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# Grassland Birds of Brazilian Cerrado: Population Trends and Conservation Challenges

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## ABSTRACT

Grassland ecosystems, characterized by open landscapes dominated by grasses, encompass diverse formations influenced by geological, climatic, and anthropogenic factors. These environments play a pivotal role in global biodiversity, carbon cycling, and ecosystem services. Due to the worldwide loss and degradation of these habitats, grassland birds are experiencing an unprecedented population decline. This work aims to supply an in-depth exploration of the conservation status of Cerrado grassland birds, including their population trends, protective measures, and primary threats within this bird group. Through an exhaustive literature review, conference of endangered species databases, and field data of grassland birds gathered by us, we compiled a comprehensive dataset detailing the trends, threats, and distribution of Cerrado grassland birds. The Cerrado, the world's largest savanna and Brazil's second-largest biome, accommodates 116 bird species specialized in grassland formations, including 13 endemics. Significantly, a notable proportion (26%) of endangered bird species in the Cerrado are strongly associated with grasslands. The primary threats faced by this group encompass habitat loss and degradation, the proliferation of exotic grass species, and the recurrent incidence of wildfires. Upon analyzing population trends, a concerning 37% of Cerrado grassland birds show declining numbers, with inadequate representation in existing protected areas. While grasslands hold global significance, conservation endeavors often give precedence to tropical forests. The preservation of central Brazil's grassland formations assumes utmost importance in safeguarding the abundant biodiversity of the Cerrado. These formations function as pivotal habitats for endangered and declining bird species, underscoring the pressing need to develop conservation strategies attuned to the unique challenges posed by grassland environments.
**Keywords:** endangered species; biodiversity conservation; population decline.

## RESUMO

Os ecossistemas campestres ocorrem em uma variedade de formas e são determinados pela geologia, geografia, umidade, tipo de solo, elevação, clima e regime de perturbação dos ambientes. Atualmente existem poucos campos nativos em qualquer lugar da região Neotropical, sendo que todos estão ameaçados em algum grau, e como resultado da perda e da degradação desses habitats ao redor do mundo, as aves campestres, como grupo, experimentam os maiores declínios populacionais conhecidos. O presente artigo apresenta uma discussão sobre o status de conservação das aves campestres do Cerrado, suas tendências populacionais, seu grau de proteção e as principais ameaças a esse grupo. Por meio de uma revisão bibliográfica e consulta a bases de informações sobre espécies ameaçadas elaboramos um banco de dados com informações sobre tendências, ameaças e distribuição das aves campestres. O Cerrado, segundo maior bioma brasileiro, abriga em sua área 116 espécies de aves consideradas especialistas de formações campestres, sendo 13 endêmicas. Das espécies de aves ameaçadas de extinção do Cerrado, 26% são associadas às formações campestres. Os principais fatores de ameaça para o grupo são a perda e degradação de habitat, a presença de gramíneas exóticas e a ocorrência de incêndios. Ao avaliar a tendência populacional, observa-se que 37% das aves campestres do Cerrado estão em declínio, e estão pouco representadas nas áreas protegidas existentes. Apesar da importância global dos biomas campestres, os esforços de conservação

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internacionais e nacionais tendem a priorizar as florestas tropicais. As informações aqui expostas demonstram que a conservação das formações campestres do Brasil central tem uma importância crítica para a conservação da biodiversidade do Cerrado. Essas formações concentram espécies ameaçadas e em declínio, tornando urgente o estabelecimento de estratégias de conservação direcionadas às aves de ambientes campestres.
**Palavras-chave:** espécies ameaçadas; listas vermelhas; declínio populacional.

## 1. Introduction

Despite their significant importance in terms of biodiversity and ecosystem services, grasslands, or grass-dominated formations, are among the world's most threatened ecosystems (White et al., 2000; Bardgett et al., 2021). This risky state primarily results from extensive conversion to agriculture, being one of the most substantial global changes induced by human activities. Across the globe, these ecosystems face imminent destruction due to soaring rates of habitat loss and inadequate protective measures. They have been identified as one of the terrestrial biomes most vulnerable to biodiversity and ecosystem services loss on a global scale (Hoekstra et al., 2005).

Grassland ecosystems occur in diverse forms shaped by geology, geography, moisture, soil type, elevation, climate, and environmental disturbance regimes (Vickery et al., 1999). In South America, grasslands initially existed as expansive islands within savannahs and forests in Central Brazil. Currently, they rank among the most endangered grassland environments worldwide. Native grasslands in the Neotropics are sparse, with all facing some degree of threat (Stotz et al., 1996). In Brazil and northeastern Bolivia, extensive native grassland areas have succumbed to the encroachment of large-scale mechanized agriculture. What remains of these grasslands is now confined to a few protected areas, with destruction looming outside these limited safeguards. Collar et al. (1992) describe the near-complete extinction of Brazilian grassland environments as one of the greatest ecological catastrophes in South America.

Within the Cerrado, grassland ecosystems dominated by herbaceous and shrubby strata encompass various phytophysiognomies like "campo limpo" (grasslands), "campo sujo" (shrub savannah), and "campo rupestre" (rupestrian grasslands) (Ribeiro and Walter, 2008). Over recent decades, the Cerrado biome has endured substantial habitat loss, particularly in savannah and grassland formations, with 91.6 million hectares (46% of native Cerrado vegetation) already deforested for pastures (31%), soy (9%), sugarcane (2%), tree plantations (2%), and other crops (2%; MapBiomas, 2020).

Non-forest ecosystems occupy extensive swaths of Brazilian territory, harboring unique biodiversity and crucial ecosystem services like water availability and carbon sequestration (Grace et al., 2006). Nonetheless, conservation efforts in the region have often favored tropical forests, leaving grassland environments and their biota with minimal protection. These areas often stay undervalued and insufficiently shielded, often appointed as reserves for agribusiness expansion (Pennington et al., 2018). Consequently, human-driven impacts on grasslands, particularly their conversion to agricultural land, persist at alarming rates (Overback et al., 2022; Overbeck at al., 2015).

The loss and degradation of grasslands have wrought negative consequences on global bird populations (Askins et al., 2007; Donald et al., 2006; Azpiroz et al. 2012). Grassland birds, as a group, have experienced declines more pronounced, consistent, and widespread than any other behavioral or ecological guild (Knopf, 1994). In the Neotropics, populations of various birds inhabiting grassland pastures have significantly dwindled (Fraga et al., 1998; Tubaro and Gabelli, 1999; Fraga, 2003; Di Giacomo and Di Giacomo, 2004). Modernization and mechanization of agricultural practices in central Brazil during the past two decades have wrought profound changes in grassland habitats, posing a threat to many habitat-specialized birds (Cavalcanti, 1999). Wege and Long (1995) report that 12% of threatened Neotropical bird species inhabit grasslands and savannas. Unlike

North America, most grassland species in South and Central America remain insufficiently understood (Vickery et al., 1999), with scant information about their distributions, conservation status, and population trends.

This work presents insights into birds within Central Brazil's grassland formations, discussing their population trends, protection levels, and primary threats. We provide a perspective on key strategies to sustain these populations in the Cerrado throughout the forthcoming decades.

## 2. Methods

Based on the knowledge garnered from an extensive literature review and data gathered from our experience of more than two decades of research experience with grassland birds, we present a summary overview of the conservation status of Brazilian Cerrado grassland birds.

To define grassland bird species, we used the Cerrado bird list as a basis reference (Silva, 1995), followed by the assessment of their degree of association with grasslands, as outlined by Vickery et al. (1999). These species were categorized as grassland obligate and facultative species. Species nomenclature adhered to the definitions provided by the Brazilian Committee of Ornithological Records (Pacheco et al., 2021).

We constructed a comprehensive database detailing the level of threat facing each species (ICMbio, 2023; IUCN, 2022), which also highlighted the primary threat factors affecting each species. To ascertain the population trends of Cerrado grassland birds, we used the IUCN Red List of Threatened Species. This classification appoints species with decreasing, stable, or increasing population trends (IUCN, 2022).

To evaluate the representativeness of endangered grassland species within Cerrado Protected Areas, we synthesized a database using our own records, alongside information from existing literature and management plans of protected areas (refer to Braz, 2008 for specifics). Furthermore, we enhanced this dataset with information sourced from citizen science platform WikiAves (2023), meticulously reviewing available photographs and audio recordings. Our assessment centered on the occurrence of species within "Unidades de Conservação de Proteção Integral" (strict-use protected areas) in the Cerrado region, encompassing a total of twenty-three areas spanning national parks, ecological stations, biological reserves, and natural monuments.

## 3. Grasslands: Origin, Definition and Threats

Grasslands, encompassing grasses and grass-like plants as their primary constituents, constitute a dominant biome on Earth. An assortment of other plant species and diverse animal communities further enrich their biodiversity. Among the most species-rich habitats worldwide, grasslands display a global distribution primarily influenced by climate, particularly temperature and precipitation patterns that prevent the formation of forests or deserts. Notably, tree growth in many grassland areas is reduced by intermittent droughts and the advent of seasonal dry or cold conditions (Petermann & Buzhdygan, 2021).

Grasses have evolved adaptive traits enabling them to withstand climatic extremities, specific soil conditions, fire, and herbivory – all of which play vital roles in supporting grasslands by constraining the establishment and survival of woody vegetation. Presently, contemporary C4 grass biomes span roughly 20% of terrestrial vegetation within the latitudinal band 30N and S of the equator, predominantly thriving in Africa, northern Australia, and South America (Sage, 2004; Ehleringer, 2005).

The emergence of C4 grasses over 30 million years ago marked a pivotal milestone in grassland development. Under arid conditions, C4 plants conserve water by keeping closed stomata, concurrently absorbing CO2 at lower levels compared to C3 plants. Approximately eight million years ago, the expansion of C4 grasslands through the displacement of C3 vegetation likely ensued due to global reductions in atmospheric CO2 levels and heightened seasonality. This period saw alternating wet and warm growing seasons with dry

interludes. The presence of large herbivorous mammals and frequent fires has also significantly contributed to the sustenance and propagation of grassland ecosystems worldwide (Edwards et al., 2010). Consequently, ecosystems dominated by C4 grasses rapidly expanded from their equatorial origins, extending southward and northward during the Pliocene and Pleistocene epochs. Although recent in Earth's history, these biomes are ancient within the context of human existence (Cerling et al., 1997).

In extensive areas of the tropical region, the landscape assumes a mosaic configuration including scattered grasslands amidst savannas and forests (Figure 1). According to Bond & Parr (2010), these grass-dominated biomes mirror forests. While forest plants thrive in shaded environments, grassland vegetation avoids shade. Unlike forests where fallen leaves decompose swiftly, dead matter in grasslands decomposes more gradually, often being consumed by fires. Moreover, fire inflicts structural damage in forest trees, but is essential for the maintenance of large areas of tropical savannas and grasslands (Bond & Parr, 2010). Consequently, upholding regional diversity in such formations requires conserving landscape heterogeneity.

Grassland ecosystems, replete with herbaceous plants, play an immensely vital role in Brazil's biodiversity. In the Cerrado, the most diverse savannah on the planet (Mendonça et al., 2008), plant diversity is represented by grasses, sedges, forbs, and subshrubs. The Cerrado flora boasts high species richness and notable endemism, especially within the herbaceous-shrub stratum, which features six times more species than the arboreal stratum (Filgueiras, 2002).

Within the Cerrado, three primary phytophysiognomic types of grassland formations prevail: "campo limpo" (grasslands), "campo sujo" (shrub savannah), and "campo rupestre" (rupestrian grasslands) (Ribeiro and Walter, 2008) (Figure 1). Campo sujo is characterized by the conspicuous presence of interspersed shrubs and subshrubs within the shrubby-herbaceous stratum. Campo limpo, on the other hand, features minimal shrub and subshrub presence, with an overwhelming prevalence of herbaceous and grassy vegetation. Campo rupestre exhibits stretches with structures akin to Campo Sujo or Campo Limpo but is distinguished by its rock substrate and floristic composition, which encompasses a wealth of endemics (Ribeiro Walter, 2008).

Diversification of Cerrado's plant lineages occurred in less than 10 million years, with most lineages diversifying within a span of 4 million years or less. This period corresponds to the ascendancy of highly flammable C4 grasses and the expansion of the savannah biome on a global scale. C4 grasses capitalize on increased light and warm, humid summers to swiftly accumulate biomass, which becomes combustible during the extended dry winters, igniting fires often multiple times within a decade. The evolutionary trajectories of these plant lineages highlight their strong correlation with fire, shown by their sister groups in nearby, largely fire-free tropical forests, seasonally dry forests, subtropical grasslands, and wetland habitats. These findings underscore the in-situ development of the Cerrado through frequent and recent adaptive changes (Simon et al., 2009).

Agricultural conversion of natural habitats stands as a principal driver of global biodiversity loss. Within the Cerrado biome, extensive areas have been transformed into agricultural land and cattle pastures. Additionally, the prioritization of forest preservation over savannas and grasslands has resulted in inadequate protection for these ecosystems. This disparity, valuing forests over grasslands, poses a specific conservation threat in regions featuring a natural mosaic of forests and open areas (Henderson et al., 2016).

Grasslands are currently confronting significant global threats, leading to sharp declines in biodiversity, including bird populations. The loss and fragmentation of grasslands are precipitating species depletion, altering ecosystem structure and function, depleting vital ecological services, and adversely affecting human well-being. Studies underscore substantial and swift transformations within grassland communities, clear through substantial decreases in species abundance (Ceballos et al., 2010). Across major grassland regions worldwide,

agriculture stands as the primary threat, accompanied by hunting, ecosystem modifications, and climate change. Conservation efforts have focused on land and water management, as well as species-specific management actions (Douglas et al., 2023).

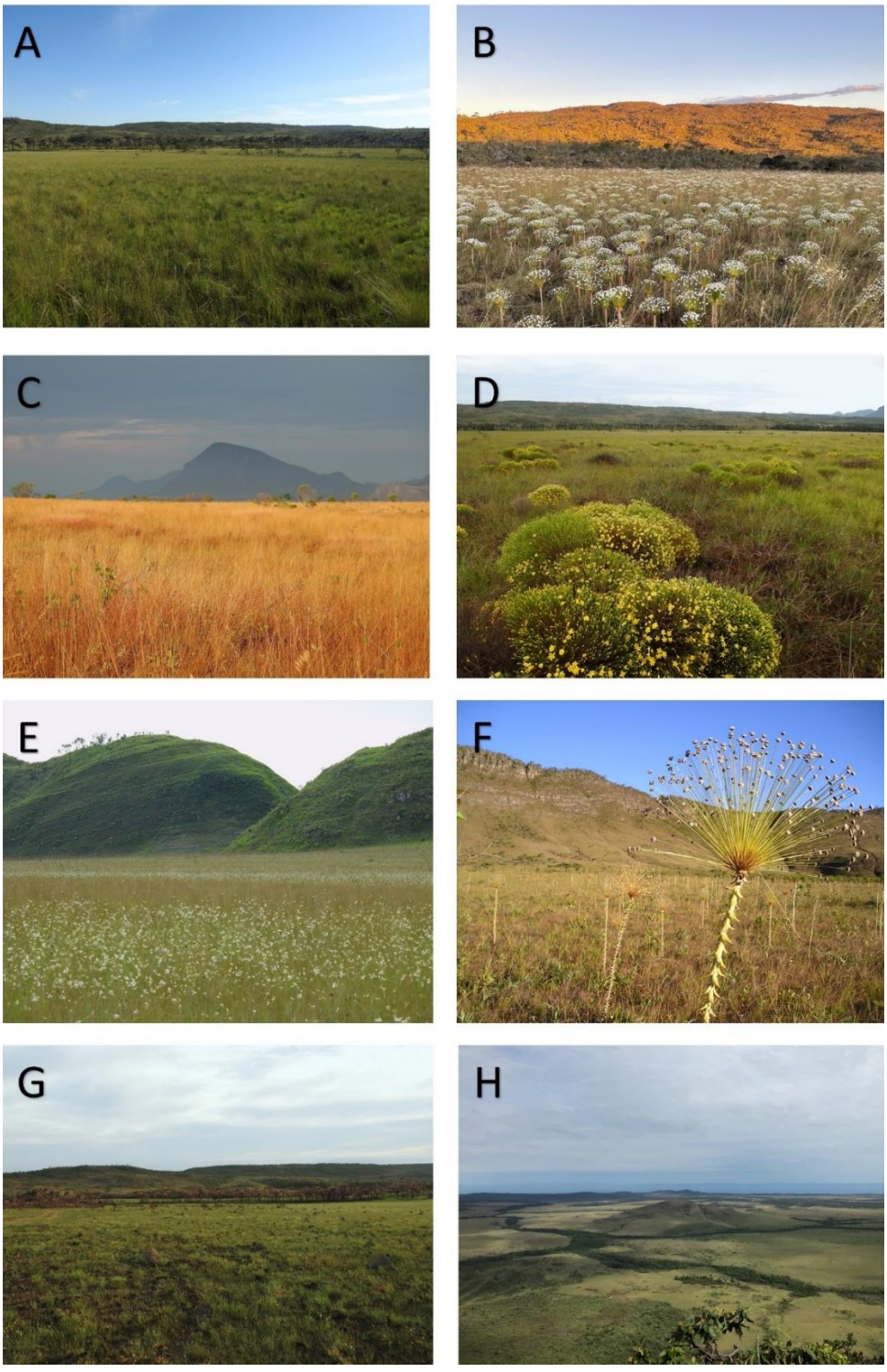


Figure 1. Grassland formations in the Cerrado biome. A: Campo Limpo in the rainy season. B, C and F: grasslands in the dry season. G: One-month post-fire grassland, H: mosaic of grassland, savannah and forest environments of the Cerrado. Source: All photos: Vívian Braz.

## 4. Grassland Birds of Cerrado: Definitions, Classification and Knowledge

Neotropical grassland birds are intricately connected with their habitat, forming a group of considerable phylogenetic diversity that stays underexplored from an evolutionary perspective (Norambuena & Van Els,

2021). The distinctive layout of Neotropical grassland landscapes profoundly shapes the biogeography of these organisms, and their phylogeography can significantly diverge from that of the more extensively studied forest taxa. A minimum of 297 bird species in the Neotropics rely on expansive open grassy landscapes for nesting (Stotz et al., 1996).

An ecological framework for delineating grassland bird species, as proposed by Vickery et al. (1999), identify these birds based on their adaptation and dependence on grassland habitats for various life cycle stages, such as reproduction, nesting, feeding, and migration. This classification discerns two primary groups of grassland birds: obligate specialists and facultative specialists. Obligate specialists are exclusively adapted and reliant on grassland habitats, with minimal to no use of other habitat types. These species would likely face extinction without these crucial habitats. In contrast, facultative specialists incorporate grasslands as part of their habitat repertoire, commonly and regularly employing these environments without complete dependence.

Within the Cerrado, 114 grassland bird species are known, constituting 40% of those documented in South America (Vickery et al., 1999; Silva, 1995). Among these, 44 are categorized as obligate, while 70 fall within the facultative classification (Figure 2 and 3). Out of the 33 species unique to the Cerrado biome (Silva and Bates, 2002), 39% belong to grassland species, encompassing eight obligate and five facultative.


Figure 2. Facultative grassland birds of Cerrado (Vickery at al., 1999). A: Rhea americana B: Sicalis citrina C: Melanopareia torquata, D: Heterospizias meridionalis, E: Cariama cristata F: Gubernetes yetapa G: Xolmis velata, H: Colaptes campestris. Source: All photos: Vívian Braz.


Figure 3. Obligate grassland birds of Cerrado. A: Coryphaspiza melanotis B: Heliactin bilophus C: Culicivora caudacuta, D: Alectrurus tricolor, E: Porphyrospiza caerulescens, F: Rynchotus rufescens, G: Tyrannus savana, H: : Emberizoides herbicola. Source: All photos: Vívian Braz.

Despite their significance, limited knowledge prevails concerning Cerrado's grassland species, particularly those that are endangered, and fundamental aspects of their ecology often remain unknown. Some studies have addressed the ecology of bird assemblages within Cerrado's grassland formations, delving into topics like

landscape modifications, fire impacts, and seasonality (Braz, 2008; Tubélis & Cavalcanti, 2000). Recent years have witnessed advancements in the understanding of specific species, encompassing reproductive traits (Lima & Buzzetti, 2006; Machado et al., 2017), habitat utilization, home range, and distribution (Kanegae et al., 2012; Fujikawa & Tubélis, 2019; Lopes et al., 2010, Lopes et al., 2023), population sizes (Braz, 2008; Kanegae, 2012), and distribution modeling (Marini et al., 2013; Meireles et al., 2023). Collectively, these studies show population declines across various species within the Cerrado. Yet, more population studies are essential to substantiate and quantify these declines. Currently, the available information on these species stays fragmented and incomplete. A better understanding of the ecological requisites of grassland birds is urgently needed to aid in mitigating or reversing population declines.

## 5. Grassland Birds of Cerrado: Population Trends and Vulnerability

Based both on the Brazilian red list (ICMBio, 2023), alongside the global endangered classification (IUCN, 2022), 92 Cerrado bird species are endangered or near threatened. Of these, eighteen species are obligate grassland birds and six are facultative. This underscores a critical reality - a remarkable 26% of the Cerrado biome's threatened avian population thrives within the intricate realm of grassland ecosystems.

Upon assessing the population trends of the 116 grassland bird species within the Cerrado, 37% of these species are in decline. This decline is particularly pronounced among obligate grassland birds, constituting 63% of the species undergoing a population decline (Figure 4). Among the forty-three species experiencing population declines, a significant 54% are currently classified as endangered (Figure 5). This underscores that, in addition to the species already listed as endangered, many others are at risk and may soon call for endangered status.

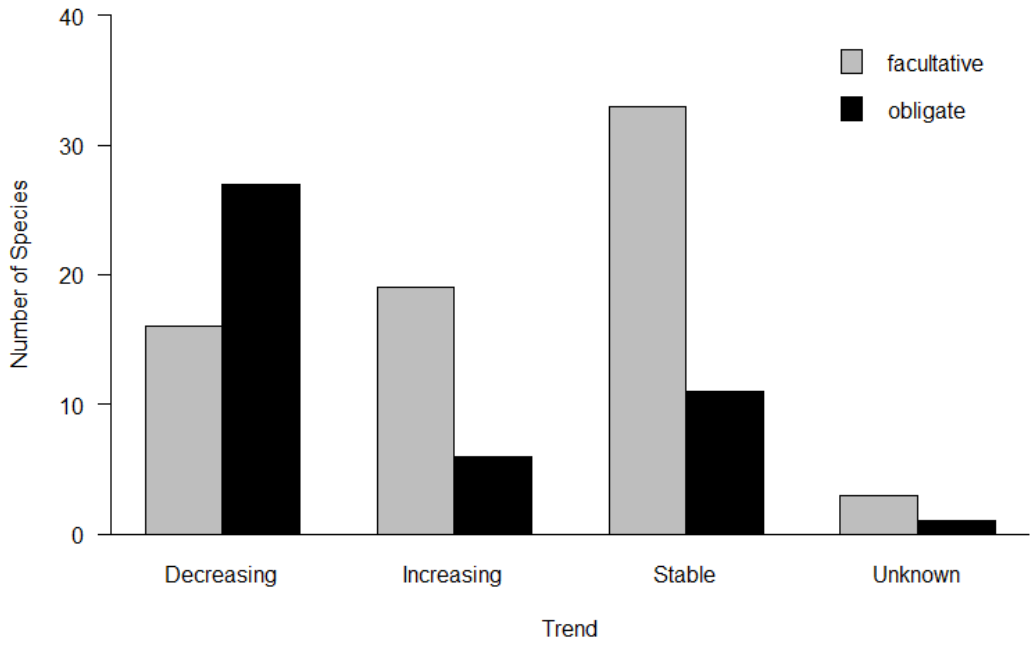


Figure 4. Population trend (IUCN 2022) for obligate and facultative grassland birds of the Cerrado. Source: prepared by the authors.

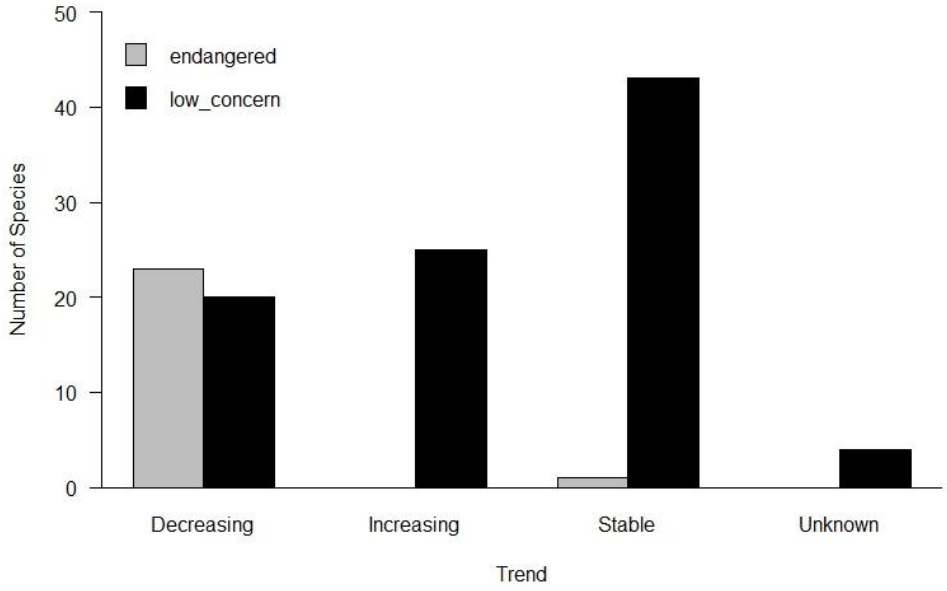


Figure 5. Population trend and current threat categories (IUCN 2022) for grassland birds of the Cerrado. Source: All photos: Vívian Braz.

Currently, the primary threats to Cerrado's grassland birds, classified as endangered, center on habitat loss and degradation (Figure 6). Given the substantial rates of habitat transformation in native grasslands over recent decades, habitat loss undeniably stands as the primary menace to grassland birds. The persistence of these avian populations' mandates not only the protection of existing remnants but also the restoration of degraded grassland areas.

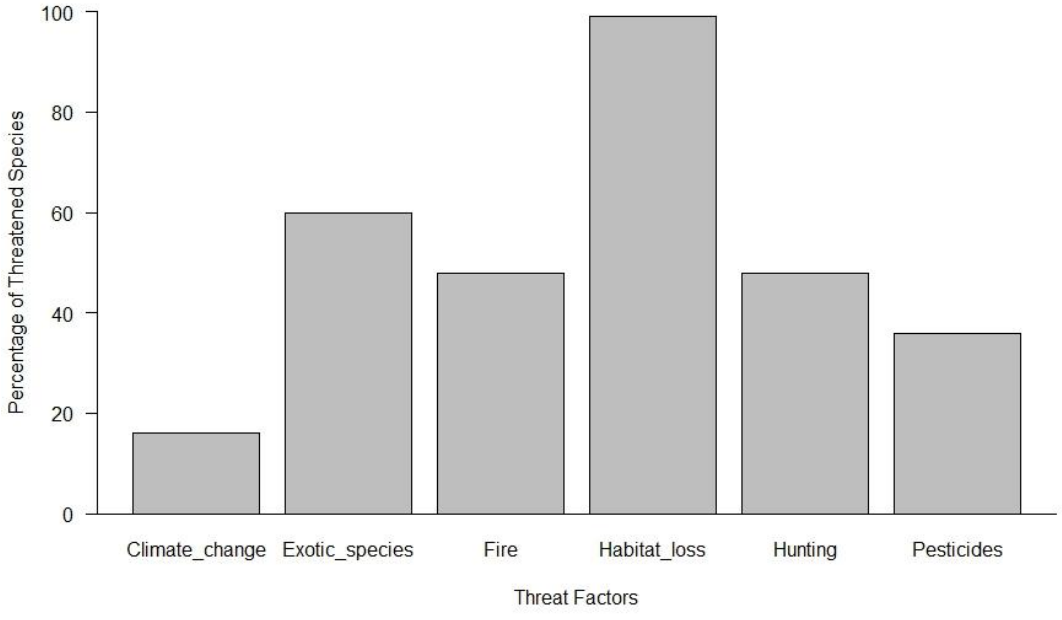


Figure 6. Threat factors for Cerrado grassland bird species classified as endangered (IUCN 2022, ICMBio, 2023). Source: prepared by the authors.

The assessment of the representation of endangered grassland birds in Cerrado's protected areas reveals a concerning low level of protection (Table 1). Only three species are found in over 50% of the evaluated areas. Among the endangered species, a staggering 79% inhabit five or fewer protected areas. Most species are confined to limited protected areas that constantly face a spectrum of threats, including the presence of exotic species, hunting, and fires. Hence, safeguarding Cerrado's grassland birds needs not only their augmented presence in protected areas but also a management approach that sustains or enhances habitat quality.

Exotic grasses and fire dynamics appear as significant threat factors for Cerrado's grassland birds. This underscores the imperative of adeptly managing remnants and restoring degraded areas to keep environmental quality. The global decline of grassland birds is a stark reality, with North America even witnessing declines exceeding 50% in common species over recent decades. Studies suggest that even substantial grassland remnants may not support populations due to soil management practices causing habitat degradation (With et al., 2008). In addition, an identified consequence of environmental changes that significantly contribute to bird population decline is the reduction in insect populations. A considerable number of bird species that have declined over the past half-century are those reliant on insects for sustenance. The proliferation of non-native plants and pesticide usage play roles in this decline (Tallamy & Shriver, 2021).

Within the Cerrado, the long-term monitoring of grassland environments' flora indicates changes in richness, diversity, cover, and composition over time. The encroachment of certain species notably contributes to floristic homogenization in grasslands situated within areas experiencing pronounced anthropogenic pressures (de Souza et al., 2022). The introduction of exotic grass species can alter spatial heterogeneity, culminating in diminished biodiversity. Consequently, invasive exotic grasses stand as a formidable threat to the conservation efficacy of Brazilian protected areas (Sampaio and Schmidt, 2013).

While the destruction and degradation of grasslands is fast, the restoration of biodiversity is a slow and arduous process. Unlike the focus on restoring forest ecosystems, grassland restoration has received less attention over time, presenting many challenges due to its global importance (Buisson et al., 2022). In recent years, innovative techniques have appeared, but their efficacy remains to be conclusively proved. A multifaceted approach incorporating various techniques and heightened research investment are essential (Pilon et al., 2023).

Regarding fire, species' responses are intricately tied to the burning regimen, with the effects determined primarily by the timing and frequency of occurrences. Due to variances in species' habitat preferences, soil types, and vegetation, individual grassland bird species respond differently to specific management practices, often showing regional dependencies. This suggests that a mosaic of grassland habitats could potentially benefit the community (Vickery et al., 2000).

While more research remains imperative for tropical grasslands, another significant threat to grassland birds is the application of pesticides. Insights from the Northern Hemisphere underscore that intensified agriculture, alongside the indirect repercussions of pesticides - manifested through the depletion of insect food sources - significantly contribute to the decline of bird populations. Moreover, the toxic impact of pesticides on organisms should be acknowledged as a pivotal factor in the dwindling of grassland bird populations (Mineau & Whiteside, 2013). Compelling evidence also suggests a pronounced decline in bird numbers within areas more heavily polluted with neonicotinoids, thereby highlighting that the environmental harm inflicted by these insecticides could surpass earlier estimations (Goulson, 2014).

Climate change has been identified as a serious threat factor for Cerrado grassland birds, (Marini et al., 2019, Meireles et al., 2023). Projections suggest that by 2100, elevated carbon dioxide levels in the atmosphere will usher in a substantial transformation in grassland biodiversity. This forecast stems from the fact that dominant grasses evolved within an environment characterized by low CO2 concentrations. In the next 20 to

30 years, CO2 concentrations will rise above the levels at which tropical grasses first appeared on Earth and below which they have a photosynthetic advantage over their temperate competitors. The implications for the ecology and conservation of these vast herbaceous ecosystems are still difficult to measure (Palazzesi et al., 2022).

Hofmann et al. (2021) substantiate that increased temperatures will cause a reduction of approximately 15% in relative humidity. This, in turn, will make these fields increasingly arid and hot, thereby exerting a direct impact on local biodiversity. Broadly speaking, climate projections for grassland ecosystems predict rising temperatures and carbon dioxide levels, which, when compounded with land exploitation and habitat loss, could further jeopardize the constitution of native species (Gibson & Newman, 2019).

Table 1. Endangered Cerrado's grassland birds at Brazilian (ICMBio, 2023) and global (IUCN 2022) levels and total protected areas (PA) where the species occurs. CR: critically endangered, EN: endangered, VU: vulnerable, NT: near threatened, LC: low concern.

| Taxon | Common Name | ICMBio 2023 | IUCN 2022 | Total PA |
|---|---|---|---|---|
| *Rhea americana* | Greater Rhea | | NT | 10 |
| *Nothura minor* | Lesser Nothura | EN | VU | 5 |
| *Taoniscus nanus* | Dwarf Tinamou | EN | EN | 5 |
| *Columbina cyanopis* | Blue-eyed Ground-Dove | CR | CR | 1 |
| *Hydropsalis candicans* | White-winged Nightjar | EN | VU | 1 |
| *Calidris subruficollis* | Buff-breasted Sandpiper | VU | NT | 0 |
| *Urubitinga coronata* | Crowned Eagle | EN | NT | 5 |
| *Geositta poeciloptera* | Campo Miner | VU | VU | 5 |
| *Asthenes luizae* | Cipo Canastero | EN | NT | 1 |
| *Euscarthmus rufomarginatus* | Rufous-sided Pygmy-Tyrant | | NT | 5 |
| *Culicivora caudacuta* | Sharp-tailed Tyrant | | VU | 9 |
| *Polystictus pectoralis* | Bearded Tachuri | | NT | 2 |
| *Heteroxolmis dominicanus* | Black-and-white Monjita | VU | VU | 0 |
| *Alectrurus tricolor* | Cock-tailed Tyrant | VU | VU | 5 |
| *Charitospiza eucosma* | Coal-crested Finch | | NT | 7 |
| *Coryphaspiza melanotis* | Black-masked Finch | VU | VU | 8 |
| *Porphyrospiza caerulescens* | Blue Finch | | NT | 9 |
| *Sporophila hypoxantha* | Tawny-bellied Seedeater | VU | | 2 |
| *Sporophila ruficollis* | Dark-throated Seedeater | VU | NT | 1 |
| *Sporophila palustris* | Marsh Seedeater | VU | EN | 1 |
| *Sporophila hypochroma* | Rufous-rumped Seedeater | | NT | 2 |
| *Sporophila cinnamomea* | Chestnut Seedeater | | VU | 2 |
| *Sporophila melanogaster* | Black-bellied Seedeater | VU | NT | 1 |
| *Sporophila maximiliani* | Great-billed Seed-Finch | CR | EN | 2 |

Source: Prepared by the authors.

## 5. Conclusion

The native grasslands within the Cerrado biome have been relegated to protected areas, effectively confining the populations of grassland birds to these reserves. These areas hold utmost significance not only as supports for sustaining source populations of bird species but also as repositories of knowledge concerning the intrinsic processes underpinning these ecosystems. The overarching aim lies in reestablishing these processes where they have been curtailed or suppressed, through the restoration of native grasslands within the Cerrado.

Hence, it is essential to meticulously check populations already dwindling within the protected areas of Cerrado. This endeavor not only enriches our understanding of the species and their requisites but also points the management practices within these zones, ensuring the perpetuation of natural processes. The implementation of a controlled and well-planned rotational system for burned areas becomes indispensable to uphold the dynamism of processes and the inherent environmental diversity. Furthermore, to safeguard the habitat's quality for grassland species, stringent control over invasive exotic grasses is paramount.

Despite the global significance attributed to grassland biomes, conservation endeavors, both internationally and nationally, are often skewed towards prioritizing tropical forests. The insights unveiled here underscore the critical importance of conserving grassland formations in central Brazil for upholding biodiversity within the Cerrado. These formations harbor species teetering on the brink of extinction and experiencing decline, thus precipitating the exigency of devising conservation strategies that specifically target birds within grassland ecosystems. This comprehensive strategy encompasses the establishment and upkeep of public and private reserves, the promotion for agricultural practices that harmonize production with biodiversity conservation, the undertaking of research on the habitat requisites and population trends of grassland birds, and the ambitious restoration of degraded grassland areas.

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