peoples, family farmers, and Quilombolas from Mato Grosso, and we visited the Cerrado of Bolivia, known there as *Bosque Seco Chiquitano* (Chiquitano Dry Forest). Bolivians also came to Brazil to understand what was happening to the Cerrado here. And the Brazilians in the caravan looked at the Bosque Seco Chiquitano and said, "This is the Cerrado of my childhood, the one I saw being destroyed," because Mato Grosso is one of the oldest frontiers of agribusiness expansion in the Brazilian Cerrado. Many of the older people looking at the Cerrado on the Bolivian side said, "It used to look like this on our side; we saw this disappear in Mato Grosso." So, from the very beginning I participated in the process of building the National Campaign in Defense of the Cerrado, and what began gradually evolved into a deep love for the Cerrado. Since then, the Cerrado has been at the center of my research agenda and my work as an activist.

Approximately twelve thousand years ago, the Amazon began to grow over what used to be the Cerrado.

IN: So, your love for the Cerrado ended up being a passion for the people, for their ways of life?

DA: That's right! And through the process of coordinating with the savannas of other countries and among communities from various parts of the Cerrado, something I gradually realized was how much of a shared history exists. For example, the babassu coconut breakers—one of the most typical traditional communities of the Cerrado, well known throughout the Cerrado-Amazon transition zone in Maranhão and Tocantins, and also present in southeastern Pará and Piauí—actually also exist in Mato Grosso and in the Bosque Seco Chiquitano, in Bolivia. So, by promoting these exchanges, the coconut breakers from Mato Grosso met the ones from Bolivia, who often didn't even know the others existed and had very similar practices of coconut breaking and generating products and income from babassu. And in this way, I began to see this vast Cerrado, connected by a common history, because how else can we explain that there are Indigenous people in Bolivia who break coconuts and use them in such a similar way as people in São Luís, Maranhão—despite the fact that these people have never met? This is part of a sociocultural history, inherited over many generations, of which these women and their practices are living witnesses.

I began to see this vast Cerrado, connected by a common history.

IN: The Cerrado is often overlooked, often seen as an ugly, lifeless area, but it's quite the opposite. In addition to hosting enormous biodiversity of fauna and flora, the Cerrado is home to many people. Who are the peoples of the Cerrado, and how do they relate to the biome?

DA: This contemptuous view of the Cerrado is a political, social, and cultural construct. It also has to do with a certain understanding that nature is something to be conquered by humans, and that, for example, deforestation for large-scale production would be equivalent to the hegemonic idea of development. This is also connected to the long-held understanding that the Amazon should be occupied to be developed. But in the case of the Amazon, there has been a significant shift in this understanding. I think the way people look at the Amazon is very focused on the lushness of the forest, whereas when it comes to the Cerrado, people often talk, for instance, about the twisted trees. The Amazon began gaining prominence in global environmental thought—which shifted in the 1970s with the first major UN conferences and the first reports addressing

environmental devastation—and it became a major focal point of global environmental concern. This has had significant repercussions in Brazil, as a split in perspectives started to emerge: on the one hand, the Amazon as something to be preserved, and on the other hand, this whole idea about the Cerrado as an empty space and backward peoples ripe for development, even as part of a strategy to hold back the expansion of the agricultural frontier into the Amazon. But this had been building long before. For example, the move to establish Brasília in the Central Plateau and the major highways built to connect the federal capital with the Amazonian capitals were, above all, deeply rooted in this logic that Central Brazil needed to be occupied. So historically, the Cerrado was viewed as a place without ecological or cultural importance, therefore something that could be devastated. This idea began taking shape through occupation and colonization projects and programs, and investment in research to develop soybean varieties adapted to these latitudes, with the creation of Embrapa in 1973 playing a central role in this. Meanwhile, the peoples who have lived in the region for so many generations were increasingly being expelled, pushed out, and surrounded.

In the Cerrado there is an enormous diversity of peoples, which has to do with the biological diversity of this ecological region. These peoples have co-constituted the Cerrado over many generations. As a collaborator with the National Campaign in Defense of the Cerrado, I have been working with other researchers to recover an understanding of the geohistorical formation of the Cerrado: when the last retreat of the Würm glaciation occurred, around thirteen thousand years ago, the planet's climate became warmer and more humid, which favored the expansion of forests. The forest took over the entire savanna area that existed where the Amazon is today, and the Cerrado spread a little further into areas where it hadn't been before. While this process was taking place, there was already human occupation here. It's worth remembering that the oldest human fossil found in Brazil—Luzia, from the Cerrado in northern Minas Gerais—dates to approximately thirteen thousand years ago. In other words, the Cerrado, in its current delimitation, has been constituted through interaction with human presence. And as Professor Carlos Walter Porto-Gonçalves—a leading scholar of the Cerrado with whom I have collaborated in recent years—reminds us, no people, community, or social group inhabits a place without learning, without producing knowledge. One cannot live in a place without learning how to feed oneself: hence agriculture, hunting, fishing, gathering. One cannot live in a place without learning how to shelter oneself: hence architecture. This knowledge is developed through coexistence with the environment and has to do with this co-constitution of the Cerrado with its peoples.

According to the survey conducted by the National Campaign in Defense of the Cerrado, based on data from *Fundação Nacional dos Povos Indígenas* (National Foundation for Indigenous Peoples; FUNAI) and *Conselho Indigenista Missionário* (Indigenist Missionary Council; CIMI), there are 117 Indigenous peoples in the Cerrado and its transition zones, living in 338 Indigenous Territories, of which about 60 percent are currently regularized by FUNAI. The next census by *Instituto Brasileiro de Geografia e Estatística* (Brazilian Institute of Geography and Statistics; IBGE) will include Quilombola communities for the first time, but current data from the institute and from *Coordenação Nacional de Articulação de Quilombos* (National Coordination of Black Rural Quilombola Communities; CONAQ), compiled by the Campaign, point to around 1,500 Quilombola communities in the Cerrado and its transition zones. About half of them have self-recognition certificates issued by *Fundação Cultural Palmares* (Palmares Cultural Foundation), but less than 5 percent have titled land from *Instituto Nacional de Colonização e Reforma Agrária* (National Institute for Colonization and Agrarian Reform; INCRA) or state land agencies. In addition to these, numerous other traditional communities remain largely invisible in public records, even though their existence and importance are recognized by various regulatory instruments. These traditional Cerrado communities often self-designate based on the landscape elements they interact with most intensely, which are also most important to their productive and cultural practices. For example, the communities of Babassu Coconut Breakers; the Sempre-viva Flower Gatherers; the Raizeiras; the Retireiros and Retireiras of the Araguaia, who move away from the Araguaia lowlands when the plains are flooded by the river's rise; the fundo and fecho de pasto communities; the Geraizeiros, who live and produce between the Gerais and valleys; the *Ribeirinhos* (riverine communities); the *Brejeiros* (wetland communities); the Vazanteiros; and the Veredeiros. Therefore, the places, landscapes, and elements of the Cerrado end up being the elements that these peoples use to name themselves because their lives are completely connected to this region. These Indigenous, Quilombola, and traditional peoples have a relationship with the Cerrado of co-constitution, care, love, multiplication of diversity, and a very deep identification—so much so that many of them name themselves after elements of the very place they inhabit.

These Indigenous, Quilombola, and traditional peoples have a relationship with the Cerrado of co-constitution, care, love, multiplication of diversity, and a very deep identification—so much so that many of them name themselves after elements of the very place they inhabit.

IN: There's a dichotomous and colonialist view that pits people against biodiversity, but this relationship can indeed be sustainable, fruitful, and harmonious. How do the peoples of the Cerrado help conserve the biome's biodiversity?

DA: These peoples make public and recognized use of the Cerrado, which goes far beyond merely helping to conserve it. The biological diversity of the Cerrado was built through the interaction of the peoples with the environment. Brazil has an archaeology that differs from the one that inhabits our imagination—of thinking and looking at large structures—but actually looks at where certain species are concentrated to understand that this is an area of ancient human occupation, because Indigenous peoples played the role of carrying seeds as they moved. Take the areas of the Amazon where the Brazil nut trees are concentrated, for example. The forest was literally built by the peoples. When we explain that the Amazon grew over an area that was once savanna and where human presence came to be established, we can see how this presence was important in the formation of various ecosystems—and still is. And the Cerrado is no different. Much of the biological diversity that exists there is the result of variety selection and ecosystem management. For example, the Cerrado has a very important characteristic in the relationship between its landscapes and fire. The fields of sempre-viva flowers have their regrowth strengthened by fire management based on traditional knowledge. In many areas of the Cerrado, fire management plays a fundamental role in containing wildfires by reducing the availability of organic matter that could fuel catastrophic fires. Traditional communities that work with free-range cattle, such as the fecho de pasto and Geraizeiros, also practice fire management to encourage pasture regrowth. All this knowledge has been developed over hundreds or even thousands of years through testing, innovation, and adaptation; it is a knowledge that is continually inherited, adapted, and built upon. These peoples not only conserve biodiversity, but they also literally multiply it through the choices they make. They also provide a destination for the human, social, and cultural use of this biodiversity. It's a multiplication that has been finding destinations for this biodiversity—not just as something set apart, but as something used, managed, conserved, multiplied, and destined, something that is part of the culture of those who live in the Cerrado. The very consumption of pequi nuts in so many parts of the Cerrado—a staple for families—was a discovery made by the people who live among the pequi tree. There wasn't a scientist who said that pequi could be consumed.

Much of the biological diversity that exists there is the result of variety selection and ecosystem management.

IN: If we talk about medicinal plants, there are so many, many species... It's incredibly ignorant to think that just because the Cerrado doesn't have the lush trees of the forest, it doesn't have richness and potential. We're destroying the Cerrado without knowing the Cerrado, and in doing so, we may be destroying the cures for diseases and species that humanity needs.

DA: That reminds me of a group of traditional communities—the Raizeiras of the Cerrado—where women play an impressive leading role. They have the Pacari Network, which brings together Raizeiras from various states of the Cerrado. Once again, this is a segment of traditional communities whose self-designation is connected to roots, fruits, and medicinal plants, and who do beautiful work with the popular pharmacopoeia they themselves have built, documenting a variety of species and uses of these traditional medicines. These Raizeiras suffer both from the destruction of vegetation—which leads to the scarcity of species—and from the criminalization of these traditional medicines and medicinal practices. There is, therefore, a major struggle for the recognition of the work of the Raizeiras, midwives, and traditional healers. Another threat they face is appropriation through intellectual property—the private appropriation of biodiversity. In other words, that remnant vegetation that is being sustained by the presence of these peoples is gradually being privatized through the patenting of active ingredients that these peoples discovered and continue to apply. In fact, science often steals knowledge that already exists and has been practiced by Indigenous peoples.

The movement of *Seringueiros* (rubber tree tappers) played a very important historical role in making it clear that the ways of life of these peoples is all about sustaining the forest.

IN: The peoples, diversity, and environmental sustainability go hand in hand—they are deeply intertwined. But sometimes the activities carried out by traditional peoples are criminalized. How do you see the relationship between legal institutions and the peoples of the Cerrado?

DA: While there is a view of nature as an object of conquest for development, there is also another view that sees nature as untouched—a kind of "biocracy"—that treats as enemies of the environment the very peoples who, in fact, built that diversity. Brazil is possibly the country in the world that has done the most to demystify this idea, this "myth of untouched nature," as analyzed by Brazilian anthropologist Antônio Carlos Diegues. For example, the movement of *Seringueiros* (rubber tree tappers) led by

Chico Mendes, played a very important historical role in making it clear that the ways of life of these peoples is all about sustaining the forest and that, therefore, strengthening their territoriality is a way of conserving the forest. Brazil's socio-environmental movement and its traditional peoples and communities have achieved, for instance, conservation and sustainable use policies guided by the idea that coexistence is possible. But unfortunately, to this day, there are Full Protection Conservation Units (which do not allow human presence) that were demarcated over areas of traditional occupation. This is the case of the Parque Nacional das Sempre-Vivas in the Serra do Espinhaço, Minas Gerais, which restricts access for the apanhadoras de flores (flower gatherers) to the fields they have historically managed; or the mosaic of conservation units demarcated over the Quilombola territories of Jalapão, in Tocantins. There is still a very significant challenge in the socio-environmental sphere, in the dialogue with Brazilian environmental policy, regarding how institutions such as the *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* (Brazilian Institute for the Environment and Renewable Natural Resources; IBAMA) should treat traditional peoples. It needs to be a dialogue of knowledge, one that requires humility and the recognition that the one who knows those places best is not the biologist who may have just graduated or has only been working in that region for a few years, and who is mistaken when undervaluing the knowledge historically developed by those who were born and raised there, and learned from their grandparents. In fact, there needs to be a more horizontal exchange of knowledge, one that fosters collective learning and respects all that these peoples have to offer for environmental conservation.

In fact, there needs to be a more horizontal exchange of knowledge, one that fosters collective learning and respects all that these peoples have to offer for environmental conservation.

IN: What are the threats that traditional peoples of the Cerrado are currently facing? And what are their claims?

DA: Over the past three years, we've mapped conflicts and issues in the Cerrado drawing from the Permanent Peoples' Tribunal's (PPT) proceedings. The PPT is a tribunal of opinion; it is not an official court and does not have legal binding power, but it has existed for over forty years, originating from an initial tribunal led by philosopher Bertrand Russell to judge US war crimes in Vietnam and later the crimes of Pinochet's dictatorship in Chile. The Permanent Peoples' Tribunal is based in Rome and, over these four decades, has held numerous sessions on different topics around the world. In 2019, we submitted a petition to hold a specific session on the Cerrado. Then the pandemic hit, and the process had to be postponed, but we continued working virtually until we finally managed to hold the final in-person hearing in July 2022, focusing on the Land and Territory dimension. Prior to that, throughout 2021, we held some thematic hearings on Water and on Food Sovereignty and Sociobiodiversity. These hearings systematized the main threats through around fifteen cases that, in our view, represent a broader reality in the Cerrado—not only because they took place in the eight states with the largest Cerrado coverage, but also because they involve a diversity of peoples and a variety of types of problems faced.

In the Water dimension, the main threats are agriculture irrigated by center pivots or through dams and irrigation canals, and deforestation over groundwater recharge areas, which has led to the death or historical reduction in flow of several rivers. Cerrado vegetation has very deep roots, sometimes much deeper than the tree's visible part above ground. These roots play a fundamental hydrological role by capturing rainwater and infiltrating it into water tables and aquifers. It's no coincidence that two of Brazil's main aquifers—the Guarani and the Urucuia-Bambuí—are located in the Cerrado. The Cerrado, this great cradle of waters, concentrates 75 percent of Brazil's center pivots for irrigated agriculture. Therefore, the issue of reduced flow and death of the rivers is one of the key threats, frequently denounced by the communities. The contamination of some rivers by tailings due to major mining disasters, especially in Minas Gerais, is also a concern, as is the contamination of waters by pesticides. The incidence of poisoning and illness caused by pesticides is very high.

In the Food Sovereignty and Sociobiodiversity dimension, pesticide contamination was a major focus. There were numerous reports of illness, including extremely high cancer incidence that hadn't existed previously, cases of miscarriage, and breast milk contamination. Aerial pesticide spraying is also a very serious issue because it can occur on a neighboring farm, but spray drift carries it through the air, causing agrobiodiversity erosion. Communities report losing varieties in both their traditional gathering areas and their own gardens, where plants fail to thrive due to aerial spraying, which often directly impacts their territory. Pesticide contamination also reaches them via waterways. All of this, combined with deforestation, leads to the loss of these agro-extractive fields and affects traditional farming areas. The dismantling of food and nutritional security policies is another problem. Programs such as *Programa de Aquisição de Alimentos* (Food Acquisition Program) promoted public procurement and supported the production of smallholder family farmers. This was also identified as a very serious problem, with the lack of market access

for small producers, the dismantling of farmers' markets and agrarian reform policies—at a time when hunger and food insecurity are widespread problems in Brazil. There is also the issue of the privatization of biodiversity, which has been widely denounced by the Raizeiras and the Babassu Coconut Breakers, who are rendered invisible and treated as mere suppliers of raw materials for industries like cosmetics, for example, which gives them no recognition.

The final dimension we addressed, and perhaps the foundation of all others, was Land and Territory. The central threats here are the lack of systematic land titling for traditional territories and the undermining of agrarian reform settlement policies. This involves, on the one hand, the failure to establish new settlements and, on the other, the process of individual titling within existing settlements, which opens the door for settlers to be harassed into selling their land. In the case of the lack of systematic land titling for traditional territories, we conducted a survey and found that less than 5 percent of the Quilombola territories in the Cerrado are titled. This leaves communities in a situation of land tenure insecurity in the face of *grileiros* (land grabbers) and *pistoleiros* (hired guns). For other traditional communities, the available data is even scarcer, but the situation is even worse. This means that these communities are highly vulnerable to harassment by grileiros, sometimes defending their territory with their own bodies, placing themselves in front of the *correntão* (a big chain attached to two tractors) used by these land grabbers to deforest and occupy traditional territories that aren't yet titled. We have several maps showing that the areas where the Cerrado remains standing are precisely the areas with traditional occupation. Therefore, titling territories is the main way to curb deforestation, besides being a matter of these peoples' rights.

The areas where the Cerrado remains standing are precisely the areas with traditional occupation.

IN: How can public policies impact the Cerrado?

DA: There's no way to combat deforestation without addressing land titling and the fight against land grabbing. During the PPT process, we developed an agenda of proposals that can be turned into bills and implemented through public policies. We need, for example, to increase controls on pesticide use and ban aerial spraying. There must be stricter limits—pesticides should not be used near schools, beekeeping areas, or other territories. The limits must be very clear, and they must be broadened. It's also necessary to curb genetically modified organisms, which contaminate native seed crops. Another key point to address the main claims of the Cerrado communities is to resume and strengthen agrarian reform policies and public procurement of their production. These would be some of the policies to support family farming production. Furthermore, it is fundamental to advance the titling of all claimed traditional territories, investigate and expropriate grileiros, and especially protect the groundwater recharge areas from the rampant deforestation that's killing the rivers of the Cerrado.

IN: Protecting the Cerrado also means protecting the traditional peoples who inhabit it. How can we help keep the Cerrado alive?

DA: I believe it's a combination of major demands and small, daily practices. The first step is to get to know the Cerrado—not just physically visit but truly get to know it. This Inhotim project plays a fundamental role in this because it has the potential to break through the bubble and reach many people. I think we're more likely to defend a place when we're enchanted by it, and the Cerrado is there to enchant anyone who is open to learning about it. People need to feel that defending the Cerrado makes sense and then mobilize.

When it comes to small-scale actions, people need to pay attention to whether the candidates they're voting for support the Cerrado and demand that these candidates promote bills to protect the Cerrado. In daily life, this means buying from farmers' markets, buying from family and smallholder farmers, buying the products these communities make, and prioritizing Cerrado products—especially those living in the region, but not exclusively. Use Cerrado oils. For example, those who live in the areas of coconut breakers, use babassu oil. Learn how to use babassu; its flour is used to make cakes, cookies, porridge, and other delicious recipes. Try Cerrado cuisine. I believe this type of engagement will evolve our defense of the Cerrado from daily practices to a broader perspective.

We're more likely to defend a place when we're enchanted by it, and the Cerrado is there to enchant anyone who is open to learning about it. People need to feel that defending the Cerrado makes sense and then mobilize.

Above all, we also need to understand that while we, as citizens, can certainly take important actions in our daily lives, we also have to confront a national project that currently positions the country as an exporter of commodities, primarily serving industries such as the meat industry (given that much of what we produce in the Cerrado is animal feed for China and Europe). Brazil dedicates an area equivalent to the size of Italy to soy monoculture for export. When we consider this, we have to ask: Is this the national

project we want as citizens? We need to examine other economies and other existing sociocultural practices and reflect on the type of economy we want to promote.

All of this is part of developing a political vocabulary and a perspective on the Cerrado that understands its central role in this dispute: 75 percent of the soy cultivated in Brazil is grown in the Cerrado. I refer to soy because 90 percent of the area planted with grains in this country is for soy and corn. Let's say that soy is the benchmark commodity for this project of devastation, which involves genetically modified organisms and their technological packages, intensive pesticide use, deforestation, the expansion of land grabbing, and all those threats we mentioned earlier which are linked to the expansion of a monoculture-based system across the Cerrado.

This project led the Permanent Peoples' Tribunal to try the Brazilian state, condemning it for the crime of ecocide and genocide of its peoples, understanding that this devastation, which has been occurring for about fifty years and has already destroyed more than half of the native vegetation is, at the same time, the destruction of the material basis of these peoples' ways of life. When we understand genocide not only as physical extermination but also as systematic attacks on the cultural identity of a group—and knowing that these peoples are recognized by the Brazilian Constitution, International Labour Convention 169, and Decree No. 6040 of 2008 as culturally distinct peoples—we understand that the destruction of the conditions for their sociocultural reproduction is a process of genocide. The Permanent Peoples' Tribunal concluded that an ongoing process of ecocide and genocide is taking place in the Cerrado, with the Brazilian state as the primary party found guilty, along with other national and international actors, both private and public, who shared responsibility.

In the sense of loving, caring for, and defending, to be of the Cerrado is, above all, what we can say about the human and nonhuman beings who constitute and keep this region alive, beautiful, and rich in its biological and cultural diversity—a heritage for all of us.

IN: *Ser do Cerrado* is the name of the project that Inhotim is carrying out together with the Public Prosecutor's Office of Minas Gerais. We want to bring the Cerrado closer, to show that it is a fundamental part of the lives of Brazilians. For you, what does *Ser do Cerrado* mean?

DA: The Cerrado is at the center of both my research agenda and my activism. So, in that sense of commitment and dedication, for me, *Ser do Cerrado* means loving, caring for, and defending the Cerrado and its peoples. In that sense, I consider myself more from the Cerrado than many people who were born there, who have always lived there, but who look at the Cerrado with the desire to accumulate wealth for themselves while destroying the wealth that belongs to all of us.

In the sense of loving, caring for, and defending, *Ser do Cerrado* is, above all, what we can say about the human and nonhuman beings who constitute and keep this region alive, beautiful, and rich in its biological and cultural diversity—a heritage for all of us.

MARIA AUXILIADORA (DODORA) DRUMOND

Biologist specializing in the planning of protected areas; holds a master's and a PhD in Ecology, Conservation, and Wildlife Management; professor in the Department of Genetics, Ecology, and Evolution at the Universidade Federal de Minas Gerais (UFMG); and coordinator of the Socioecological Systems Laboratory at UFMG. She has experience and works with the planning and management of protected areas, socioecological systems, emancipatory environmental education, adaptive and participatory management of natural resources, and formal and nonformal education in Ecology and other fields related to nature conservation. Since 2004, she has been developing a research and outreach project in Paraopeba, Minas Gerais, where several environmental education and sustainable management initiatives have been carried out in partnership with the Pontinha Quilombola community, giving rise to the Minhocuçu and Pequi projects.

Interview conducted on August 19, 2022,
and moderated by Sílvia Almeida and Lorena Vicini.

Inhotim: The Cerrado is the predominant biome in Minas Gerais, but conventional wisdom associates the Cerrado of Minas Gerais with specific regions, such as the coffee-growing region in the west of the state or the sertão (vast semiarid region) depicted in Guimarães Rosa's literature in the north. Is there Cerrado in central Minas Gerais?

Dodora Drumond: The central region of Minas Gerais still has Cerrado, but it's a biome that could be transformed at any time by agribusiness endeavors. There's a lot of pastureland in this region, but there's still a Cerrado that needs to be valued and is very important for the communities that live there, especially small rural landowners and Quilombolas. So, I believe we need to value the Cerrado, and, to that end, we have to join forces.

IN: How did your work with the minhocuçu and the communities in the Cerrado region of central Minas Gerais begin?

DD: I'm a biologist, but I've always been really interested in the interplay of people and the environment. In 2001, IBAMA invited me to do some participatory work in the Paraopeba region, and that's when I learned about the socio-environmental conflict involving the invasion of rural properties due to the collection of the giant earthworm minhocuçu (*Rhinodrilus alatus*). The minhocuçu occurs in both Cerrado areas and in pastures and eucalyptus plantations that were once Cerrado—it can survive in these areas. That's where the conflict came from due to the invasion of private properties, pastures, and eucalyptus plantations by minhoqueiros (traditional earthworm collectors for fishing bait), and even land disputes with the Quilombola community of Pontinha.

In 2004, the Public Prosecutor's Office of Minas Gerais called a public hearing to analyze these conflicts. The hearing was attended by people from the rural producers' union, staff from IBAMA, minhocuçu

traders and collectors, the Military Police (because things there were tense), and me, with my dissertation project. I argued that we needed to study this socio-environmental conflict before making any decisions. And the prosecutor, a nice guy, said that my doctoral project would be included in the civil inquiry that had been opened because of the land invasion complaint filed by the rural producers' union. So, my project became part of this civil inquiry, and I began developing the study, addressing both the social and environmental aspects.

IN: What exactly were the conflicts?

DD: The conflict centered around the invasion of private property without the landowner's knowledge or consent, involving the use of fire and the extraction of the species during its breeding season. And the conflict was ugly. There are reports of landowners dragging minhoqueiros behind their cars. There's a history of confiscation of the small hoes they use to extract the earthworms and the bicycles they rode to enter the properties. The use of fire was also a constant issue, as minhoqueiros would set fires to help locate the last castings of the minhocuçu before reaching the "pot" where the earthworm stays during the entire dry season.

I believe we need to value the Cerrado, and, to that end, we have to join forces.

And here I need to talk a bit about the habits of the minhocuçu: they have an adaptive strategy of sheltering in estivation chambers that range from ten centimeters to over half a meter below the soil surface. The minhoqueiros capture the minhocuçu when it is in this chamber, which they call the "pot." And to extract the minhocuçu from there, the minhoqueiros dig and disturb the soil quite a bit. Another problem was the capture of the minhocuçu during its breeding season, which occurs during the rainy season, usually from November to March depending on the year. The minhocuçu emerges from its chamber, finds a mate, they mate, and lay eggs.

IN: How important is the earthworm to the ecosystem? And what ecological and social functions does it perform?

DD: Of course, the minhocuçu has its ecological role, related to nutrient cycling and soil aeration. However, we also need to consider the fundamental role it plays in people's lives. Some people rely exclusively on collecting these earthworms for their livelihood, like the Quilombola community of Pontinha, where minhocuçu collection is the primary means of subsistence. Minhocuçu collection has been occurring since 1930 or 1935—that's almost a century of extraction. A century of use without significant indicators of the species' depletion, so there was something there we needed to understand. First, who relies on this creature for their livelihood? Who are these people? What kind of impact does this extraction really have on the environment?

I knew nothing about earthworms, and there was no literature on this species; it was very difficult to study this animal. We couldn't capture them ourselves. The only ones who know how to capture minhocuçu and understand their habits and biology very well are the minhoqueiros, who have been living from this activity for almost one hundred years.

IN: Is it very difficult to capture minhocuçu?

DD: It is absurdly difficult. The process requires a lot of skill. Before entering the "pot," the minhocuçu empties its intestines, that is, it leaves its final castings on the soil surface, which are different from the castings it produces when feeding. Minhoqueiros call these castings "*amarelinho*" (yellowish) because they're smoother than other castings. They find this "amarelinho" and start digging with a short-handled hoe, and it can't be just any hoe because the Cerrado soil is very hard during the dry season. So, they make a special hoe using a tractor plow. They build this hoe because a normal one would break on the first swing.

Minhocuçu collection has been occurring since 1930 or 1935—that's almost a century of extraction.

Then, they find the burrow, and there's a whole trick to it: they blow into the burrow, and if the sound is hollow, the creature isn't in the "pot," but if the sound is muffled, then there's an earthworm inside. They take a flexible branch and insert it into the burrow until they reach the "pot." If the branch comes out wet, the minhocuçu is there; if it doesn't come out wet, there's no minhocuçu, and there's no point in digging further.

IN: What led the minhocuçu to be considered a vulnerable species?

DD: First, it's important to explain that the IUCN (International Union for Conservation of Nature) classifies species from "extinct" to "least concern." Within the "threatened" species, there are three levels of classification: "critically endangered," "endangered," or "vulnerable." The IUCN conducts a global assessment of species for which information is available. Expert

groups linked to the IUCN contribute to the *Red List of Threatened Species*, but the minhocuçu had not been assessed by the IUCN.

When I started the project in 2004, the minhocuçu was on Brazil's national list of threatened species as well as the state of Minas Gerais's list of threatened species. Even though there wasn't much information, it was considered a threatened species because it was known to be widely used as bait for amateur fishing, and because its distribution was believed to be restricted to only two municipalities: Sete Lagoas and Paraopeba. But there wasn't much information to support this classification.

I arrived there in 2004, and all the minhoqueiros ran away from me. It took two years of building trust with them before I started to get any information at all. And I only got that kind of information because I accompanied them. In the first meeting with them, we created the first spoken map, and they indicated that instead of two municipalities—Sete Lagoas and Paraopeba—there were actually seventeen municipalities where the minhocuçu was found.

IN: So that's what sparked your interest to review the conservation status of the minhocuçu?

DD: Based on the information I gathered from the minhoqueiros, I began to think that something didn't align with the IUCN criteria for considering that species as threatened. So, we went to the seventeen municipalities they had indicated on the spoken map. The minhoqueiros collected minhocuçu in each of these municipalities, which we identified and sent to a specialist for species identification. They were indeed the same species, *Rhinodrilus alatus*. We conducted ecological studies and observed that the minhocuçu, like other earthworm species, also has a strong capacity for population recovery. For example, if you capture them in an area for one year and then leave that same area undisturbed the following year, the population will have already recovered, at least partially, by the third year.

Based on the data collected, in 2006 we started the process of reassessing the species' conservation status, realizing that it was not an endangered species according to the IUCN criteria, which are the same used in Brazil. In 2010, the species was removed from the state list, and in 2011 we conducted, together with ICMBio, a conservation status assessment of the species, which was published in the *Revista Biodiversidade Brasileira*. In 2014, the new list of Brazilian endangered species was published in the *Diário Oficial*, which did not include the minhocuçu *Rhinodrilus alatus*.

IN: Was this an important step towards decriminalizing the centuries-old activity of collecting minhocuçu?

DD: Yes, legally it would not have been possible to manage the species before that. You can't manage a species considered endangered in the wild. Unfortunately, the process isn't over. The management regulations are still pending. What happened was that in 2015, there was a disagreement over which agency would be responsible for this regulation: IBAMA claimed it was the *Instituto Estadual de Florestas* (State Forestry Institute; IEF) and IEF believed it was IBAMA. In 2017, the Federal Public Prosecutor's Office called IBAMA, IEF, and other stakeholders for a meeting, and IBAMA then assumed responsibility for managing the species. However, a new opinion was negative regarding the possibility of management in the wild. Thus, the whole story took a few steps back, and in 2020, we received a positive opinion from IBAMA, and we—the team from the Laboratory of Ecological Systems at UFMG and IBAMA professionals—drafted a Normative Instruction, which is currently under evaluation by IBAMA in Brasília.

I conducted a diagnostic study and found that approximately three thousand people in the region made a living from minhocuçu extraction, which is no small number. The activity is fundamental for the livelihood of families.

IN: While the process of reviewing the conservation status of the minhocuçu was underway, you were developing research and outreach projects in Paraopeba. Tell us a bit about the Minhocuçu and Pequi projects. What motivated you to carry them out?

DD: At the beginning of my doctorate, I conducted a diagnostic study and found that approximately three thousand people in the region made a living from minhocuçu extraction, which is no small number. The activity is fundamental for the livelihood of families, especially for the Quilombola community of Pontinha, in Paraopeba, and another community in São José da Lagoa, in the municipality of Curvelo. And there were all those conflicts we've already talked about.

I held over thirty meetings during my doctorate. First, I met only with the minhoqueiros, then with institutions (Public Prosecutor's Office, Police, Environmental Secretariat, IEF, IBAMA) and then with rural landowners. After two years, in 2006, we organized a participatory management workshop with eighty-three people representing all parties involved.

At this workshop, we set up a display board, a "clothesline of ideas." Every idea that emerged from the different groups were put on the display. And things came up like "the minhoqueiro uses fire to collect the minhocuçu," and the minhoqueiros, in turn, put on the display, "the rancher sets the fire and says it's the minhoqueiro." So, it was necessary to mediate this and other discussions. Finally, we reached an agreement on several points, such as not collecting minhocuçu during their breeding season and stopping the use of fire during extraction.

We made a gentlemen's agreement, which they began to follow as if it were law. So much so that if you look at what's happening in the region now, you'll see that the conflicts have greatly diminished.

When we decided at that meeting not to capture minhocuçu during the species' breeding season, the minhoqueiros asked: "And what are we going to live on?" That's when we realized we needed to start something alternative with these communities for the agreement to work. So, we started working with the Quilombola community of Pontinha, where people heavily depend on minhocuçu collection. We used another participatory technique, a "seasonal calendar." We observed the minhocuçu's breeding season and asked: "What do you think we should do to compensate for this period of nonuse?" We talked at length, and they said that since the minhocuçu's breeding season coincides with the pequi's fruiting season, why not start a project to utilize the fruit during this period? That's how the Pequi project began.

IN: How did the community respond to the guidelines for sustainable minhocuçu management?

DD: They follow the guidelines, especially because they were part of the development of all the proposals. We made a gentlemen's agreement, which they began to follow as if it were law. So much so that if you look at what's happening in the region now, you'll see that the conflicts have greatly diminished. I had a meeting at the Paraopeba City Hall in June 2022, and they said they've been monitoring the project for a long time, and the conflicts have practically ended.

IN: It's really interesting to notice the partnership that was created between academia and traditional peoples in these two projects. What did you learn from the Quilombola community of Pontinha?

DD: Not only from the Quilombola community of Pontinha but from all the minhocuçu extractivists and traders I came into contact with. I learned a lot about the species, its distribution, and annual life cycle by accompanying the extractivists' activities. And we really managed to build a partnership. To share the traditional knowledge of the communities with more people, we created a booklet titled *Minhocuçu: conservação e sustentabilidade* (Minhocuçu: Conservation and Sustainability), which recounts our entire learning process. That title, by the way, was suggested by a trader named Colé.

As for the Quilombola community of Pontinha, we published other booklets and videos about the community's knowledge of both the minhocuçu and the pequi species. In the dissertation of a former PhD student, Lorena Cristina Lana Pinto, there is a specific chapter on the traditional knowledge of people of this community, in which they discussed the uses of pequi, and the animals that visit the pequi trees. They explained that there are pequi fruits with different flavors: there's a bitter pequi, used more for soap making, and another one used to produce liqueur, sweets, flour, etc. Another really interesting thing was that one of the community's demands was to learn how to make pequi oil, which is highly valued in the market and in the cosmetics industry. We found out that in São José da Lagoa there was a woman who knew how to make the oil, Dona Nenzinha. She held a workshop for the Pontinha community, teaching them how to produce pequi oil, and we also made another booklet on the subject.

I learned a lot about the species, its distribution, and annual life cycle by accompanying the extractivists' activities. And we really managed to build a partnership.

Another very interesting piece of knowledge, part of a student's final project, Júlia de Matos Nogueira, came from an experiment she conducted on pequi germination. She designed this experiment using both bibliographical research on germination techniques and interviews with nursery workers from the Paraopeba National Forest, who had a lot of experience with pequi germination.

We also facilitated an exchange program, taking the Pontinha community to northern Minas Gerais. They had no prior experience with community organizing and went to see how a cooperative operated. We used the university's bus to visit other towns, where they visited cooperatives, exchanged knowledge, and came back highly motivated. They saw techniques for cutting pequi and processing the nuts. They've adapted these technologies and are now producing pequi nuts, using a guillotine device that was made by a member of the community. Today, we set up a factory, which consists of repurposed containers installed in the yard of Pontinha's municipal school. We recently installed a septic system

and are in the process of building a rainwater harvesting system and a photovoltaic energy system. The power generated will be used by both the factory and the school. Additionally, another booklet on sustainable technologies has been produced.

So, I learned a lot about the species, its distribution, and annual life cycle by accompanying the extractivists' activities. And we really managed to build a partnership. We didn't just learn from them—they also learned from us and from other people in the region and the state.

IN: *Ser do Cerrado* is the name of the project that Inhotim is carrying out together with the Public Prosecutor's Office of Minas Gerais. We want to bring the Cerrado closer, to show that it is a fundamental part of Brazilians' lives. For you, what does it mean to be of the Cerrado?

DD: For me, being of the Cerrado symbolizes strength and resilience. I often reflect on how the Cerrado sustains itself: it's like an upside-down forest because it has far more roots than canopy. The external part, above ground, is much smaller than the Cerrado's roots. To me, this is a symbol of determination, strength, and resilience. Being of the Cerrado means resistance, and we must resist, because the common perception of the Cerrado is an image of a crooked, inadequate, arid environment. In reality, it's none of that. The Cerrado is an environment that provides strength, not only for its immense biodiversity but also for the people who live in it and from it—like the Geraizeiros, Quilombolas, Vazanteiros, and so many other traditional communities. For me, being of the Cerrado is to be resistance.

The Cerrado is an environment that provides strength, not only for its immense biodiversity but also for the people who live in it and from it.

Coquinho-azedo (*Butia capitata*) is one of the Cerrado species widely used by traditional communities. Its fruits can be consumed fresh or in the form of juices, jellies, and ice cream.

THE CERRADO AT INHOTIM

The leaves and flowers of the gueroba (*Syagrus oleracea*) occur in clusters. From its fruit, the edible kernel is extracted and used in confections and other dishes.

THE CERRADO AT INHOTIM

Have you ever noticed that when we think of nature, the first image that often comes to mind is a dense forest filled with lush, green trees? While the Amazon Rainforest dominates the common image of Brazil, we need to recognize that Brazilian identity is shaped by a mosaic of landscapes. Grasses, shrubs, herbs, palms, flowers, and fruits of various shapes and colors are just as emblematic of our flora. These diverse environments host equally diverse fauna, people, and ways of life. Only by appreciating the beauty in this complex tapestry of forms, peoples, colors, and vegetation that make up the diversity of our country, can we truly value and defend our biomes.

There's so much beauty in nature, and landscaping offers a way to highlight it. By thoughtfully designing outdoor spaces, it enhances the enjoyment and appreciation people have for them, drawing the eye and stirring emotions. Through this aesthetic connection, landscaping opens the door to curiosity and prompts reflection.

Roberto Burle Marx (1909–1994) was one of the most important and influential landscape architects of the 20th century. His gardens—marked by contemplative spaces, large-scale plant groupings, and contrasting colors and textures—are part of the landscape of various Brazilian cities. Passionate about trees and other native plants, he chose to integrate them into gardens with sinuous forms, a hallmark of his landscaping work throughout his life.

Burle Marx enjoyed studying the relationships between species and their environments. Alongside professionals from various disciplines—including botanists, landscape architects, photographers, artists, and geographers—he organized interdisciplinary expeditions to observe plants in their natural habitats and learn more about Brazil's flora. His extensive botanical knowledge enabled him to design gardens that required less maintenance and develop world-renowned landscape projects.

Burle Marx is also an important influence on the landscaping at Instituto Inhotim, which blends native and exotic species from around the world in a captivating invitation to wonder and enchantment. But anyone

who thinks that strolling through the gardens of Inhotim is merely about admiring how lush they are would be mistaken. Situated in a transition zone between the Cerrado and the Atlantic Forest—two of the most biodiverse and simultaneously most threatened biomes on Earth—Inhotim is a fertile ground for scientific research and a tool for conservation and environmental education.

In 2010, Inhotim was officially recognized as a Botanical Garden by Brazil's National Commission of Botanical Gardens. And in 2021, it joined Botanic Gardens Conservation International (BGCI),[16] a network dedicated to conserving plant diversity worldwide. The gardens, which began construction in the 1980s, were designed by landscape architect and artist Pedro Nehring (1955–2023), one of the masterminds behind Inhotim's landscaping. Between 2000 and 2004, Luiz Carlos Orsini designed the landscaping of twenty-five hectares. Today, the Instituto is a national and international reference in contemporary tropical landscaping.

Inhotim spans over 140 hectares and is adjacent to a Private Natural Heritage Reserve of approximately 250 hectares. The Inhotim Botanical Garden manages the botanical collection, including themed living plant collections, featuring native and exotic species from around the world. It also conducts research and monitoring of the Instituto's natural heritage.

Recognizing its capability to raise awareness and educate people on environmental issues, Inhotim has launched a series of initiatives focused on the Cerrado. These efforts reflect a commitment to appreciating Brazil's second-largest biome, revealing its unique traits, and fostering a deeper connection of the public with the surrounding landscape and the knowledge it holds.

Since January 2022, this work has been supported by the *Ser do Cerrado* project, in partnership with the Public Prosecutor's Office of Minas Gerais, through Plataforma Semente. Guided by the principle that knowledge is essential for protection, the project seeks to bring the Cerrado closer to people—expanding access to information, encouraging thoughtful engagement, and helping to cultivate a society that is both sensitive to and actively committed to protecting this biome.

16 In March 2024, Inhotim became the first botanical garden in Brazil to receive the BGCI Accredited Garden certification, a distinction awarded to institutions that contribute to flora conservation and operate according to the highest international standards for botanical gardens.

Urucum or achiote (*Bixa orellana*) is one of the species featured in the *Jardim de Todos os Sentidos* (Garden of All Senses).

J3 *Jardim de Transição* (Transition Garden)

Shrubs and herbaceous plants native to the Cerrado make up part of the rupestrian landscape of the Jardim de Transição, one of the themed gardens along the Orange Axis for visitors at Inhotim.

THE PRESENCE OF THE CERRADO AT THE INHOTIM BOTANICAL GARDEN

Inhotim is situated in a transition zone between two biomes: the Atlantic Forest and the Cerrado. Consequently, Cerrado species have long been a part of the Instituto's gardens, whether occurring naturally or through landscaping interventions. With landscaping as the driving force behind the activities of the Botanical Garden, Inhotim encourages reflection on the environment by creating themed gardens.[17] In some of these gardens, the presence of Cerrado plants is prominent.

One example is the *Jardim de Transição* (Transition Garden), which celebrates the meeting point of the Atlantic Forest and the Cerrado. In this garden—designed by Pedro Nehring and Juliano Borin—visitors can observe the similarities and differences between these biomes, feeling on their skin the shifts in temperature and humidity, while observing the mosaic of native species from these extraordinarily biodiverse and threatened biomes.

17 Visitor circulation at Instituto Inhotim follows three different axes: Yellow, Orange, and Pink. The themed gardens are marked on the map with pictograms. In the following pages, these symbols will identify each garden mentioned, along with the axis on which it is located.

Another themed garden where the Cerrado is strongly present is *Jardim Veredas* (Veredas Garden). This space was created by landscape architect Pedro Nehring and honors the Veredas, an ecosystem that inspired the writings of Brazilian novelist Guimarães Rosa. Water is a prominent element in the landscaping of this garden, which features beautiful specimens of buritis (*Mauritia flexuosa*) and buritiranas (*Mauritiella armata*)—both species emblematic of that striking landscape of the Cerrado.

J5

Jardim Veredas (Veredas Garden)

Wetland plants make up the Jardim Veredas, one of the themed gardens along the Orange Axis for visitors at Inhotim.

The Cerrado is also a significant theme in the *Largo das Orquídeas* (Orchid Plaza), home to seventeen thousand *Cattleya walkeriana* plants. This orchid species, native to the biome and popularly known as the "Queen of the Cerrado," is classified as vulnerable. Keeping these orchids alive and thriving in this garden reinforces the importance of protecting, studying, and documenting Brazil's biodiversity. For this reason, the Queen of the Cerrado is both a source of awe and a subject of scientific research at Inhotim Botanical Laboratory.

J7

Largo das Orquídeas (Orchid Plaza)

The rainha-do-cerrado or Queen of the Cerrado (*Cattleya walkeriana)* is the star of the Largo das Orquídeas, one of the themed gardens along the Yellow Axis for visitors at Inhotim.

Another themed garden where the Cerrado is prominently featured is the *Jardim Sombra e Água Fresca* (Shade and Fresh Water Garden). This space is filled with fruit trees and shade trees, including native Cerrado species such as uvaia (*Eugenia pyriformis*), cerejeira-do-rio-grande or Rio Grande cherry (*Eugenia involucrata*), pitanga or Suriname cherry (*Eugenia uniflora*), and ingá (*Inga sessilis*). These fruits reflect how the biodiversity of the Cerrado is deeply woven into Brazilian culture and cuisine. Their natural flavors invite delight and discovery, offering visitors the chance to encounter fruits that are rarely found in conventional markets.

J8

Jardim Sombra e Água Fresca
(Shade and Fresh Water Garden)

Fruit-bearing species from the Cerrado are found in the Jardim Sombra e Água Fresca, one of the themed gardens along the Orange Axis for visitors at Inhotim.

Beyond the gardens accessible to the public, the Inhotim Botanical Garden also supports the conservation of the Inhotim Private Natural Heritage Reserve. This reserve spans approximately 250 hectares of natural vegetation, predominantly composed of Atlantic Forest formations, but also featuring savanna vegetation typical of the Cerrado, especially in its interfluvial zones.

Inhotim Private Natural Heritage Reserve is a conservation unit established under Brazil's National System of Nature Conservation Units. These reserves must prioritize biological conservation and may also be used for scientific research, tourism, and educational and recreational purposes.

In addition to preserving native flora and fauna, the Inhotim Private Natural Heritage Reserve serves as a site for botanical identification, seed collection, and research conducted by Inhotim Botanical Laboratory or authorized researchers. Some plant species preserved in the Inhotim Private Natural Heritage Reserve are noteworthy due to their restricted geographic distribution or because they are threatened with extinction. These include *Ditassa mucronata* (Apocynaceae), endemic to the rupestrian grasslands of the Campos Rupestres in the Atlantic Forest and Cerrado; *Barbacenia tomentosa* (Velloziaceae), which occurs on rocky outcrops in the states of Minas Gerais, Espírito Santo, and São Paulo; *Begonia alchemilloides* (Begoniaceae), which grows in rocky soils and crevices and is restricted to the states of Goiás and Minas Gerais; *Lippia corymbosa* and *Stachytarpheta glabra* (Verbenaceae), which occur only in the Serra do Espinhaço Mountain Range; and *Cinnamomum quadrangulum* (Lauraceae), endemic to the Iron Quadrangle region in Minas Gerais and considered vulnerable.

The Inhotim Private Natural Heritage Reserve features both Atlantic Forest and Cerrado vegetation.

View of the Inhotim Private Natural Heritage Reserve.

Although the Cerrado was already present in various forms at Inhotim, from the outset of the *Ser do Cerrado* project, there was a clear intention to introduce more Cerrado species into the gardens. This effort aimed not only to create new opportunities for visitors to connect with the biome but also to expand Inhotim's contribution to the conservation of the Cerrado and its biodiversity.

As a Botanical Garden—a space dedicated to the preservation, documentation, and monitoring of plant collections for research, education, and conservation—Inhotim began assembling a new collection focused on Cerrado species. This collection became the foundation for the project's broader initiatives, designed to raise awareness among visitors in a natural and spontaneous way, encouraging a more intuitive and autonomous experience.

THE HEART OF THE INHOTIM BOTANICAL GARDEN

The activities of the Inhotim Botanical Garden focus not only on plant conservation but also on environmental education and species propagation. The *Viveiro Educador* (Educational Nursery) is the heart of the Inhotim Botanical Garden. It is here that a range of hands-on activities take place, helping to keep Inhotim's gardens vibrant and accessible to a wide and diverse public.

This space includes four themed gardens open to visitors, as well as plant production areas—including greenhouses and shade houses—and the Botanical Laboratory, alongside other essential facilities for garden maintenance and the conservation of the botanical collections. As a hub where scientific research, species production and conservation, environmental education, and landscaping intersect, the Viveiro Educador was the primary site for the *Ser do Cerrado* project from 2021 to 2022.

A variety of activities were carried out at the Viveiro Educador, including a floristic survey and the heritage listing of the botanical collection found both in the areas open to public visitation and in the collections housed within the greenhouses. A Curatorial Plan was developed specifically for this project, guiding the acquisition of additional plant species to build a botanical collection representative of the Cerrado. Throughout 2022, the Viveiro Educador also served as the main venue for educational and outreach activities and underwent renovations that made the space more inclusive and accessible.

J1

Jardim de Todos os Sentidos (Garden of All Senses)

Upon arrival at the *Viveiro Educador* (Educational Nursery), visitors are greeted by the mandalas of the Jardim de Todos os Sentidos.

A young person browses through educational material distributed by the *Ser do* Cerrado project in 2022.

ENVIRONMENTAL EDUCATION TO LEARN ABOUT AND CONSERVE THE CERRADO

Vinícius Porfírio

Biologist, specialist in Environmental Auditing, Assessment, and Forensic Analysis, and holds a master's degree in Environmental Technology and Sustainability. He was a collaborator at Inhotim from 2011 to 2024.

Environmental Education, though defined in various ways, is broadly understood as the process through which individuals and communities develop social values, knowledge, skills, attitudes, and competencies aimed at environmental conservation (Brazilian Federal Law No. 9795). While scholars offer diverse interpretations and theoretical frameworks, one principle remains central: the need to understand the environment and its components to better interact with it.

In the past, the concept of *environment* was often restricted to flora, fauna, and water resources, frequently detached from the lived experiences of individuals. Today, however, there is a growing recognition of the importance of a holistic perspective on the environment—one that includes social factors as equally relevant (Dias 2004).

Environmental Education, therefore, seeks to connect with people's realities, helping them recognize the environment as something personal, immediate, and vital to their lives (Reigota 2002). This shift fosters a deeper sense of responsibility for biodiversity conservation, closely tied to quality of life.

Guided by this conceptual foundation, Environmental Education embraces a humanist, democratic, and participatory approach. Its core principles are the pluralism of ideas and pedagogical perspectives, the recognition and respect for individual and cultural diversity, and the strengthening of civic engagement.

As both a botanical garden and a contemporary art museum, Instituto Inhotim embraces nonformal education as a core part of its mission. Since 2006, it has developed and implemented a range of Environmental Education programs and initiatives. Given Inhotim's unique character—where art and nature converge in a shared space—its educational activities are grounded in a cross-disciplinary approach.

Group taking part in the mediated visit “Behind the Scenes at the Viveiro Educador” led by Inhotim’s Education team, with a focus on the Cerrado.

Drawing from the institution’s botanical and artistic collections, as well as regional memory, Inhotim’s Education Department seeks to build and share knowledge, promote human development, and foster critical thinking among participants in its programs.

Another focus of Inhotim’s Environmental Education work is the popularization of scientific knowledge and the dissemination of environmental information. The collections serve as both educational platforms and learning tools, offering opportunities for engagement across a wide spectrum of audiences. Children, adults, seniors, students, residents of Brumadinho and neighboring communities, as well as visitors from across Brazil and abroad, are all invited to reflect on themes central to community life. These activities emphasize dialogue and aim to cultivate environmental awareness, encouraging curiosity, care for natural resources, and actions that support biodiversity conservation.

Mediation is the primary methodological foundation of Inhotim’s Environmental Education programs. It serves as a bridge between different forms of knowledge, placing value on individual lived experiences and recognizing their importance in contextualized learning processes. This approach respects each person’s individuality while also engaging with the collective, the collections, and contemporary issues.

Through dialogic practice, educators facilitate experiences that are playful, engaging, and inter-, multi-, and transdisciplinary. A variety of pedagogical strategies are employed, including mediated visits, experiential learning with the botanical and artistic collections, artistic languages, discussion circles, interactive activities, research and the use of microscopy equipment, didactic models, and various media.

Given its capability for social transformation, Environmental Education plays a vital role in Cerrado conservation. It not only fosters a deeper understanding of the biome but also inspires a commitment to protect its natural and cultural heritage, and to care for the communities that inhabit it.

The pursuit of human development that honors all forms of life—as advocated by Environmental Education—fosters a sense of belonging to the environment. This leads to the recognition and strengthening of identities, a perception of community, and an appreciation for memory and cultural heritage, all of which culminate in a positive way of relating to nature.

Paradoxically, the very variety of phytophysiognomies that makes the Cerrado a unique biome also leads many to underestimate it. Its gnarled, sparsely distributed trees with thick bark, the maned wolf, and the giant armadillo—these may be the images that come to mind when people think of the Cerrado. But it’s so much more than that! In some areas,

the Cerrado appears differently, formed by vast expanses of low-lying vegetation, such as grasses and herbaceous plants.

Unfortunately, this leads some to undervalue the biome due to the absence of dense, humid forest formations. They forget that this vegetation holds significant ecological importance, providing habitat for diverse animal species and providing essential ecosystem services. This misunderstanding fuels aggressions against the biome, such as criminal wildfires, soil disturbance, and unsustainable agricultural and livestock exploitation, resulting in biodiversity loss. It is therefore the role of Environmental Education to raise awareness, inviting people to learn about and understand the biome so that, recognizing its importance, they adopt a new behavior that supports its conservation.

Another area where Environmental Education focuses its efforts in the context of the Cerrado is challenging the aesthetic paradigms applied to its flora. Again, intense green leafy trees with their globular crowns seem to be considered more beautiful compared to the trees of the Cerrado.

In this regard, Environmental Education aims to showcase alternative beauty standards and provide information that justifies and redefines their significance. For example, we can explain that the opaque leaf of a Cerrado tree results from a waxy coating, an evolutionary strategy for better adaptation to an environment with less water availability and intense solar radiation. Or we can disseminate the information that the thick bark of the trunk is a fire-resistant adaptation, serving as a protective layer for the sap-conducting vessels when fire passes through, thus ensuring the plant's survival.

As aesthetic paradigms evolve, environmental educators play a crucial role in revealing the harmful consequences of human-induced fires. Although the practice of burning is still considered routine by many, Environmental Education encourages new reflections and behaviors. Raising awareness about the need to combat hunting, illegal fishing, and the trafficking of wild animals and plants is also central to Environmental Education efforts focused on the preservation and conservation of the Cerrado.

Understanding the complex ecological relationships within the biome is essential. Environmental Education helps explain the interdependence of biotic and abiotic components, showing that disruptions to this web can lead to large-scale imbalances. These impacts may even affect human populations, contributing to the spread of disease vectors, scarcity of natural resources, and water shortages, among other problems.

To present the Cerrado in a way that highlights its strengths and dispels misconceptions, Environmental Education serves as a strategic tool. It emphasizes the Cerrado's role as the "cradle of waters," given its importance in water resource generation. It also communicates the biome's significance in food and energy production, while illustrating the anthropogenic pressures that threaten its ecosystems. Recognizing the cultural heritage of the Cerrado, Environmental Education initiatives also seek to honor traditional communities and value traditional knowledge.

As part of the *Ser do Cerrado* project, a series of Environmental Education actions were carried out, including: educational visits focused on the Cerrado and its unique ecological traits; ongoing environmental training for youth from Brumadinho, with an emphasis on the biome; accessibility improvements to enhance engagement with Inhotim's botanical collection; educational workshops on Cerrado-related themes; discussions with internal and external audiences; pedagogical review; and the display of ethnobotanical content for new communication materials at the *Viveiro Educador* (Educational Nursery).

Other notable Environmental Education initiatives included the organization of events, such as Environment Week and Cerrado Week, which provided opportunities for environmental discussions and reflections through specific programming designed for Inhotim's staff and visitors.

By encouraging a comprehensive understanding of the Cerrado, the Environmental Education activities developed through the project helped foster new ways of perceiving the biome. In turn, this strengthened the call for conservation actions, both at the individual and collective levels.

SER DO CERRADO

Gueroba leaf (*Syagrus oleracea),* a native palm with a wide distribution in the Cerrado. The bitter palm heart (palmito-amargoso) is extracted from this palm and is widely used in the cuisines of Goiás and Minas Gerais.

The *Ser do Cerrado* project emerged from a partnership between Instituto Inhotim, the Public Prosecutor's Office of Minas Gerais, and the Plataforma Semente. Its first edition unfolded between 2022 and 2023, and its second edition is currently underway, spanning 2025 to 2026.

Situated in a transition zone between two major Brazilian biomes—the Atlantic Forest and the Cerrado—Inhotim holds a unique position. Internationally recognized as both a Botanical Garden and a Museum, it offers a powerful platform for raising awareness among diverse audiences about the urgency of environmental stewardship. Within this context, the *Ser do Cerrado* project aligns seamlessly with Inhotim's mission, as it drives various of the institution's own initiatives as a Botanical Garden. By integrating research, experimentation, and education, we foster experiences where the Cerrado serves as the starting point for reflection on biodiversity and the challenges of its conservation.

Between 2022 and 2023, *Ser do Cerrado* made possible a range of initiatives that expanded the presence of the biome in Inhotim's daily activities, including environmental education, scientific research, landscaping, and accessibility. The project also led to the publication of the book *Ser do Cerrado: Saberes e diversidade nos jardins do Inhotim* (Ser do Cerrado: Knowledge and Diversity in the Gardens of Inhotim). The English edition of this work is now in your hands.

The following pages provide an overview of these actions and reaffirm Inhotim's commitment to environmental conservation. Through *Ser do Cerrado*, we seek to bring the public closer to the richness of the biome, encourage new perspectives, and inspire an outlook that contributes to its protection.

The canela-de-ema (*Vellozia compacta*) is a species of the Minas Gerais flora, endemic to the Serra do Espinhaço mountain range, and adapted to withstand water shortages, constant winds, and wide temperature variations.

THE *SER DO CERRADO* PROJECT 2022-2023

Carolina Frare Lameirinha
Public Prosecutor (MPMG)

Luciano José Alvarenga
Legal Advisor (MPMG)

The Cerrado boasts one of the highest levels of biodiversity in the world, primarily distributed across its savanna and grassland ecosystems. The remarkable heterogeneity of the Cerrado's landscapes, a result of its diverse geology, climate, and hydrology, supports an impressive array of life forms.

The Cerrado is also critically important for water conservation and distribution. Numerous rivers of regional and national importance—like the São Francisco River—originate within the biome. Additionally, the Cerrado is home to an immense diversity of peoples, cultures, and tangible and intangible cultural heritage assets.

However, the Cerrado has suffered intense degradation and loss of native vegetation, triggering environmental damage such as river siltation, biodiversity extinction, disruption of hydrological cycles, spread of invasive species, and a host of socio-environmental and economic problems.

Deforestation and the conversion of native vegetation into areas for agricultural and livestock activities have caused the Cerrado to lose nearly half of its original area. Currently, Minas Gerais ranks as the third Brazilian state in terms of accumulated deforestation in the Cerrado, with a loss of forty-five thousand square kilometers. It is also estimated that nearly 40 percent of the total tailings deposited in dams in Brazil are located in the Cerrado, primarily in Minas Gerais.

Despite the severe degradation of the biome, only 8 percent of the Cerrado's territory is protected by conservation units—with 3 percent designated as strictly protected areas and 5 percent allocated for sustainable use.

These factors make the Cerrado a biodiversity conservation hotspot. In other words, it is a region that has exceptionally high levels of endemism and biological diversity per square meter, but, paradoxically, its conservation is currently seriously threatened by human activity.

Furthermore, the biome lacks legal recognition and policy support. Notably, the 1988 Federal Constitution failed to formally include

the Cerrado among the territories recognized as part of Brazil's national heritage (Article 225, §4).

Given the progressive and accelerated devastation of the Cerrado, and recognizing the biome's ecological and social importance, the Environmental Operational Support Center (CAOMA) of the Public Prosecutor's Office of the State of Minas Gerais (MPMG) launched the *Ser do Cerrado* project. This initiative is part of the MPMG's General Strategic Action Plan, and it is designed to promote the valorization, conservation, and restoration of representative areas of the Cerrado biome in Minas Gerais.

To this end, the MPMG has been organizing and promoting educational and informational initiatives for the public on the importance of conserving the Cerrado biome. These efforts include a project with Instituto Inhotim, aimed at integrating Cerrado plants into the botanical collection of the Inhotim Botanical Garden. It also involves implementing Environmental Education programs to raise public awareness of the biome's ecological and cultural significance.

Additionally, the CAOMA has developed technical materials specifically dedicated to the protection of the Cerrado, including an action guide, practical tools, technical notes, and regulatory documents related to the biome, in order to support MPMG members in their efforts to protect the Cerrado.

Through the *Ser do Cerrado* project, the MPMG recognizes the importance of the Cerrado and has adopted judicial and extrajudicial measures for its environmental conservation and restoration. The MPMG is constitutionally mandated to protect the environment (Article 129, III).

The *Ser do Cerrado* project calls for organized civil society to take an active role by raising public awareness about the need to protect the Cerrado and creating sustainable educational spaces, thus building a foundation for long-term environmental protection.

The project also envisions collaboration, aligning with similar initiatives in other Brazilian states. Through joint projects, collaborative enforcement operations, the development of best-practice manuals, and the organization of events, *Ser do Cerrado* aims to amplify its impact by fostering inter-institutional cooperation.

THE WINDING PATHS OF THE NEW BOTANICAL COLLECTION

Bárbara Sales

Biologist, holds a master's degree in Environmental Sustainability, and is a doctoral candidate in Crop Science. She has been a collaborator at Inhotim since 2013, having worked in the Education Department; since 2019, she has been working in the Nature Department.

"Which Cerrado should we work with?" This was the question that arose in early 2022 when Inhotim's Botanical Curatorial team had to choose between focusing on a single Cerrado phytophysiognomy or including them all. We chose to approach the Cerrado in all its various vegetation formations, or Cerrado *lato sensu*. Therefore, we considered the Cerrado that extends beyond Minas Gerais to encompass an array of other riches, peoples, and cultures.

Another question that emerged was: "Which Cerrado species are already present in the *Viveiro Educador* (Educational Nursery)?" We needed to know what was already here before proposing any acquisition list. Based on this question, we conducted a floristic survey of the Viveiro Educador's botanical collection to determine which Cerrado species were already represented in that space.

The survey revealed approximately 170 species that occur in the Cerrado. We then moved on to selecting new species to introduce into the emerging collection. These choices were formalized in the *Curatorial Plan of the Ser do Cerrado Project*, a document designed to present the collection strategy in a clear and structured format.

Although developed specifically for the Inhotim Botanical Garden and the Cerrado biome, the Curatorial Plan is envisioned as a starting point that could guide the integration of native species from any biome into botanical gardens elsewhere. We also defined the narratives, landscape design, and the plant acquisitions.

Establishing a botanical collection is a deliberate process—species are not added at random. Thus, we established criteria: diversity, threat level, fruit-bearing species, and historical significance. These parameters formed the foundation for the initial list of species to be introduced into the Viveiro Educador. The acquisition of these plants could occur through four main avenues: purchasing plants, receiving

Bloom of the canela-de-ema (*Vellozia compacta*) at Inhotim.

donations, exchanging with other botanical gardens or similar institutions, or collecting from authorized areas.

Once the list was finalized, new questions arose: "Where and how can we get these species?" At this stage, new challenges and opportunities emerged. As we began searching for Cerrado plant producers, especially in the vicinity of Brumadinho, it became clear that availability was limited, and the diversity of species offered was narrow.

Despite these constraints, we were determined to create a rich and varied collection—one that includes emblematic species from our collective imagination like the pequi, while also introducing lesser-known Cerrado species. And so, we continued our search for grasses, palms, shrubs, and melliferous plants.

During our search for suppliers, fate crossed our path with Gerson Dias—a producer from Igarapé, Minas Gerais, who donated some Cerrado fruit-bearing species to Inhotim—and with Otávio Ribeiro, a producer of Campo Rupestre species from Conceição do Mato Dentro, Minas Gerais, where we went to learn even more about this specific Cerrado phytophysiognomy and exchange knowledge.

It was during this search for suppliers that we received a significant donation of a cactus and bromeliad collection: the Eddie Esteves Pereira collection, which arrived at Inhotim following a phone call and a visit to Goiânia, Goiás. This was a magnificent opportunity to add an exceptionally rich collection to our botanical holdings, with cacti and bromeliads that also occur in the Cerrado. The collection represents years of research by a passionate enthusiast of the biome's plants.

Some setbacks were also part of the process of building this botanical collection. Early in their life cycle, Cerrado species develop extensive root systems relative to their above-ground biomass, which can be a problem for nursery growers who sell these plants. Consequently, it was difficult to find seedlings of Cerrado species in the right quantity, size, and diversity to form a truly diverse collection with an interesting landscape design.

Another challenge was the difficulty of finding Cerrado grasses and ground covers available for purchase in nurseries. This is both surprising and, in a way, predictable. It's surprising because the Cerrado is often referred to as the Brazilian savanna, and the defining image of a savanna is a landscape dominated by grasses and low-lying plants.

But why are these plants so hard to find in nurseries? The answer may lie in a narrow perception of grasses as useful only for pasture. This limited view has led to a lack of interest in exploring their ornamental potential. The species that shape our collective imagination of the savanna are precisely the ones overlooked or undervalued by nursery growers and landscape designers.

Another challenge is the use of common names for botanical species. Many nurseries identify plants only by their common names, not their scientific ones. But different species can have the same common name, which can create confusion about which species we are actually referring to.

Once the initial challenges were overcome, the next phase was landscape planning: "How do we integrate the plants into the gardens?" and "What's the best way to plant them?" The answers to these questions involved research, trial and error, careful observation, expert consultation, patience, and a lot of determination. For instance, adding species to the *Jardim de Transição* (Transition Garden) required laying a layer of sand and gravel to improve soil drainage and, consequently, help the plants adapt to their new environment. After planting, it was necessary to wait for many months, keep a close eye on everything, and monitor every detail of the species' adaptation.

Once the plants were successfully established, the next step was to organize in a database the information about the plants. Following the parameters of Inhotim's Botanical Collections Policy, each plant selected for the new Cerrado collection was officially registered.

While all plants are valued equally, endemic and threatened species require enhanced monitoring, with the goal of developing cultivation protocols for these species. This is a policy of Inhotim, which, as a botanical garden, understands the importance of its role in conserving species from all biomes, not just the Cerrado.

MELIPONÁRIO: A SPACE TO LEARN ABOUT AND LOVE BEES

Sabrina Carmo

Biologist, with a postgraduate degree in Environmental Education and a master's degree in Environmental Sustainability and Technologies. She was a collaborator at Inhotim's Education Department from 2013 to 2017; since 2019, she has been working in the Nature Department, where she currently serves as manager.

You may have never heard this, but Brazil holds a fascinating treasure when it comes to a certain group of insects: bees. While roughly twenty thousand different bee species are known worldwide, Brazil is home to approximately 1,800 of them.

Where are Brazil's native bees? The truth is most of us aren't trained to recognize them. Our imagination is dominated by *Apis mellifera*, commonly known as the "European bee" or "Africanized bee." This is an exotic species that was introduced to all regions of the country in the 19th century and is responsible for most of the honey we consume. It is also well known for its painful sting.

After all, what are Brazilian bees? Are they really that different? These are important questions because they are gateways into the fascinating and complex world of stingless bees. When it comes to stingless bees, there are three interesting facts you should know.

The first concerns their diversity. Of the nearly 1,800 bee species described in Brazil, about 250 are stingless species. Despite their name, they do possess a vestigial stinger, but it poses no threat to humans. These bees are very docile and easy to manage.

The second fact is historical. Stingless bees are also known as "Indigenous bees" because they have been managed by Brazil's Indigenous peoples for centuries. There are numerous historical records showing how the products from these hives were part of the daily lives of different ethnic groups. Honey was used for food, while waxes and resins were useful for crafting various items. Not to mention the application of these products in religious and healing practices. Unfortunately, the massacre of Indigenous peoples throughout Brazil's history also took with it much of this ethnobiological knowledge.

Maurício de Oliveira opens one of the rational beehive boxes for stingless bees at Inhotim's *Meliponário* (Meliponary).

The third and final fact is their ecological and economic significance. While stingless bees do produce a delicious honey, their true value is found in the ecosystem service of pollination. These bees play a critical role in the reproduction of native plant species and are equally vital to food production. It is no exaggeration to say that stingless bees are cornerstones of plant conservation, ecosystem stability, and food security in Brazil. Unfortunately, like many other pollinators, these bees are severely threatened and are at serious risk of disappearing.

Recognizing both the beauty of pollination and the clear threat to this ecosystem service, Inhotim—especially given its role as a botanical garden—has been impelled to incorporate the world of bees into its practices. The subject of stingless bees is key for the Instituto, as without these pollinators, the conservation of native flora is at risk.

Finding ways to address this issue in a light, engaging manner that familiarizes the general public with these species and also touches on other important contemporary issues, such as sustainability, food production, and climate change, presents a challenge. One of Inhotim's responses to this challenge was to open a *Meliponário* (Meliponary) to the public. The new space highlights stingless bees, showcases the flora that attracts these species, and helps to raise public awareness.

The story of the Meliponário at Inhotim began in 2019, when the first rational hives, donated by the *Centro de Resgate e Ecologia de Abelhas Nativas* (Center for the Rescue and Ecology of Native Bees; CRESAN), were installed in the *Viveiro Educador* (Educational Nursery). CRESAN is a center dedicated to the rescue, stabilization, and reintroduction of native bees. It is a project based in Brumadinho, Minas Gerais, conceived and run by local resident Maurício de Oliveira.

Initially, the hives were placed in an area outside the reach of visitors and were intended solely for conservation purposes. No honey or by-products were extracted. However, from the outset, it was always a goal to eventually open the space to the public, using it to promote the species and raise public awareness about them.

Fortunately, the space was opened to the public in 2022 through the *Ser do Cerrado* project and a partnership with CRESAN and Eurico Novy, a renowned meliponiculturist from Sabará, Minas Gerais, and then president of the *Associação de Meliponicultores de Minas Gerais* (Association of Meliponiculturists of Minas Gerais; AME-Minas). That year, the Meliponário received ten rational hives, representing five different species: moça-branca (*Frieseomelitta varia*), iraí (*Nannotrigona testaceicornis*), jataí (*Tetragonisca angustula*), mirim-droriana (*Plebeia droryana*), and mandaçaia (*Melipona quadrifasciata*).

Located within the Viveiro Educador, the Meliponário joins other themed gardens and laboratory facilities of the Inhotim Botanical Garden, offering visitors a space to reflect on the environment, the life cycle of plants, and the interactions between species. Here, a keen eye is the key to noticing—and being enchanted by—the variety of sizes, colors, and shapes of these bees.

All of the species at the Meliponário occur in the Cerrado. Learning about the bees of this biome is an important mission, and not just stingless bees, but all the other bees that inhabit it. Since the 1980s, studies have shown how much the flora of the Cerrado depends on these pollinators. In 1988, researchers Ilse Silberbauer-Gottsberger and Gerhard Gottsberger studied 279 plant species and found that 29 percent of them were pollinated exclusively by bees, and that 46 percent of those species were pollinated by other agents but had bees as their main pollinators.

The fact is that stingless bees and the Cerrado share many vulnerabilities. Both are threatened daily by criminal wildfires, deforestation, monoculture, pesticides, and the effects of climate change. The threats are numerous, but getting to know these bees and the biome they inhabit is the first step toward recognizing their value and, most importantly, inspiring us to think and act in their protection.

The mandaçaia (*Melipona quadrifasciata)* is easily identified by its robust body and yellow stripes on the abdomen. This stingless bee species is very popular in Brazil.

Jataí (*Tetragonisca angustula*) is one of the five species of stingless bees found in the *Meliponário* (Meliponary). The photo shows the bees on their honeycombs, which are built in disc-shaped layers inside the rational beekeeping hives.

Vinhático (*Plathymenia reticulata*), a native species with a suberous trunk which is characteristic of many Cerrado trees.

A NEW BOTANICAL COLLECTION

Inhotim Botanical Garden set out to establish a new collection of Cerrado species in the *Viveiro Educador* (Educational Nursery). This collection was meant to be representative of the biome, as diverse as the biome itself, and useful for educational, research, and conservation purposes, with designed landscaping. The resulting new botanical collection, made possible by the *Ser do Cerrado* project, was very successful. The consolidation of this collection was guided by the *Curatorial Plan of the Ser do Cerrado Project*, which directed the acquisition of new plant species added to the Viveiro Educador. These species were selected based on five criteria as follows:

DIVERSITY

The myriad of possibilities in the shapes and colors of Cerrado plants made the selection process easier. We chose plants with unconventional characteristics specific to the biome, such as trees with cork-like bark on their trunks or palms with subterranean stems. These are necessary adaptations for surviving the periodic fires that occur in the Cerrado.

THREAT LEVEL

The Botanical Curatorial team targeted threatened and endemic plants for conservation purposes. These plants typically occur in restricted areas, and human activities often place them at a high risk of being threatened.

FRUIT-BEARING PLANTS

Plants that produce edible fruit for both wildlife and humans are important elements for gardens. These are generally plants that have been used for millennia by Brazil's Indigenous peoples or for medicinal and economic purposes by traditional communities. They also offer the public the delightful experience of picking fresh fruit straight from the plant and discovering new flavors. It is worth noting that at Inhotim, most of the fruit is consumed by wildlife, such as birds, small mammals, and insects.

KEY SPECIES FOR GARDEN COMPOSITION

We prioritized species that could also be used in the existing gardens within the Viveiro Educador. These included Cerrado cacti for the *Jardim Desértico* (Desert Garden), and plants from savanna and grassland vegetation of the Cerrado for the edges of the *Jardim de Transição* (Transition Garden). We also selected Cerrado melliferous plants to increase food options for the bees in the *Meliponário* (Meliponary).

STORIES

Plants can be the subject of different kinds of stories. One interesting example is that through a plant's scientific name, it is possible to honor important individuals who contributed to the advancement of science. A notable example is the Vellozia family, native Cerrado plants named in honor of Frei José Mariano Velloso (1742–1811), a great Brazilian botanist and naturalist. It is also possible to tell stories about the relationship between traditional and Indigenous peoples and plants, as well as the discoveries made by the naturalists who explored this region.

Species such as pequi (*Caryocar brasiliense*), canela-de-ema (*Barbacenia delicatula*), palmeirinha-azul (*Syagrus glaucescens*), cagaita (*Eugenia dysenterica*), ouriço-do-mar (*Echinopsis calochlora*), and sucupira-preta (*Bowdichia virgilioides*) are important representatives of this collection. The Inhotim Botanical Garden aims to continue expanding this collection over the coming years, further highlighting the beauty of the Cerrado and promoting education and research initiatives.

Before acquiring new species, it was necessary to identify which Cerrado plants were already present in the Viveiro Educador. Considering that Inhotim is located in a transition zone between biomes and that Cerrado species may occur naturally—without having been introduced through landscaping—this floristic survey proved to be a complex task that required specialized labor.

Assistant botanists Alex Coelho and Tatiana Almeida led this effort, which resulted in the identification of 720 species in the Viveiro Educador. Of these, 173 species occur in the Cerrado, and 33 are endemic to Brazil.

Regarding the threat level of the identified Cerrado species, the findings were as follows: 9.8 percent (17 species) are "threatened" (including species classified as "vulnerable," "endangered," and "critically endangered"), 2.3 percent (4 species) are "near threatened," and 36 percent (62 species) are of "least concern" for extinction risk. Notably, the majority of the identified Cerrado species, around 52 percent (88 species), have

Cagaita (*Eugenia dysenterica*) is well known for its fruit, which has laxative properties. Its leaves, on the other hand, have the opposite effect and are used to treat intestinal disorders.

Palmeirinha-azul (*Syagrus glaucescens*), a species endemic to the Cerrado in Minas Gerais, classified as Vulnerable (CNCFlora).

Ouriço-do-mar (*Echinopsis calochlora*), one of the cacti featured in the *Jardim Desértico* (Desert Garden).

not yet had their threat level assessed. These findings underscore the urgent need to better document Cerrado biodiversity and evaluate species' conservation status. They also highlight the importance of including these plants in botanical collections for ex situ conservation.

Following the survey of existing Cerrado plants in the *Viveiro Educador* (Educational Nursery) and the acquisition of new ones, an extensive phase of planting and monitoring began. Once the adaptation phase was complete, the heritage listing—the formal registration of the collection—was initiated.

It is important to understand that a botanical collection is a biological heritage that must be properly handled, conserved, and documented in accordance with rules and standards that ensure security, accessibility, quality, longevity, and data integrity. Heritage listing is a crucial step in the consolidation of any biological collection.

For the heritage listing of a botanical collection, organizing and correctly recording the information associated with each plant is not only important but also highly dynamic. This data can serve as a basis for scientific research, educational initiatives, ex situ conservation, species propagation, reintroduction into nature, and the restoration of degraded areas, for example.

During the heritage listing process, each plant receives a plant label with the following information: scientific name, common name, family, and heritage listing number—a registration code that links the living plant in the garden or greenhouse to a computerized database. This database contains additional information about the plant, such as its location, habit, biome in which it occurs, collection origin, threat level, and whether or not it is endemic to Brazil.

The new Cerrado collection at Inhotim includes approximately 287 species. Regarding the risk of extinction in the wild, 121 of these species have already been evaluated by the *Centro Nacional de Conservação da Flora* (National Center for Flora Conservation; CNCFlora). Of these, 88 are classified as "least concern"; 7 as "near threatened"; 10 as "vulnerable"; 12 as "endangered"; and 4 as "critically endangered." The collection includes about 66 botanical families, with strong representation from Cactaceae, Bromeliaceae, Myrtaceae, Fabaceae, and Arecaceae, resulting in an abundance of forms, colors, and plant diversity.

In a botanical garden, the heritage listing process is a task with a beginning but no end. Because Inhotim is a dynamic space where new gardens are always being created and more species are continuously being added, the process of official registration for the heritage status of the botanical collections is ongoing. The heritage listing of the Cerrado

The pequi tree (*Caryocar brasiliense*) is a symbol of the Cerrado. Tea made from its leaves is used to treat liver and intestinal disorders.

Plants in the *Viveiro Educador* (Educational Nursery) receive identification labels with their heritage listing number.

collection, carried out in 2022, will require continuous updates, as each listed plant will be closely monitored.

The addition of Cerrado species to the Viveiro Educador led to valuable connections. The *Rede de Sementes do Cerrado* (Cerrado Seed Network) was a key supplier. The seeds acquired from them were used for direct sowing and seedling production for donations, as well as for the gardens. They were also used in the Seed Exhibition, an educational display showcasing over ninety fruits and seeds of Cerrado species that reveal the diversity of shapes, colors, and reproductive strategies of the biome's plants. It's a powerful educational tool and as such, it has been used in environmental education activities at Inhotim.

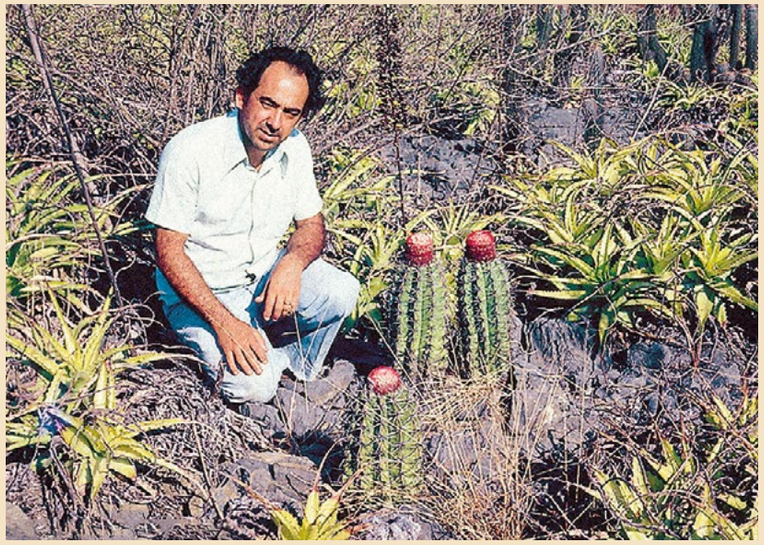
Otávio Ribeiro, a seedling producer in Conceição do Mato Dentro, Minas Gerais, was another supplier of endemic Campo Rupestre species. Gerson Dias, from Igarapé, Minas Gerais, was yet another partner with whom we exchanged information. He donated several Cerrado fruit-bearing species that became part of Inhotim's gardens.

Julio Pastore, professor at the Universidade de Brasília (UnB) and creator of the *Jardim de Sequeiro* (Rainfed Garden), was also a key partner. His work with the use of groundcover Cerrado species in landscape design inspired the creation of an experimental naturalistic garden at Inhotim.

The Luiz de Queiroz College of Agriculture (ESALQ), at the Universidade de São Paulo (USP), through Professor Claudia Mattiuz and several researchers and students, provided a rich exchange of knowledge on the use of Cerrado species in landscape design.

Another relationship that emerged from the Cerrado research was with the family of Eddie Esteves Pereira, a collector of cacti and bromeliads. His wife, Lindevalda Borges Pereira, and their five children—Edward, Charles, Richard, Herbert, and Michael—donated part of his collection to Inhotim to make it accessible to the public and serve research and conservation efforts.

Other partners were extremely important to the mission by Eddie Esteves to preserve and conserve the species he collected over decades. Biologist Güydo Horta (a specialist in cacti and succulents) and Monica Corrêa (a supplier of substrate for this group of plants) helped accommodate the collection at Inhotim, suggesting the best techniques for acclimatizing and conserving the cacti. Diego Gonzaga, former curator of the cactus collection at the Rio de Janeiro Botanical Garden, was also a key ally in species identification and organizing the greenhouse created specifically to house the collection.



Eddie alongside the bromeliad *Encholirium viride*, in Minas Gerais, 1979. This species is exclusive to limestone outcrops in the Cerrado. Its populations are concentrated in Minas Gerais, Goiás, Tocantins, and the Federal District, and are threatened by mining.

It took years for Eddie Esteves to capture the exact moment when a hummingbird visits the bloom of *Pierrebraunia brauniorum*. Discovered in Minas Gerais in 1999, the species is named after Pierre Braun, Eddie's friend and publication partner.

EDDIE ESTEVES: A LIFE DEDICATED TO XEROPHYTIC PLANTS

Eddie Esteves Pereira (1939–2022) was an advertising professional, artist, nature photographer, and enthusiast of Brazilian flora. Born in Trindade, Goiás, he was an expert in cacti, succulents, and bromeliads. Eddie dedicated more than fifty years of his life to identifying and conserving plants. During his expeditions through unexplored areas of the Cerrado and other Brazilian biomes, he discovered species previously unknown to science. He took it upon himself to describe and publish these new taxa, laying the groundwork for researchers and scientists to study the rich diversity of native xerophytic plants (plants adapted to water stress).

His contributions to the taxonomy and species conservation earned him recognition and friends all over the world. Eddie published numerous articles in American, Brazilian, British, Dutch, and German journals. The International Plant Names Index (IPNI) lists him as the author of 269 taxa! In his honor, twenty-one species of cacti, bromeliads, and euphorbiaceae bear the epithet *estevesii* in their scientific name.

Over the years, Eddie built a vast botanical collection and assembled an impressive collection of cacti and bromeliads in his home garden, which was only visited by friends. After Eddie passed away in February 2022, his family donated part of the collection to the Inhotim Botanical Garden to ensure that more people would have access to his legacy.

Approximately 1,800 potted plants were transported from Goiás to Brumadinho, where the Inhotim team is now providing the necessary care to conserve this rich botanical holding. The collection contains rare plants, in addition to the type specimen used to describe *Pierrebraunia brauniorum*, which was discovered in Minas Gerais in 1999. In addition to acclimatizing the plants, replacing their substrate, and repotting them, Inhotim built a greenhouse to house the collection and has been forming partnerships to identify the species and establish a maintenance protocol for each one.

Although the cactus family is commonly associated with the Caatinga biome, many cactus species also occur in the Cerrado, including some species endemic to this biome. With the help of Diego Gonzaga, PhD in Botany and curator of the cactus collection at the Rio de Janeiro Botanical Garden, and Güydo Horta, a producer and collector of cacti and succulents, around one hundred cactus species from Eddie Esteves' collection have already been identified; fifteen of these occur in the Cerrado.

By welcoming Eddie Esteves' collection of cacti and bromeliads, the Inhotim Botanical Garden is helping to keep alive the memory of this great friend of Brazilian flora. At the same time, it is honoring its commitment to opening the collection to the public, allowing more people to study and love the biodiversity of Brazil.

Discocactus estevesii, from the southern Cerrado of Goiás, was the first plant to be registered with Eddie's surname, in 1978. The species is part of the collection now housed at Inhotim.

JARDIM DE SEQUEIRO

There is a great deal of beauty in grasses—a different kind of beauty than our eyes are used to recognizing in other plants. Seemingly simple structures, varied forms, and color changes that mark the passage of time give grasses great ornamental potential.

Talking about the Cerrado also means talking about an incredible diversity of grasses and other graminoids, which are still undervalued plants that pose challenges in terms of acquisition and propagation. Although this biome is best known for its grasslands, sourcing to find native Cerrado graminoids for landscaping at Inhotim proved difficult. But where challenges arise, so do opportunities. And this is where the opportunity arose to create an experimental garden at the Instituto: the *Jardim de Sequeiro* (Rainfed Garden).[18]

The Jardim de Sequeiro is an outreach initiative at the Universidade de Brasília (UnB), coordinated by Professor Julio Pastore. It stands as an important benchmark for how native Cerrado flora can expand the Brazilian landscape design vocabulary. In 2022, the innovative nature of this project earned international recognition at the 5th Latin-American Landscape Architecture Biennial.

Just like its counterpart at UnB, Inhotim's Jardim de Sequeiro is an experimental project that combines Cerrado grasses with other ephemeral plants. Unlike conventional gardens, the Jardim de Sequeiro will not always be green. It embraces the fact that there is a time for sprouting, a time to dry out, a time for dormancy, and a time to resprout—and each phase has a different kind of beauty.

The Jardim de Sequeiro is also considered a naturalist garden because it prioritizes native species, takes ecological processes into account, and is more sustainable, as it demands less in terms of irrigation and fertilization. This experimental garden was established at Inhotim through a partnership with Julio Pastore, who, along with his team, contributed not only with a transfer of technology but also with hands-on work.

In the first week of December 2022, the Jardim de Sequeiro was born, occupying approximately three thousand square meters within the *Viveiro Educador* (Educational Nursery). Its implementation lasted six consecutive days and was the result of a collective effort by around thirty participants, including Inhotim staff and UnB volunteers.

18 The Jardim de Sequeiro was created in partnership with the Universidade de Brasília (UnB) and remained on display at Inhotim for two cycles, in December 2022 and December 2023, as an experimental garden.

Flowering in the *Jardim de Sequeiro* (Rainfed Garden) at Inhotim. Most of the species in this garden have a short cycle; that is, they germinate, grow, flower, and produce seeds within a few months.

Along with early- and late-flowering species, the garden received several native Cerrado grasses, such as capim-carrapato (*Aristida flaccida*), capim-rabo-de-burro (*Aristida riparia*), and capim-orelha-de-coelho (*Paspalum stellatum*). Each of these species demonstrates that there is a great deal of beauty in grasses, especially in the grasses of the Cerrado.

BEHIND THE SCENES AT THE VIVEIRO EDUCADOR

Throughout 2022, Inhotim offered fifty-nine mediated visits focused on the Cerrado biome, welcoming a diverse array of visitors. These experiences reached over 850 participants, with weekly sessions and special editions during events such as Environment Week and Cerrado Week.

These mediated visits highlighted the Cerrado species present in Inhotim's gardens and led visitors to the *Viveiro Educador* (Educational Nursery). Recognizing that knowledge of the biodiversity of the Cerrado is the first step toward conservation, the facilitators shared ethnobotanical information about the species of the biome, enriching the cultural knowledge of participants. Once inside the Viveiro Educador, visitors gained access to areas typically closed to unguided visits, including plant production facilities, greenhouses, and shade houses.

Mediated visits are flexible and responsive, adapting to the interests and backgrounds of each group. Facilitators prioritized dialogue, collective curiosity, and the exchange of knowledge among visitors. The goal of the "Behind the Scenes at the Viveiro Educador" mediated visits was to showcase the importance of the Cerrado and bring the public closer to this biome, which is often overlooked. This connection was fostered through the observation of the distinctive traits of the Cerrado plants in the gardens of Inhotim, the exchange of knowledge about these species, and individual stories. Thus, each visit provided unique paths and discussions, collectively constructed by each participating group.

The "Behind the Scenes at the Viveiro Educador" mediated visits were facilitated by professionals from Inhotim's Education Department and Botanical Garden Management, alongside guest facilitators. At least once a month, specialists, professors, and collectors were invited to lead these visits. The public responded enthusiastically, and many participants formed lasting connections with the biome and its advocates.

We extend our heartfelt thanks to: Alex Coelho, Ana Vitória Martins, Anna Luisa Pacheco Candido, Carlos Alberto Ferreira Júnior, Diego Rafael Gonzaga, Efigênia da Silva Costa, Evandro Fortini, Gerson Dias, Giordanna Bié, Güydo Horta, Henrique Duarte Vieira, Luiz Querino, Lucas Mourão, Otávio Ribeiro, Raiane Amorim, Samuel Gonçalves, Sandra Regina Q. da Silva, Silvana Querino da Silva, and Tatiana Almeida, who enriched the discussions about the Cerrado and the experience of visitors at Inhotim by facilitating the "Behind the Scenes at the Viveiro Educador" mediated visits.

A student from Escola Estadual Francisco Sales — Institute for Speech and Hearing Impairments during a visit to the *Jardim de Todos os Sentidos* (Garden of All Senses).

ACCESSIBILITY ACTIONS

From its inception, the *Ser do Cerrado* project has embraced accessibility as a core value, recognizing that inclusion is essential to environmental education and public engagement. As the *Viveiro Educador* (Educational Nursery) serves as the central venue for the project's activities, targeted efforts were made throughout 2022 to implement accessibility upgrades aligned with universal design standards. These adaptations were designed to enhance access to the Viveiro Educador, an educational space open to all, and to accommodate the diverse ways people experience it.

A series of changes to the facilities were made in the Viveiro Educador area, such as paving the trails in the *Jardim de Transição* (Transition Garden) and the *Jardim de Todos os Sentidos* (Garden of All Senses), improving safety and mobility. We also adjusted the height and width of the garden beds in the Jardim de Todos os Sentidos, adapted the restrooms at the Viveiro Educador to meet universal accessibility standards, installed accessible signage, and expanded the ethnobotanical labels. These upgrades aimed to create a more autonomous and enriching experience for the diverse audiences that visit Inhotim.

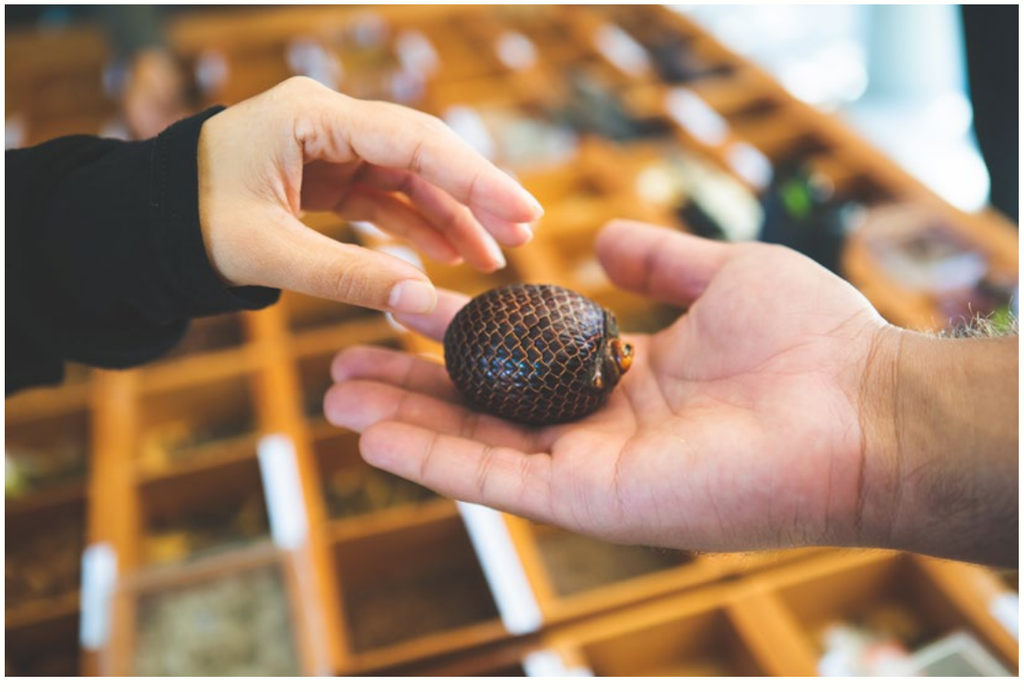
Also as part of the *Ser do Cerrado* project, we conducted mediated visits for groups from institutions focused on accessibility. These visits were scheduled in advance and led participants to the Viveiro Educador, where they explored the gardens and engaged with key concepts related to the Cerrado through environmental awareness, emphasizing the principle that "to conserve, you must first know." At the Viveiro Educador, visitors primarily explored the Jardim de Todos os Sentidos and the Jardim de Transição.

Another accessibility initiative conducted by the *Ser do Cerrado* project was the creation of an inclusive herbarium featuring exsiccatae from native Cerrado species. Since visiting Inhotim is a multisensory experience, it is important for the Instituto to offer opportunities that engage the different senses.

The herbarium features exsiccatae—that is, pressed and dried specimens of a plant's leaves and flowers mounted on sheets—from eight different species, including ipê-amarelo (*Handroanthus ochraceus*), copaíba (*Copaifera langsdorffii*), dedaleiro (*Lafoensia pacari*), aroeira-vermelha (*Schinus terebinthifolius*), and açoita-cavalo (*Luehea divaricata*). Considering that the flora of the Cerrado has very distinctive characteristics, this inclusive herbarium offers a particularly engaging tactile experience. The material is available for visitors at the entrance of the

Viveiro Educador and is used as a teaching aid by the educational team on mediated visits.

The signage at the Viveiro Educador was expanded to provide more information about the plants and spaces in different languages. The Viveiro Educador also received new directional signs; featured species in the gardens received ethnobotanical identification labels; and a leaflet presenting the Viveiro Educador's attractions was made available in Portuguese and English. Accessible signage—with tactile labels, maps, and a leaflet in Braille—and audio guides with information about the species that make up Inhotim's botanical collection are also available to the public. These efforts aim to provide a more autonomous and complete experience for everyone who visits Inhotim.



The seed display offers a multisensory experience with Cerrado species.

During a visit to the *Viveiro Educador* (Educational Nursery), the group from Instituto São Rafael, in Belo Horizonte, Minas Gerais, came into contact with the plants of *Jardim de Todos os Sentidos* (Garden of All Senses).

A group from Escola Estadual Francisco Sales — Institute for Speech and Hearing Impairments visiting the *Jardim Desértico* (Desert Garden).

YOUTH LEADERSHIP IN CERRADO CONSERVATION

If young people are the present and future of the planet, why shouldn't they lead the way in raising environmental awareness? *Jovens Agentes Ambientais* (Young Environmental Agents) is a continuing education program for public schools students in Brumadinho, Minas Gerais, and surroundings.

Participants are invited to develop initiatives that benefit the environment, drawing on the artistic and botanical collections of Inhotim as well as the local territory. Since its launch in 2008, the program has been renewed annually through partnerships with sponsors and supporters of Instituto Inhotim, each edition addressing contemporary environmental challenges.

In 2022, as part of the *Ser do Cerrado* project, a group of Young Environmental Agents composed of high school students from Escola Estadual Abelardo Duarte Passos, located in the district of Melo Franco, focused their activities on the Cerrado. The program used various educational methods to promote youth leadership, fostering autonomy, effective communication, and critical thinking regarding socio-environmental issues. Over the course of sixty training sessions, the young participants—aged between fifteen and nineteen—engaged in debates, workshops; mediated visits to galleries, gardens, and spaces inside and outside Inhotim; games, discussion circles, and many hands-on activities.

The sessions were held twice a week, outside regular school hours. Transportation provided by the *Ser do Cerrado* project shuttled the students between the school and Inhotim. From May to December 2022, the program addressed topics such as identity, perception, memory, communication, recognition, and a sense of belonging. The Cerrado biome was explored through discussions on topics such as territoriality, environmental conservation, water management, ethnobotany, anthropogenic and natural fires, civic engagement, and rights and duties. The exchange of experiences also highlighted the importance of the Cerrado in the lives of Brazilians, emphasizing youth leadership in the fight to conserve this biome.

The program encourages young people to reflect on the contemporary issues they face in their daily lives, using elements from the nature and society around them. Given that participants of the Jovens Agentes Ambientais Ser do Cerrado program live in rural areas of Brumadinho—where communities coexist with mining operations and the environmental impacts caused by the collapse of the Córrego do Feijão Mine dam in

Young Environmental Agents on a visit to the Epicentro Urihi in Brumadinho.

January 2019—the educational program not only offers positive examples of local environmental action, but also expands the professional outlook of these young people, inspiring them to take the lead in building a healthier and more sustainable future.

One of the most significant outcomes of the program is the sense of community that emerges among these young people. They begin to see themselves as active agents, developing mutual respect, shared identity, and a collective drive to apply their knowledge.

For Ana Vitória Martins, the educator responsible for the Jovens Agentes Ambientais Ser do Cerrado, it is a privilege to teach and learn with the group. "This group carries a heavy burden of responsibility, a

result of the tough reality these young people face. The determination with which they tackle life's challenges is an inspiration to me, and I can see real transformation taking place in their lives. I see them recognizing themselves and evolving in how they communicate their ideas," she says.

Adolescents represent a unique audience with their own pedagogical needs and great potential for transformation. It is crucial that cultural institutions and botanical gardens direct more educational initiatives toward this group. As an educational program that fosters a critical stance on the world and strengthens the relationship of people with the environment, Jovens Agentes Ambientais can inspire other initiatives that place young people at the center of discussions about current events and the future.

Young Environmental Agents on a visit to the Brigada Carcará in Brumadinho.

"Being a Young Environmental Agent for the Ser do Cerrado was a very fascinating and enriching experience, surprising for all of us. We had different motivations and expectations, but throughout the year we found a common denominator: finding our own agency. Each meeting had its own 'face,' each day a different theme, each theme a different surprise. We shared unique experiences together, both inside and outside Inhotim. We didn't just learn about the wonderful Cerrado biome—we also learned to have agency over our own lives and to fight so that more people pay more attention to the environment, its importance, and the care we must take with it. Being a Young Environmental Agent means being active and conscious in society, thinking outside the box, and never giving up. It means knowing how to respect opinions, whether different or similar, and understanding that if everyone can express themselves, it's possible to reach a final result that pleases everyone."

Amanda Gomes, Caio Alves, Camille Lima, Dalyla Mengali, Deivid Machado, Felipe Alves, Gustavo Maia, Lucas de Andrade, Luciana Cássia, Maxsuel Vieira, Moises Fiuza, Monique Marques, Paula Amorim, Paulo Almeida, Roberth Silva, and Thamires Silva.

Participants of the mediated visit “Behind the Scenes at the Viveiro Educador” in the Epifitário.

The seed display showcases the diversity of propagation strategies used by Cerrado species.

ENVIRONMENT WEEK 2022

World Environment Day, celebrated worldwide on June 5, was established in 1972 by the United Nations General Assembly during the Stockholm Conference. Its purpose is to remind the global community of the need to preserve the environment. Inhotim has always marked this occasion, and in 2022, it chose the Cerrado as the central theme for its entire Environment Week program.

Inhotim Environment Week 2022 – Ser do Cerrado took place from May 30 to June 5, featuring lectures, mediated visits, educational workshops, and cultural performances. The program encouraged the public to learn more about the biodiversity, phytophysiological characteristics, traditional knowledge, and importance of the Brazilian savanna, calling upon everyone to take co-responsibility for the conservation of the Cerrado.

MEDIATED VISITS

From June 1 to June 5, the Cerrado was the central theme of a series of mediated visits through the gardens of Inhotim, culminating at the *Viveiro Educador* (Educational Nursery), engaging participants in reflections about the features that make this biome a natural heritage that must be better protected and conserved.

A total of 107 participants of different ages took part in the visits, which were led by the Education team, Inhotim’s botanical curator Juliano Borin, and botanist Samuel Gonçalves. The activities included Brazilian Sign Language (LIBRAS) interpretation, broadening the opportunities for interaction among participants.

CERRADO SEED EXHIBITION

From June 2 to 5, the Cerrado Seed Exhibition took place at the entrance of the *Viveiro Educador* (Educational Nursery), drawing visitors passing through the area. The exhibition featured seeds from around seventy species that occur in the Cerrado, collected either within Inhotim or sourced externally. A total of 460 people of all ages participated spontaneously in the event while visiting the Viveiro Educador. Visitors learned about some of the diversity of the Cerrado and the strategies used by plants for seed dispersal. This experience helped raise their awareness about the importance of conserving the biome.

EDUCATIONAL WORKSHOPS

From June 3 to 5, Inhotim hosted three educational workshops that offered participants an immersive experience in the cultural and ecological aspects of the Cerrado. A total of fifty-five individuals—children, young people, and adults—took part in the activities, which were held in both morning and afternoon sessions and included LIBRAS interpretation.

Participants engaged directly with native Cerrado plant species through a variety of hands-on activities. They produced natural cosmetics, scientific illustrations, and exsiccatae (herbarium specimens), all while learning about the traditions and ecosystems of the Cerrado.

In the Saberes do Cerrado workshop, participants made natural cosmetics using species from the biome.

POLLINATION: DISCUSSION CIRCLE

Stingless bees are important pollinators of native flora and play a fundamental role in conserving the biodiversity of biomes. On June 3, Inhotim welcomed stingless beekeeping and conservation specialists Maurício de Oliveira and Eurico Novy for a discussion circle on the diversity of native bees, their characteristics, and interesting facts. The discussion marked the opening of the *Meliponário* (Meliponary) for unmediated visits, celebrating its mission to foster environmental education and awareness.

Eurico Novy explained the structures of the rational beekeeping hives for stingless bees during the discussion circle at the *Meliponário* (Meliponary).

EVERLASTING CERRADO

The *Cerrado Sempre-Vivo* (Everlasting Cerrado) Lecture Series was held on June 4 at the Teatro do Inhotim. It brought together professionals with diverse backgrounds in conservation, education, and research to foster interdisciplinary conversations about the Cerrado. A musical performance by the ¿Silencie? Coletivo Percussivo, from the School of Music at Universidade Federal de Minas Gerais (UFMG) opened the event, which featured simultaneous livestreaming and Brazilian Sign Language (LIBRAS) interpretation for all three talks. The event is available for viewing on Inhotim's YouTube channel.

Mariana Siqueira, landscape architect and head of the Projeto Jardins de Cerrado, was the first speaker, presenting "Landscaping and Cerrado Flora." She emphasized the need to develop an aesthetic identification with the non-forest ecosystems of Brazil, valuing and conserving them. Next, Nayara Mota and Alex Coelho, a specialist biologist and an assistant botanist at Inhotim, presented "Paths of Scientific Research in the Cerrado." They explored the major research themes on this highly threatened biome, underscoring the fact that we are losing the Cerrado before even fully knowing it. Lastly, Rosângela Corrêa, general director of the Museu do Cerrado and professor at the School of Education at the Universidade de Brasília, spoke on "Environmental Education in the Cerrado." She reminded the audience of our co-responsibility in environmental conservation, underscoring the cultural and social aspects that shape Brazil's second-largest biome.

The lecture series fostered a welcoming and generous environment for the exchange of ideas. The audience—composed of university students and environmental professionals—not only attentively followed the presentations but also enriched the discussions with questions and contributions.

Among the invited attendees were students and faculty from the undergraduate Biology and graduate Botany programs at the Universidade Federal de Viçosa (UFV); the graduate program in Ecology, Conservation, and Wildlife Management at the Universidade Federal de Minas Gerais (UFMG); and the Biology course at Centro Universitário Una Aymorés in Belo Horizonte and at the Universidade Estadual de Minas Gerais (UEMG), Ibirité campus.

The event inspired Jayne Mayrink, a Geography student at UFV, to write a poem. She recited it during the Q&A session, and it was met with applause from everyone.

With rain, everything seems to be
[ready to bloom
In the dry season, colors gleam unseen
But "to see, you must want to see,"
[said Mariana
The golden hue begs for attention
It's the color that rules the Cerrado
This, Mariana understood
And it came to reveal that
[in evergreen Brazil
There is much that is golden too
Not just in the towering ipê trees
But scattered across the lowly shrubs
To be so alive is to be golden
To be so alive is to reflect the color
[of the Cerrado

Jayne Mayrink

At the end of the speakers' presentations, Juliano Borin moderated the Q&A session. Pictured: Mariana Siqueira, Rosângela Corrêa, Juliano Borin, Nayara Mota, and Alex Coelho.

The lecture series brought together students, university students, and educators at the Inhotim Theater.

It is common to spot seriemas (*Cariama cristata*) walking through the gardens at Inhotim.

Inhotim collaborators participating in the “Behind the Scenes at the Viveiro Educador” mediated visit during Environment Week 2022.

GETTING TO KNOW THE WILDLIFE OF THE CERRADO

To protect the Cerrado, we also need to know the animals that inhabit it and often go unnoticed. The lecture delivered by Vinícius Barbosa on June 1 and 2 featured discussions about the ecology and species preservation. The biologist, with the Municipal Environmental Secretariat of Brumadinho, Minas Gerais, also spoke about the diversity of wildlife that occurs in the region where Inhotim is located.

EXCLUSIVE PROGRAMMING FOR STAFF

Inhotim’s Environment Week 2022 extended beyond public programming to include exclusive mediated visits and lectures for its staff—an initiative that reflects the Instituto’s ongoing commitment to deepen employees’ understanding of contemporary ecological issues, enriching the experience they offer to visitors

On May 30 and 31, the “Behind the Scenes at the Viveiro Educador” mediated visit led Inhotim employees to reflect on the Cerrado, highlighting elements of its flora and fauna, cultural aspects, major environmental impacts, and the direct relationships that humans establish with the biome.

On May 31, a mediated visit of the *Meliponário* (Meliponary) officially inaugurated this themed garden, sparking discussions about the biodiversity of the Cerrado and the importance of protecting the pollinators of this biome.

Inhotim staff also participated in a lecture on the fauna of the Cerrado held on June 1 and 2. It addressed the diversity of wildlife in Brumadinho—home to Inhotim and many of its employees.

CULTURAL PERFORMANCES

The *Viveiro Educador* (Educational Nursery) served as the stage for two cultural performances during Inhotim Environment Week 2022 – *Ser do Cerrado*.

On Saturday, June 4, artist Luzmilla Luz presented the performative show *Sintrópica*. The show, built around themes celebrating the land and the forces of nature, featured special guests and captivated the audience enjoying the sunset at Inhotim.

On Sunday, June 5, it was the turn of the Orquestra de Câmara Inhotim to delight the audience. Under the baton of maestro César Timóteo and featuring guitarist Celso Faria, the orchestra performed *Os jardins de Inhotim* (The Gardens of Inhotim) by award-winning Brazilian composer Jônatas Reis. The composition pays tribute to the gardens of Inhotim and was inspired by the sensations, images, and beauty that radiate from them and captivate visitors.

Luzmilla Luz energized the crowd and got everyone dancing during her performance at Inhotim.

Visitors joined the dance on a Saturday of cultural performances.

The Orquestra de Câmara Inhotim closed the Environment Week 2022 program with a concert at the *Viveiro Educador* (Educational Nursery).

During Cerrado Week, Inhotim visitors learned about various characteristics of this biome at the Cabinet of Curiosities.

CERRADO WEEK 2022

National Cerrado Day, observed annually on September 11, has been part of Brazil's environmental calendar since 2003. Its purpose is to raise awareness about the importance of the Cerrado and to sensitize society to the threats it faces. At Inhotim, the date served as an opportunity to activate the theme of the Cerrado among visitors through a program designed to engage diverse audiences. Cerrado Week took place from September 10 to 16, 2022, and featured an array of activities.

SCIENCE SPACE: CERRADO CABINET OF CURIOSITIES

The unique botanical characteristics of the Cerrado were showcased in the Cabinet of Curiosities, set up in the central area of Inhotim. The space included several attractions related to the biome, such as: an exhibition of fruits and seeds from over ninety Cerrado species; exsiccatae and flowers from species of the biome; ten bird species cards selected from the guide *Aves do Inhotim* (Birds of Inhotim); butterflies selected from Inhotim's entomological collection; and an exhibition of flowers and roots from seedlings.

On September 10 and 11, over one thousand visitors were encouraged to interact with seeds, leaves, fruits, exsiccatae, and microscopes, and discover the details that make the Cerrado such a unique biome. The idea was that through direct contact with these elements and conversations with the facilitators of the space, visitors could develop a closer relationship with the Cerrado and gain a new perspective on its biodiversity—making it tangible and meaningful to them. During this activity, seedlings of five Cerrado tree species were also given away to the public.

EDUCATIONAL WORKSHOPS

On September 10 and 11, children and adults participated in educational workshops focused on the Cerrado. Through hands-on activities, these workshops helped raise awareness and knowledge about the biome's flora, fauna, and natural phenomena.

The painting workshop focused primarily on wildlife, natural fires, and the ecosystem services provided by the Cerrado. After a few hours, toucans, jaguars, and maned wolves emerged from paints and brushes, accompanied by Cerrado conservation messages.

The following day, it was the turn of the ikebana workshop to bring the public closer to the flora of the Cerrado. In addition to learning more about ornamental species, attendees used the Japanese floral arrangement technique to create arrangements full of meaning and beauty.

Participants in the painting workshop during Cerrado Week.

OPEN GREENHOUSE: EDDIE ESTEVES COLLECTION

Cerrado Week offered an opportunity to introduce to the public a special collection of cacti and bromeliads acquired through the *Ser do Cerrado* project, featuring species from the Cerrado and other territories. For the first time, the greenhouse built to house the Eddie Esteves collection was opened to the public. On September 10 and 11, specialists from the Inhotim Botanical Garden were on hand to discuss conservation in the Cerrado biome, plant production and collecting, and to show details of the species housed in the greenhouse.

During Cerrado Week, the greenhouse housing the Eddie Esteves cacti collection was opened to the public for the first time.

BIRDWATCHING WALK

On Cerrado Day, September 11, ornithologist Raiane Amorim led a bird-watching walk through the gardens of Inhotim. During this special bird-watching tour, participants were encouraged to sharpen their gaze to observe bird species, understand their behavior, and discover how birds interact with the environment they inhabit.

The activity began prior to Inhotim's public opening hours, since early morning is when bird activity is at its peak. With fewer visitors and less movement of electric carts, birds feel more at ease in the gardens, making them easier to spot. The walk focused on observing bird species from the Cerrado biome that occur at Inhotim and are cataloged in the *Aves do Inhotim* guide, which compiles information on the natural history of ninety-four bird species that inhabit the Instituto. The guide can be downloaded for free online.

DISCUSSION CIRCLE: JARDIM DE SEQUEIRO

As part of Cerrado Week, a discussion circle was held where Young Environmental Agents had the chance to learn about the *Jardim de Sequeiro* (Rainfed Garden), a project led by Professor Julio Pastore at the Universidade de Brasília. The discussion provided an opportunity to talk about the beauty of the seasonality of the plants and naturalistic gardens, drawing attention to maintenance techniques for Cerrado plants in landscape design.

WORKSHOP ON LANDSCAPE DESIGN AND THE CERRADO

From September 12 to 14, a four-day workshop delved into the landscaping potential of Cerrado biodiversity and the role of landscape design in biome conservation. Each day welcomed around ten participants, including Professor Claudia Mattiuz (Esalq/USP), researchers and students from USP and UnB, and staff from Inhotim and the nursery Quinta's Brasil from Igarapé, Minas Gerais.

The workshop featured a three-day immersion in the gardens of Inhotim. Bibliographic research was conducted on the ornamental potential of Cerrado flora and on landscaping as a tool for conservation. Participants conducted a detailed survey to identify species with strong potential for landscape design and also focused on the in vitro cultivation of species from the biome.

During Cerrado Week, Inhotim opened early to welcome participants of the Passarinhada.

A full audience gathered at the Espaço Igrejinha in Inhotim to attend lectures on landscaping and the Cerrado.

The workshop concluded on September 15 with a Lecture Series, where participants shared insights from their immersion and research. The event also featured presentations on the *Ser do Cerrado* project, attracting an audience of students, researchers, and professionals interested in botany and the environment.

Among the attendees were students from the landscape architecture program at the Instituto de Arte e Projeto de Belo Horizonte (INAP), researchers from the Laboratório de Sistemas Socioecológicos at UFMG, and a representative from the Public Prosecutor's Office of Minas Gerais. The participation of diverse sectors enriched the discussion and helped the dissemination of knowledge within society about the potential of using Cerrado plants in landscape design.

THE *SER DO CERRADO* PROJECT 2025-2026

The actions carried out by the *Ser do Cerrado* project at Inhotim in 2022 and 2023 revealed both the public's great interest in the biome and the urgent need to expand conservation efforts. It became clear that the Cerrado needs more attention and that, with knowledge and awareness, we can contribute to its protection.

In the second edition of the project, taking place in 2025 and 2026, Inhotim is focusing on valuing the native flora of the Cerrado in Minas Gerais, with particular emphasis on rare, endemic, and threatened species in the Brumadinho region and its surroundings. The project is also expanding its presence within the Instituto: while in the first edition the *Viveiro Educador* (Educational Nursery) was the central hub of activities, now *Ser do Cerrado* extends throughout Inhotim's Orange Axis.

One of the main fronts of this new phase is the *Ser do Cerrado* Landscaping Program, which will integrate twenty-five new species from the biome into Inhotim's landscaping. The proposal is to create aesthetic experiments that highlight the diversity of local flora and encourage new ways of looking at the Cerrado. As part of this process, field trips and seed collection of species with landscaping potential are planned.

Another highlight of this edition is the investment in scientific research focused on Cerrado grasses. Often overlooked in conservation programs, these grasses and other small plants are taking center stage in experiments to be conducted at the Inhotim Botanical Laboratory.

The project also reinforces its commitment to environmental education with a free program that includes Cerrado Week, workshops, a landscaping course, and a seminar. In this way, we reinforce the message that to protect the biome, one must first know it.

Once again, we hope that this publication and the initiatives of the *Ser do Cerrado* project will foster new understandings of what it means to belong to the Cerrado and inspire other efforts in defense and appreciation of the biome.

SUGGESTIONS TO LEARN MORE ABOUT THE CERRADO

Many initiatives have drawn attention to the need to protect the Cerrado and the people who live in it. Below is a curated list of websites offering qualified content about the Cerrado, its species and peoples, as well as resistance and conservation efforts on this important biome.

- *Campanha Nacional em Defesa do Cerrado* (National Campaign in Defense of the Cerrado): **campanhacerrado.org.br**
- *Embrapa Cerrados*: **embrapa.br/cerrados**
- *Instituto Sociedade, População e Natureza – ISPN* (Society, Population, and Nature Institute): **ispn.org.br/biomas/cerrado**
- *Jardim Botânico de Brasília* (Brasília Botanical Garden): **www.jardimbotanico.df.gov.br**
- *MapBiomas Brasil*: **brasil.mapbiomas.org**
- *Museu do Cerrado* (Cerrado Museum): **museucerrado.com.br**
- *Podcast Cerrados*: **cerrados.org.br**
- *Rede Cerrado* (Cerrado Network): **redecerrado.org.br**
- *Território Temático Ser do Cerrado* (Ser do Cerrado Themed Territory): **inhotim.org.br/territorios-tematicos/ser-do-cerrado/**
- *Tribunal Permanente dos Povos em Defesa dos Territórios do Cerrado* (Permanent Peoples' Tribunal in Defense of the Cerrado Territories): **tribunaldocerrado.org.br**

REFERENCES

Aguiar, Diana, and Helena Lopes, eds. *Saberes dos Povos do* Cerrado *e Biodiversidade*. Campanha em Defesa do Cerrado and ActionAid Brasil, 2020. Accessed September 10, 2022. https://campanhacerrado.org.br/images/biblioteca/Saberes%20dos%20Povos%20do%20Cerrado%20e%20Biodiversidade.pdf.

Bertran, Paulo. *História da Terra e do Homem no Planalto Central: Eco-história do Distrito Federal: do Indígena ao Colonizador*. Editora UnB, 2011.

Brasil. *Política Nacional de Educação Ambiental.* Law 9795 of April 27, 1999. Provides for environmental education, establishes the National Environmental Education Policy, and makes other provisions. Accessed October 7, 2022. http://www.planalto.gov.br/ccivil_03/leis/l9795.htm.

Braun, Pierre J. "Eddie Esteves Pereira 1939-2022: A Life Dedicated to the Cacti and Xerophytic Plants of Brazil." *Cactus and Succulent Journal* 94, no. 2 (June 2022): 197–203.

Carta-manifesto das mulheres e homens vazanteiros. Ilha da Ingazeira, May 2006.

Dias, Genebaldo Freire. *Educação Ambiental: Princípios e Práticas*. 9th ed. Gaia, 2004.

Dias, Jaqueline Evangelista, and Lourdes Cardozo Laureano, eds. *Protocolo Comunitário Biocultural das Raizeiras do* Cerrado*: Direito Consuetudinário de Praticar a Medicina Tradicional*. Articulação Pacari, 2014. Accessed September 10, 2022. https://fase.org.br/pt/ acervo/documentos/protocolo-comunitario-biocultu- ral-das-raizeiras-do-cerrado/.

Dias, Jaqueline Evangelista, and Lourdes Cardozo Laureano, eds. *Farmacopéia Popular do* Cerrado. Articulação Pacari (Associação Pacari), 2009. Accessed September 10, 2022. https://ava.icmbio.gov.br/mod/data/ view.php?d=17&rid=2765.

Drews, Yana Marull et al. *O Fogo e o* Cerrado. ICMBio, 2016. Accessed September 10, 2022. https://www.icmbio.gov.br/educacaoambiental/images/stories/biblioteca/educacao_ambiental/livro-o_fogo_e_o_cerrado-vfmenor.pdf.

Dutra, Rodrigo Marciel Soares, and Murilo Mendonça Oliveira de Souza. "Cerrado, Revolução Verde e Evolução do Consumo de Agrotóxicos." *Sociedade e Natureza* 29, no. 3 (Sep/Dec 2017): 469–484.

IBGE, Coordenação de Geografia e Meio Ambiente, Coordenação de Contas Nacionais. *Contas de Ecossistemas: Resultados do Projeto NCAVES no Brasil*. IBGE, 2022. Accessed September 10, 2022. https://biblioteca.ibge.gov.br/visualizacao/livros/liv101930.pdf.

ISPN, Instituto Sociedade, População e Natureza. Cerrado*: Berço das Águas*, 2020. Accessed October 13, 2022. https://ispn.org.br/biomas/cerrado/berco-das-aguas/.

Klink, Carlos A., and Ricardo B. Machado. "A Conservação do Cerrado Brasileiro." *Megadiversidade* 1, no. 1 (July 2005): 147–155.

Lopes, Rosimeire Batista, and Deise Tatiane Bueno Miola. "Sequestro de Carbono em Diferentes Fitofisionomias do Cerrado." *SynThesis Revista Digital FAPAM* 2, no. 2 (November 2010): 127–143.

MapBiomas. *Relatório Anual de Desmatamento 2021*, 2022. Accessed September 14, 2022. http://alerta.mapbiomas.org.

MapBiomas. *Mapeamento Anual de Cobertura e Uso da Terra no Brasil – Coleção 9.* Accessed July 8, 2025. https://data.mapbiomas.org/dataset.xhtml?persistentId=doi:10.58053/MapBiomas/K8GSYM.

Ministério do Meio Ambiente. *O Bioma* Cerrado. Accessed September 14, 2021. https://antigo.mma.gov.br/biomas/cerrado.html.

Mittermeier, R.A. et al. *Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions*. Cemex, 2004.

Motoki, Carolina. "O Levante das Comunidades Tradicionais." *Repórter Brasil* (January 27, 2018). Accessed September 14, 2022. https://reporterbrasil.org.br/comunidadestra- dicionais/o-levante-das-comunidades-tradicionais/.

Porto Gonçalves, C. W. *Dos* Cerrados *e de suas Riquezas: De Saberes Vernaculares e de Conhecimento Científico*. Edited by Diana Aguiar and Valéria P. Santos. FASE and CPT 2019. Accessed September 10, 2022. https://fase.org.br/wp-content/uploads/2019/12/PUBLICACAO_CERRADO-2.pdf.

Reigota, Marcos. "Educação política e competência técnica." In *Educação Ambiental: Desenvolvimento de Cursos e Projetos*, edited by Arlindo Philippi Júnior and Maria Cecília Focesi Pelicioni. 2nd ed. USP, Núcleo de Informações em Saúde Ambiental, Signus, 2002.

Ribeiro, Ricardo Ferreira. *Florestas Anãs do Sertão: O* Cerrado *na História de Minas Gerais*. Autêntica, 2005.

Ribeiro, Ricardo Ferreira. *Sertão, Lugar Desertado: O* Cerrado *na Cultura de Minas Gerais*. Autêntica, 2006.

Ribeiro, J. F., and B. M. T. Walter. "As principais fitofisionomias do Bioma Cerrado." In Cerrado*: Ecologia e Flora*, edited by S. M. Sano et al. Embrapa Informação Tecnológica; Embrapa Cerrados, 2008.

Silberbauer-Gottsberger, Ilse, and Gerhard Gottsberger. "A Polinização de Plantas do Cerrado." *Revista Brasileira de Biologia* (Rio de Janeiro) 48, no. 4 (November 1988): 651–663.

Souza, Vinicius Castro et al. *Guia das Plantas do* Cerrado. Taxon Brasil, 2018.

PHOTO CREDITS

Alexandre Guzanshe
pp. 171, 173

Brendon Campos
pp. 99, 114, 116, 147, 150, 153, 155, 156, 158, 164

Bruno Figueiredo
pp. 149, 161, 163, 166, 167

Eddie Esteves Pereira
p. 142

Glenio Campregher
pp. 140, 168, 170

Henrique Marques
pp. 148, 152, 160, 167

João Marcos Rosa
pp. 27, 28, 33, 100 a 113, 124, 128, 131, 133, 134, 137, 138, 139, 145, 164

Maria Eduarda Santos Silva
p. 153

CREDITS

SER DO CERRADO PROJECT 2022-2023

Produced By
Instituto Inhotim

Supported By
Ministério Público de Minas Gerais
Plataforma Semente

INSTITUTO INHOTIM

Project Coordination
Juliano Borin
Sabrina Carmo
Vinícius Porfírio
Wendell Silva

INHOTIM BOTANICAL GARDEN

Landscape Designer
Pedro Nehring

Botanical Garden Manager
Arthur Castro

Assistant Botanical Curator
Bárbara Sales

Assistant Botanists
Alex Coelho
Tatiana Almeida

Specialist Biologist
Nayara Mota

Environmental Analysts
Bianca Paulino
Filipe Framil
Laís Silva

Viveiro Educador Technician
Walter Pereira

Viveiro Educador and Phytosanitary Supervisor
Leandro França

Gardeners
Afonso Silva
Arivaldo Cardoso
Celton de Oliveira
Felipe Araújo
Frank Junior Ferreira
Nicias Brandão
Vicente Cruz

Phytosanitary Gardeners
Alexandre Santos
Carlos Aleandro
Elenir Santos
Sergio Lourenço

Gardening Aides
Andrey Fagundes
Gilmar Souza
Italo Nicomede

Garden Supervisors
Carlos André da Silva
Elizabete da Silva
Geraldo Almeida
Vanderley da Silva

Irrigation Supervisor
Geraldo Anacleto

Tractor Operator
Marcelo Ferreira

Administrative Assistants
Erica Castro
Juceara Prado

Youth Apprentices
Fernanda Lima
Maria Eduarda de Oliveira

EDUCATION DEPARTMENT

Education Supervisor
Luiza Verdolin

Administrative Assistant
Lucas Ribeiro

Project Analyst
Saymon Santos

Librarian
Josenberg Mendes

Educators
Ana Vitória Martins
Luiz Querino
Petúnia Caroline de Souza

Youth Apprentice
Maria Eduarda Santos

COMMUNICATIONS

Lorena Vicini
Wendell Silva
Ricardo Lopes
Alan Dhom
Ana Clara Moreira
Brendon Campos
Danielle Pinto
Lana Costa
Luana Campos
Thiago Pacheco

Collaborators
Alles Blau
Área de Serviço
Fernanda Zanette
Giovanna Ribeiro
Hardy Design
Ítalo Bacci
Mandelbrot
Nitro
Renata Gibson
Sílvia Almeida

PROJECTS

Project Coordinator
Vinicius Santos

Project Analysts
Beatriz Sousa
Caio Otta
Davds Lacerda
Viviane Campos
Viviane Melo

Public Relations
Marina Toledo

Legal Counsel
Paula Sulmonetti

PUBLIC PROSECUTOR'S OFFICE OF MINAS GERAIS

Attorney General
Jarbas Soares Júnior

Inspector General of the Public Prosecutor's Office
Marco Antônio Lopes de Almeida

Deputy Attorney General for Legal Affairs
Eliane Maria Gonçalves Falcão

Deputy Attorney General for Administration
Márcio Gomes de Souza

Deputy Attorney General for Institutional Affairs
Carlos André Mariani Bittencourt

CAOMA Coordinating Public Prosecutor
Carlos Eduardo Ferreira Pinto

Regional Coordinating Public Prosecutor of the Environmental Prosecutor's Offices of the Paracatu, Urucuia, and Abaeté River Basins
Carolina Frare Lameirinha

MPMG Legal Analyst
Luciano José Alvarenga

General Director
Clarissa Duarte Belloni

PLATAFORMA SEMENTE

MPMG Legal Analyst
Liliane Tavares Oliver

Supervisor
Renata Fonseca

Legal Analyst
Anna Otoni

Communications Advisor
Camila Dias

Financial Analyst
Nilton Ribeiro

Environmental Technical Analyst
Paula Grandi Coelho

Acknowledgements
Inhotim extends its thanks to the partners, supporters, and suppliers who stood with us throughout the *Ser do Cerrado* project 2022–2023:
Brigada Carcará
Cactário Güydo Horta
Centro de Resgate e Ecologia de Abelhas Nativas
Claudia Mattiuz
Diana Aguiar
Diego Rafael Gonzaga
Epicentro Urihi
Escola Superior de Agricultura Luiz de Queiroz – Universidade de São Paulo
Eurico Novy
Farmácia Viva do Núcleo de Práticas Integrativas e Complementares
Floresta Nacional de Paraopeba
Gerson Dias
Giovana Avancini
Giselda Durigan
Holambelo Gran Flora
Instituto Federal de Rio Verde
Jardim para Todos
José Fernandes de Sousa Filho
Julio Pastore
Lindevalda Borges
Madson Trindade
Maria Auxiliadora Drumond
Maurício de Oliveira
Monica Araújo Cotta Corrêa
Otávio Ribeiro
Parque Estadual da Serra do Rola-Moça
Paulo Eduardo de Souza da Silva
Rede Brasileira de Jardins Botânicos
Rede de Sementes do Cerrado
Renato Tsutsumi
Rio de Janeiro Botanical Garden
Rupestris Biotecnologia em Produção Vegetal
Samuel Gonçalves (*Um Botânico no Apartamento*)
Terral Jardinagem
Universidade de Brasília
Viveiro Boa Vista
Viveiro Cipreste
Viveiro Quinta's Brasil
Viveiro Viverde
Zélia Vieira

SER DO CERRADO PROJECT 2025-2026

Produced By
Instituto Inhotim

Supported By
Ministério Público de Minas Gerais
Plataforma Semente

INSTITUTO INHOTIM

Project Coordination
Sabrina Carmo
Vinicius Santos

NATURE AND GREEN SPACES DEPARTMENT

Nature Manager
Sabrina Carmo

Green Spaces Supervisor
Juceara Prado

Environmental Management Supervisor
Bianca Paulino

Specialist Biologist
Thamyris Bragioni

Environmental Analysts
Laís Silva
Petúnia Caroline de Souza
Theo Karam

Assistant Botanical Curator
Bárbara Sales

Assistant Botanist
Danielle Aparecida Souto Ferreira

Educational Advisor
Nilton César Silva dos Santos

Viveiro Educador Technician
Walter Pereira

Garden Supervisors
Carlos André F. da Silva
Elizabete Tânia da Silva
Geraldo Farias de Almeida
Leandro Ferreira França
Vanderley Francisco da Silva
Werberth dos Santos Braga

Administrative Assistants
Erica Castro
Lilian Duarte

DESIGN

Manager
Ricardo Lopes

Designers
André Travassos
Lana Costa
Vitória Oliveira

Graphic Production
Clarice Lacerda

Administrative Assistant
Ana Luiza Andrade

PROJECTS

Manager
Vinicius Santos

Coordinator
Aline Pereira

Project Analysts
Mariana Ferreira
Pipe Nascimento
Viviane Melo

LEGAL DEPARTMENT

Manager
Paula Sulmonetti

PUBLIC PROSECUTOR'S OFFICE OF MINAS GERAIS

Attorney General
Paulo de Tarso Morais Filho

Inspector General of the Public Prosecutor's Office
Marco Antônio Lopes de Almeida

Deputy Attorney General for Legal Affairs
Reyvani Jabour Ribeiro

Deputy Attorney General for Administration
Iraídes de Oliveira Marques

Deputy Attorney General for Institutional Affairs
Hugo Barros de Moura Lima

CAOMA Coordinating Public Prosecutor
Luciano Luz Badini Martins

Regional Coordinating Public Prosecutor of the Environmental Prosecutor's Offices of the Paracatu, Urucuia, and Abaeté River Basins
Carolina Frare Lameirinha

MPMG Legal Analyst
Luciano José Alvarenga

PLATAFORMA SEMENTE

MPMG Legal Analyst | Núcleo Semente
Liliane Tavares Oliver

MPMG Administrative Analysts | Núcleo Semente
Aline Bastos
Renata Fonseca

Project Manager
Anna Otoni

Financial Coordinator
Nilton Ribeiro

Environmental Technical Coordinator
Paula Grandi Coelho

Communications Supervisor
Lucas Rodrigues

Acknowledgements
Inhotim extends its thanks to the partners, supporters, and suppliers who are standing with us

throughout the *Ser do Cerrado* project 2025–2026:
Alexsander Azevedo
Audience Development Management at Inhotim
Brumas do Espinhaço Private Natural Heritage Reserve
Communications Management at Inhotim
Education Management at Inhotim
Márcio Protzner
Production Coordination for Artistic Programming and Corporate Events at Inhotim

INSTITUTO INHOTIM

Bernardo Paz
CREATOR AND FOUNDER

Allan Schwartzman
FOUNDING DIRECTOR

Board of Trustees

Eugênio Mattar
PRESIDENT

Luís Paulo Montenegro
VICE PRESIDENT

Alfredo Pinto
Andréa Cruz
Ayrson Heráclito
Betania Tanure
Cristiano Paz
Daniela Vilella
Eduardo Wurzmann
Francisco Müssnich
Genny Baran Nissenbaum
Guilherme Teixeira
Gustavo Ioschpe
Gustavo Pimenta
Izabella Teixeira
Jandaraci Araújo
José Carlos Carvalho
Keyna Eleison
Luciana de Oliveira Hall-Cezar Coelho
Maguerite Etlin
Maguy Etlin
Mariana Moura
Maurício Campos Júnior
Paula Setubal
Paulo Sérgio Kakinoff
Ricardo Guimarães
Roberto Brant
Rubens Menin Teixeira de Souza
Susana Leirner Steinbruch
Tiago Pessôa

Fiscal Council

Antônio Pelicarpo
Joaquim Guimarães
Viviane Ventura

Statutory Board

Paula Azevedo
MANAGING DIRECTOR – PRESIDENT

Júlia Rebouças
ARTISTIC DIRECTOR

Executive Board

Gleyce Heitor
EDUCATION AND TERRITORY DIRECTOR

Luciana Zanini
FINANCE, PEOPLE, AND STRATEGY DIRECTOR

Felipe Paz
INSTITUTIONAL RELATIONS DIRECTOR

Alita Mariah
NATURE, OPERATIONS, AND INFRASTRUCTURE DIRECTOR

Patricia Schmidt
COMPLIANCE OFFICER & DIRECTOR OF RISKS AND CONTROLS

Cláudia Silveira
SECRETARY

Art

Curatorship
Beatriz Lemos, *Coordinating Curator*
Douglas de Freitas, *Coordinating Curator*
Marilia Loureiro, *Curator*
Deri Andrade, *Assistant Curator*
Lucas Menezes, *Assistant Curator*
Varusa, *Curatorial Assistant*
Gabriel Barreto, *Production and Planning Coordinator*
Graciela Silva, *Administrative Assistant*

Art Collection
Bruna Oliveira, *Manager*
Alex Maciel
Álisson Valentim
Anselmo
Daniela Espínula
Elaine D. Matos
Gabriela Santiago
Paulo Rodrigues
Thiago Botelho
Victor Taumaturgo

Art Studio
Elton Damasceno, *Manager*
Aparecida Alberto
Daiane Silva
Fernando Fagundes
Guilherme Ventura
Iveraldo Luis
Janete Fabiana
Josiene dos Santos
Marco Antônio
Priscila Mara
Rodrigo Silva
Sérgio de Fátima
Valdiney Fernandes

Communications
Wendell Silva, *Manager*
Ana Luiza Andrade
Jheniffer Lourenço
Lucas Uriel
Magno Barbosa
Mariana Gonzaga
Matheus Salvino
Thiago Pacheco

Design
Ricardo Lopes, *Manager*
André Travassos
Clarice Lacerda
Lana Costa
Vitória Oliveira

Store
Kit Paz, *Manager*
Anna Gomes
Dafni Leonardo
Daniel Colares
Daniele Vieira
Fabi Faria
Fátima Murta
Gabriela Silva
Giovana Ester
Guilherme Morais
Hariel Santos
Júnia Eduarda
Lili Soares
Luiz Souza

Exhibition Production
Clara Machado
Dani Cardoso
Serafim Cruz

Programming Production
Bruna Campos
Jade Santos
Julie Aguiar
Lylah Araújo
Raphaelly Sandrine
Rogério Guimarães
Sarah Monteiro
Wallisson Arthur

Nature

Nature and Green Spaces
Sabrina Carmo, *Manager*
Abelar Moreira
Adriana Santos
Alex Rodrigues
Alexandre de Souza
Ana Paula Santos
Ana Paula Silva
Antônio de Freitas
Antônio França
Antônio Júnior
Aristides Borges
Arthur Pablo
Aumir de Paulo
Bárbara Sales
Beatriz Oliveira
Bianca Paulino
Caio Alves
Carlos de Jesus
Carlos Silva
Celton de Oliveira
César Augusto
Claudia Rodrigues
Daniel Henrique
Doglas Neres
Eber da Silva
Edmilson Candido
Eduardo Silva
Elenir Santos
Elizabete Silva
Emilly Santos
Enilson Gonçalves
Eric Junior
Erica Castro
Fabiano Lima
Frank Junior
Gabriela Candida
Geraldo Anacleto
Geraldo Custódio
Geraldo Farias
Geraldo Miguel
Glaucia Vieira
Gleiciane Silva
Gleiciane Teixeira
Grazi Santos
Gustavo Vieira
Hamilton Conceição
Heberte
Ilma Almeida
Jacson Lopes
João Carlos
Juceara Prado
Karina Maia
Lais Diniz
Larissa Nunes
Leandro Ferreira
Leandro Silva
Leonardo Vertelo
Lilian Duarte
Lourdes de Oliveira
Lucas Pereira
Luiz Alves
Luiz Domingos
Marcelina Aparecida
Marcelo Ferreira
Marcelo Miranda
Marco Antonio
Maxwel Damião
Nelse Santos
Nícias Brandão
Petúnia Sousa
Rian Morais
Sara Dias
Sergio Ferreira
Thamyris Bragioni
Theo Karam
Thiago Alves
Ulisses Oliveira
Valnei Alves
Vanderlan Silva
Vanderley Silva
Vando Silva
Victor Mendes
Walter Silva
Wellington Severino
Werberth Braga
Yuri Thierry

Education

Education
João Paulo Andrade, *Manager*
Amanda Homem
Brenno Theotônio
Christiane Avelino
Clara Duarte
Daniela Brandão
Daphne Cunha
Diu
Felipe Gabriel
Filipe Camato
Gabriel Rodrigues
Geovana Antonelle
Isadora Godoy
Júlio Gotelip
Laura Matos
Leonardo Alves
Letícia Peixoto
Lucas Ribeiro
Paula Libertad
Pedro Medeiros
Pedro Ton
Rafa S.
Saymon Santos
Victória Brandão

Audience Development
Luiza Verdolin, *Manager*
Agnes Cayane
Alice Martins
Aline dos Anjos
Aline Silva
Ana Amorim
Ana Cristina
Ana Luiza
Anna Luiza
Antônio Carlos
Ariany Campos
Brenna Hevilen
Bruna Alves
Bruna Cássia
Bruna Dominiguitti
Bruna Esthefany
Bryan Brum
Camila Dias
Camila Stephanie
Carlos Alberto
Carol Silveira
Debora Reszende
Deyse Santos
Eduardo Torres
Ellen Brito
Ellen Cristina
Estela Gonçalves
Ester Karen
Esther Fontes
Esther Silva
Evellim Lavine
Evelyn Amaral
Felipe Santana
Fernanda Maia
Fernando Henrique
Gabriel de Paiva
Gabriel Paulino
Giovana Miranda
Guilherme Dias
Gustavo
Hyago Victor
Isaura Braga
Jhoelly Rodrigues
João Vitor Cruz
Josiane Lopes
Juan Mendes
Júlia Guedes
Kamilly Alves
Karine Almeida
Kátia Braga
Kayky Mateus
Kelve Wilian
Khelysne Pereira
Klênia Santos
Larissa Leônia
Larissa Souza
Lorraine Serpa
Luan Almeida
Luann Dutra
Lucas Dutra
Ludmila Oliveira
Luiz Viegas
Marcella Neves
Marcelo de Azevedo
Marco Lage
Marcos Vinícios
Marcos Vinicius
Maria Eduarda
Maria Izabel
Maria Luiza
Marilza Alvares
Milena Castro
Milton Lira
Moyses Vittor
Mirella Castro
Naiara Oliveira
Neyla Cristina
Pablo Dias
Paloma Helen
Paulo Henrique
Pedro Mendes
Pedro Souza
Queila Oliveira
Rhuan Ventura
Richard Félix
Rosemary Diniz
Sabrina Rafaela
Sirlene da Silva
Talita Dias
Thais Costa
Vicente Cruz
Victoria de Souza
Vitoria de Carvalho
Vitória Lira
Wendell Cauã
Yasmim Barbosa

Music School
Ângela Campos
Larissa Alvarenga
Maria Elisa
Néia Maia

Finance, People, and Strategy

Strategy and Change
Lorena Vicini, *Executive Manager*

Financial and Administrative
Andreza Marinho, *Manager*
Adriana Gonçalves
Adriana Silva
Anabelle Marques
Antonio Marcos
Eliane Meneses
Gabriela Lisboa
Karine de Deus
Priscila Nascimento
Renata Gomes

Administrative Controllership
Cristiane de Paula, *Manager*
Daniel Freitas

Procurement and Transportation
Eduardo Silva, *Manager*
Celson Silva
Eduarda Ribeiro
Elber dos Santos
Flavia Lamounier
Itacilde Nascimento
Lara Lima
Marcos Vinicius
Renan Faustini
Renata Passos
Ronald Eduardo
Rone Teixeira
Suelene Alves
Valdeci Silva
Washington Silva

People Management
Raquel Murad, *Manager*
Ana Clara Rezende
Diego Calabria
Emanuelly Souza
Fernanda Silva
Gabrielly Braga
Josiane Rufino
Kamyle Leonardo
Karina Silva
Kauã Nunes
Kenia Sant' Anna
Larissa Gabriela
Laryelle Rezende
Letícia Barbosa
Lizier Oliveira
Luciana Lima
Milena Maia
Roberta Mariana
Sheila Santos
Taiz Sales
Viviane Leonarda
William Cordeiro
William Oliveira

Legal Department
Paula Sulmonetti, *Manager*
Karine Lacerda

Product, Data, and Information Technology
Taicê Mucelle, *Manager*
Josue Temporim
Pablo Herique
Pedro Assis
Richard Ryan
Samuel Moreira
Tiago Moreira
Viviane Freitas
Wellington de Paula

Operations and Infrastructure

Operations
Gabriel Corrêa, *Manager*
Alexandre César
Ana Carolina
Beatriz Nogueira
Bruna Thais
Camila Almeida
Eduarda Rodrigues
Eduardo Silva
Elton dos Santos
Emerson Avelar
Endrio Venâncio
Erick Gonçalves
Ester Ariadine
Ester Silva
Fernando Resende
Flávia Aparecida
Gabriel do Carmo
Gabriel Fernandes
Giovana Batista
Greyce Silva
Guilherme Campos
Guilherme Eduardo
Guilherme Lima
Guilherme Lopes
Gustavo Carreiro
Henrique Faria
Ihago da Silva
João Damasceno
Juan Pablo Santos
Júlia Almeida
Julia Silva
Kaique Junior
Kauan Junior
Ketlen Brum
Kimberly
Láisa Christina
Lucas Aguiar
Lucas Vitor
Luiz Felipe
Marcus Vinicius
Maria Araújo
Maria L. Souza
Maria Luisa
Mariana Kruc
Mattéo Silva
Paulo Maia
Piettro Mendes
Raphaela Faccion
Rayanne Soledad
Ricely Diniz
Roane Kassia
Ruth Reis
Sabrina Gonçalves
Samuel Lucas
Sargento Wagner
Suellen Cristina
Tenente Aparecido
Valdilene Edevim
Vanessa Rodrigues
Victor Barbosa
Victor Cabral
Victor Hugo Costa
Vitoria Karoline
Vitoria Silva
Wederson Martins
Yasmim Barra

Engineering and Infrastructure
Otávio Rodrigues, *Manager*
Adeilton de Jesus
Alessandro Souza
Altair Santos
Antônio Gabriel
Blander Abreu
Braian Felipe
Carlos Celestino
Cleyton Souza
David Cardoso
Ernando Andrade
Euverio Braga
Everton Celestino
Gilberto Ferreira
Gilmar Silva
Gilson Ribeiro
Guilherme Santiago
Gustavo Ferreira
Ilgo
Jefferson Tavares
Jéssica Silva
Joaquim Mendes
Joel Marcos
Jose Antonio
Jose Geraldo
José Valdir
Kennedy Sant'anna
Leonardo Pio
Lucas Las Casas
Luciano Drumond
Ludimila Sales
Luís Rocha
Mackton Silva
Marlon Ferreira
Olegario Fagundes
Rayane Souza
Reginaldo Aguiar

Silvano Dias
Sofia Vasconcelos
Ueuller Soares
Valter Silva
Walisson Silva
Welbe Morais
Yedda Silva

General Services
Ana Cristina
Andrea Roberta
Camila Braga
Dalva Ribeiro
Diego Rodrigues
Edivânia Rocha
Flavia Pereira
Geraldo Gonçalves
José Mauro
Juliana Aguiar
Kelly Pereira
Lindaura Matos
Luzia Costa
Margareth Firmino
Maria Aparecida Divino
Maria das Dores
Maria de Lourdes
Nilson Pereira
Patrícia Santana
Rony Danniel
Rosimara da Silva
Sabrina Lima
Sara Pereira
Sarah da Silva
Solange Aparecida
Solange Borges
Tânia Silva
Thainara Teixeira
Thayna Miranda
Vagner Santos
Valdirene Amorim
Vicentina Dias
Washington Marinho

Institutional Relations

Sponsorships and Partnerships
Andrea Lombardi, *Manager*
Beatriz Sousa
Davds Lacerda
Luana Campos
Maria Candido
Sophia Barcelos
Viviane Cunha

Projects
Vinicius Santos, *Manager*
Aline Pereira
Pipe Nascimento
Viviane Melo

Public Relations
Marina Toledo

Risks and Controls

Compliance
Elivelton Cruz, *Manager*
Wellinton Junior

Patrons

Benefactor
Camila e Eugênio Mattar
Flávia e Guilherme Teixeira

Diamond
Nadia and Olavo Setubal
Roberto Setubal

Gold
Iris Kaufmann and Gustavo Ioschpe
Luís Paulo Montenegro
Teca and Cristiano Paz
Teresa and Cândido Bracher
Valéria Nogueira and Maurício Campos

Silver
Alfredo Pinto
Beatriz Menin and Rubens Menin
Betania Tanure and Family
Daniela Villela
Fabio Barbosa
Genny Nissenbaum
Julisa and Tiago Pessôa
Lina and Eduardo Wurzmann
Maguy Etlin
Paulo Kakinoff
Susana Leirner
Verônica Dantas
and Francisco Müssnich

Patrons
Albuquerque Contemporânea
Galeria de Arte
Ananda Lopes and Leonardo Lopes
Cleusa Garfinkel
Fernanda Pessoa
and Robinson Salvador
Fernando Marques Oliveira
Fortes D'Aloia & Gabriel
Galatea
Galeria Almeida & Dale
Galeria Karla Osorio
Galeria Luisa Strina
Galeria Nara Roesler
Geyze Diniz
Juliana de Lima Vasconcellos
Lenny Niemeyer
Lucas Araripe
Nazaré Almeida Braga Metsavaht
and Oskar Metsavaht
Rita Leite and Nilson Teixeira

Young Patrons
Carolina and Mario Ermírio de Moraes
Denise Valadares
and Marcelo Chelles
Fabiana Cepeda
and Luis Rodrigo Almeida
Felipe Urbano
Luddi Oliveira
Luiza Mussnich and Pedro Sauer
Paola Sarkis
and Renata Faria Nascimento
Vinicius Veloso

Sponsors and Partners 2025

Master Maintainer
Vale

Strategic Partners
Nubank
Cemig

Master Sponsors
Shell
Itaú

Gold Sponsors
Vivo
CBMM
Grupo Ultra
Petronas
Santander

Silver Sponsors
C6 Bank
Instituto Unimed
B3

Bronze Sponsors
UBS
UBS BB
Banco BV
Drogaria Araujo
Mapfre
Banco Mercantil
Fundo Museu Escola
Pottencial Seguradora
Instituto Machado Meyer
Química Anastacio
Supernosso

Support
Cescon Barrieu Advogados
We Benefícios
Semove

Official Rental Company
Localiza

Official Transportation Partner
Stellantis

Institutional Partners
Clara Resorts
BMA Advogados
Bain & Company
Falconi
EcoSimple
Orchid Brazil
Embaixada da França no Brasil
Embaixada dos Estados
Unidos no Brasil
Kouda
Embaixada da Colômbia no Brasil
Consulado da Colômbia em São Paulo
Consulado Geral do Peru
no Rio de Janeiro
Embaixada do Peru no Brasil
SP-Arte
CasaCor
Sympla
Fernanda Pessoa Grupo Educacional

Media Partners
Jornal Estado de Minas
Revista Piauí
Rádio CDL
FredIzak
D Mídia
JCDecaux
Jornal Circuito Notícias
Portal da Cidade Brumadinho
FlyMídia
LivOOH
Eletromídia
A3TV
OOH Brasil
Rádio Inconfidência
Rede Minas
Canal Curta
Arte! Brasileiros
Visual
ELLE
Quatro Cinco Um
Rádio Band News
Band Minas
Rádio Mix

Produced by
Lei Rouanet

Every effort has been made to ensure that the mention of our sponsors, council members, patrons, members, and collaborators was published correctly. If any error has occurred, please inform us at info@inhotim.org.br.

List updated on August 12, 2025.

PUBLICATION *SER DO CERRADO: SABERES E DIVERSIDADES NOS JARDINS DO INHOTIM* 1st PORTUGUESE EDITION, 2022

Organization
Lorena Vicini
Sabrina Carmo
Sílvia Almeida

Editorial Project
Lorena Vicini

Editorial Coordination
Sílvia Almeida

Edition
Lorena Vicini
Sabrina Carmo
Sílvia Almeida
Vinícius Porfírio

Texts By
Alex Coelho
Bárbara Sales
Sabrina Carmo
Sílvia Almeida
Vinícius Porfírio

Research
Alex Coelho
Ana Vitória Martins
Bárbara Sales
Juliano Borin
Nayara Mota
Sabrina Carmo
Sílvia Almeida
Tatiana Almeida
Vinícius Porfírio

Illustration
Vito Quintans

Photography
Alexandre Guzanshe
Brendon Campos
Bruno Figueiredo
Eddie Esteves Pereira
Glenio Campregher
Henrique Marques
João Marcos Rosa
Maria Eduarda Santos Silva

Interview Transcription
Renan Camilo

Proofreading
Ricardo Lelis

Graphic Design, Layout, and Graphic Production
André Travassos
Yannick Falisse

Printing
Rona Editora

PUBLICATION *SER DO CERRADO: KNOWLEDGE AND DIVERSITY IN THE GARDENS OF INHOTIM* 1st ENGLISH EDITION, 2025

This English edition is the translation of the 2nd Portuguese edition, which largely maintained the content from the 1st Portuguese edition, and therefore, the credits remain the same for: Organization, Editorial Design, Editing, Writing, Research, Photography, Illustration, and Interview Transcription. We thank everyone involved for their collaboration.

Organization
Laís Silva
Sabrina Carmo

Editorial Coordination
Clarice Lacerda

Editorial Assistant
Sílvia Almeida

Edition
Clarice Lacerda
Sílvia Almeida

Design Supervision
Clarice Lacerda
Lana Costa
Ricardo Lopes

Graphic Design and Layout
Luísa Rabello

Graphic Production
Clarice Lacerda

Text Update
Laís Silva
Petúnia Sousa
Sílvia Almeida

Texts By
Sílvia Almeida

Translation
Juan Carlos Urbina

Proofreading
Regina Stocklen

Printing
Rona Editora

Cataloging-In-Publication (CIP)
(EDOC BRASIL)

I59s
Instituto Inhotim
Ser do Cerrado: knowledge and diversity in the gardens of Inhotim / Organizers Laís Silva... [et al.]; translator Juan Carlos Urbina; illustrator Vito Quintans. – 1st ed. – Brumadinho, MG: Instituto Inhotim, 2025.
192 p. : il. color. ; 26 cm.

Includes bibliography
ISBN 978-65-988326-1-2

1. Cerrado (Brazil). 2. Sociobiodiversity. 3. Botanical gardens. I. Silva, Laís. II. Carmo, Sabrina. III. Lacerda, Clarice. IV. Almeida, Sílvia. V. Urbina, Juan-Carlos. VI. Quintans, Vito. VII. Title.
DDC 581.9681

Prepared by Maurício Amormino Júnior – CRB6/2422

This edition of *Ser do Cerrado: Knowledge and Diversity in the Gardens of Inhotim* was typeset in Vista Sans OT, PP Neue Montreal, and TT Trailers typefaces; and printed in offset polychrome on 90 g/m² AP paper for the text block and 300 g/m² Supremo cover stock for the cover. The print run of one thousand copies was produced in September 2025 by Rona Editora in Belo Horizonte, Minas Gerais, Brazil.

PUBLIC PROSECUTOR'S OFFICE OF MINAS GERAIS AND NATIONAL COUNCIL OF THE PUBLIC PROSECUTOR'S OFFICE

The Public Prosecutor's Office is responsible for upholding the legal order, the democratic system, and the inalienable social and individual interests. Among its constitutional duties is the protection of the environment to safeguard sustainable life for future generations. The Environmental Commission of the National Council of the Public Prosecutor's Office is dedicated to strengthening and improving the environmental protection work of the Brazilian Public Prosecutor's Offices, fostering national integration and institutional development.

PLATAFORMA SEMENTE

The Plataforma Semente was developed by the Public Prosecutor's Office of Minas Gerais, through the Operational Support Center for the Environmental Protection Prosecutor's Offices (CAOMA), in partnership with the Centro Mineiro de Alianças Intersetoriais (CeMais). It aims to ensure greater legal certainty and transparency in the selection, management, and monitoring of projects funded by environmental compensatory measures, submitted by Third Sector partners, the private sector, and public authorities. Through Plataforma Semente, innovative proposals aimed at the protection, conservation, and restoration of the environment are effectively turned into reality throughout Minas Gerais.

The *Ser do Cerrado* project was born from a fruitful partnership between Instituto Inhotim and the Public Prosecutor's Office of Minas Gerais, through the Plataforma Semente. Remarkable for revealing the stories and details of an extraordinary biome—still little known and highly threatened—one of the outcomes of the project was the publication, in 2022, of the inaugural edition of the book *Ser do Cerrado: Saberes e diversidade nos jardins do Inhotim* (*Ser do Cerrado: Knowledge and Diversity in the Gardens of Inhotim*).

Based on the premise that one must know in order to protect, the publication seeks to expand the public imagination with regard to nature in Brazil through information, interviews, and initiatives that have the Cerrado as their central theme. This first English edition is being published in 2025 to reaffirm the role of Inhotim in environmental education, the conservation of local biodiversity, and the discussion of relevant contemporary issues.

ISBN 978-65-988326-1-2

PRODUCED BY

SER DO CERRADO | INHOTIM

SUPPORTED BY

semente

MPMG Ministério Público do Estado de Minas Gerais