BioOne COMPLETE

The Fate of an Amazonian Savanna: Government Land-Use Planning Endangers Sustainable Development in Amapá, the Most Protected Brazilian State

Authors: Hilário, Renato R., de Toledo, José Julio, Mustin, Karen, Castro, Isaí J., Costa-Neto, Salustiano V., et al.

Source: Tropical Conservation Science, 10(1)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/1940082917735416

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

Review Article

Tropical Conservation Science
Volume 10: 1–8
© The Author(s) 2017
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1940082917735416
journals.sagepub.com/home/trc
SAGE

The Fate of an Amazonian Savanna: Government Land-Use Planning Endangers Sustainable Development in Amapá, the Most Protected Brazilian State

Renato R. Hilário[1,2], José Julio de Toledo[1,2], Karen Mustin[3], Isaí J. Castro[4], Salustiano V. Costa-Neto[4], Érico E. Kauano[2,5], Vivianne Eilers[6], Ivan M. Vasconcelos[5], Raimundo Nonato Mendes-Junior[5], Cláudia Funi[7], Philip M. Fearnside[8], José Maria C. Silva[2,9], Ana M. C. Euler[10], and William Douglas de Carvalho[1,2]

Abstract

Although Amapá is the most protected Brazilian state, the same level of protection does not extend to its savannas. These are currently suffering increased pressure from threats including large-scale agriculture, particularly the expansion of soybean plantations. In September 2016, the Government of Amapá presented a zoning proposal (Zoneamento Socioambiental do Cerrado [ZSC]) that reserves most of the savannas for agricultural activities. Here, we outline how the methodology employed is flawed because it does not include fauna surveys, evaluations of ecosystem services or an assessment of the social importance of the savannas. The ZSC authors admit that, contrary to Brazilian legislation, the zoning was carried out with the single intention of increasing agriculture production. Current knowledge indicates that Amapá's savannas are rich in biodiversity, including endemic and threatened species, and are also home to a rich culture of traditional populations. These savannas are important providers of ecosystem services that, if intact, could represent around US$ 1.52 billion annually. We hold that the ZSC should be reformulated, with fair participation of stakeholders, in accordance with Brazil's legal requirements. At least 30% of the savannas should be protected, local family farming should be supported, and the rights of traditional peoples must now be assured through recognition of their land rights.

Keywords

agriculture, Amazon, biodiversity conservation, Cerrado, ecosystem services, land-use policy, soybean plantation

[1]Laboratório de Ecologia, Departamento de Meio Ambiente e Desenvolvimento, Universidade Federal do Amapá, Macapá, AP, Brazil
[2]Programa de Pós-Graduação em Biodiversidade Tropical, Universidade Federal do Amapá, Macapá, AP, Brazil
[3]Institute of Biological and Environmental Sciences, University of Aberdeen, Aberdeen, UK
[4]Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá, Macapá, AP, Brazil
[5]Instituto Chico Mendes de Conservação da Biodiversidade, Macapá, AP, Brazil
[6]Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, Macapá, AP, Brazil
[7]Secretaria de Estado do Meio Ambiente, Governo do Estado do Amapá, Macapá, AP, Brazil
[8]National Institute for Research in Amazonia, Manaus, AM, Brazil
[9]Department of Geography, University of Miami, Coral Gables, FL, USA
[10]Embrapa, Macapá, AP, Brazil

Received 16 May 2017; Revised 13 September 2017; Accepted 14 September 2017

Corresponding Author:
Renato R. Hilário, Laboratório de Ecologia, Departamento de Meio Ambiente e Desenvolvimento, Universidade Federal do Amapá, Rod. JK, S/N, Jardim Marco Zero, Macapá, AP 68903-419, Brazil.
Email: renatohilario@gmail.com

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (http://www.creativecommons.org/licenses/by-nc/4.0/) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

Introduction

Brazil is a key player in global biodiversity conservation. The state of Amapá, situated in the far north-east of the Amazon region, plays an important role in Brazil's conservation network with more than 95% of its original vegetation being well-preserved and close to 70% of its extent lying within protected areas (PAs) (Drummond, Dias, & Brito, 2008; Secretaria de Estado do Meio Ambiente—Estado do Amapá [SEMA-AP], 2015). However, this protection does not extend to the 10,021 km^2 of savanna vegetation that stretches along the eastern side of the state (Figure 1), forming a patchwork of savanna interspersed with moist broad-leaf forests, flooded forests, floodplains, and mangroves in an "Amazonian savanna complex" (Carvalho & Mustin, 2017; SEMA-AP, 2012).

Only 917.69 km^2 (~9.2%) of the savannas in Amapá are legally protected, and even less (40.24 km^2 [0.4%]) are in "strictly protected" areas. A further ~27 km^2 (~0.3%) are protected by Indigenous Lands, and ~850.42 km^2 (~8.5%) by PAs within which various kinds of use are allowed (Mustin et al., 2017; see also Nogueira, Yanai, Vasconcelos, Graça, & Fearnside, 2017). This lack of adequate protection is of particular concern because the savannas of Amapá are under increased pressure from threats such as large-scale agriculture and commercial silviculture (Carvalho & Mustin, 2017; Silva, 2016). Similar to those in the state of Roraima before them (Barbosa, Campos, Pinto, & Fearnside, 2007), the savannas of Amapá are now considered to be the "final frontier" for soybean plantations in Brazil (Silva, 2016). Low land costs and expected improvement in infrastructure to allow for the export of soybeans are attracting farmers to Amapá (Silva, 2016). The federal government transferred the ownership of large tracts of land, including savannas, to the state government (Federal Decree 8713/2016—Brazil, 2016), which is accelerating the process of "regularization" of land ownership by local farmers who can then sell their lands to soybean farmers at cheap prices. This situation is evolving rapidly, with the area planted with soybeans in Amapá increasing by >200%

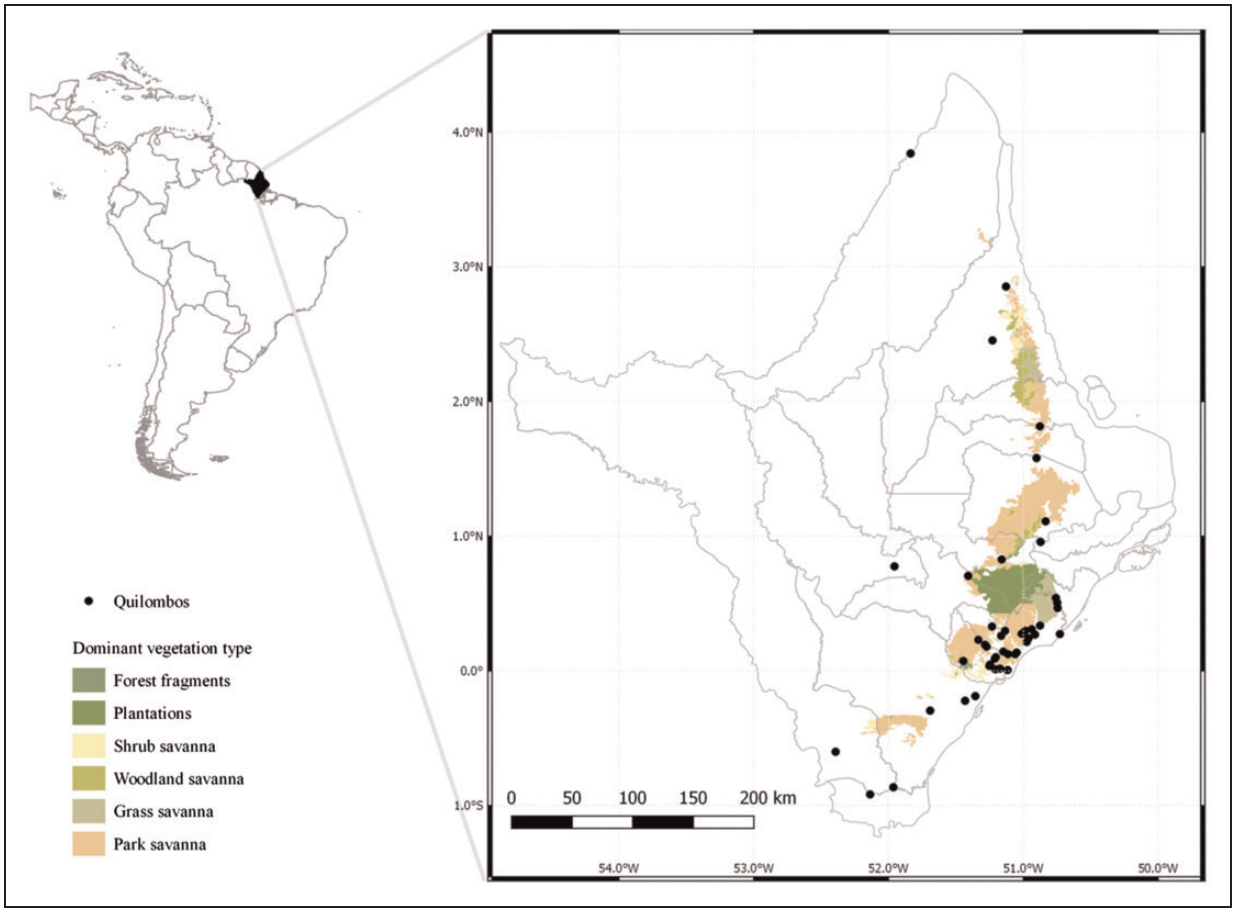


Figure 1. Distribution of the four main savanna habitat types, eucalyptus plantations, and forest patches within the savanna domain, in the state of Amapá (based on the Brazilian Ministry for the Environment's vegetation cover map for the Amazon (IBGE, 2004). Gray lines show the boundaries of the 16 municipalities that make up the state. Black dots show the locations of "*quilombos*" (traditional communities of descendants of escaped African slaves) mapped using data from SEMA-AP (2016).

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

in just three years (from 45.5 km^2 in 2013 to 148.6 km^2 in 2016; Instituto Brasileiro de Geografia e Estatística [IBGE], 2017). This increase has been entirely concentrated in two municipalities plus the state capital: Itaubal, Tartarugalzinho, and Macapá (Figure 2(a)). Tartarugalzinho and Macapá each also contain more than 1,700 km^2 of savanna (Figure 2(b)), and their savannas are some of the least protected in the state (Figure 2(c)). Projections suggest that the area planted with soybeans in the savannas of Amapá could increase up to 4,000 km^2 by 2026 (Silva, 2016), which would represent ~40% of the total area of savanna habitat in the state. In addition, of the 138 "*quilombos*" (traditional communities of descendants of escaped African slaves) that reside in the savannas of Amapá, 27 are located within these three municipalities (Figure 1), highlighting the sociocultural importance of these areas. Therefore, before considering the expansion of large-scale agriculture in the region that is planned by the state government in its recent "socioenvironmental zoning" of the savannas in Amapá (*Zoneamento Socioambiental do Cerrado* [ZSC] in Portuguese; Governo do Estado do Amapá, Secretaria Estadual de Ciência e Tecnologia em Macapá, Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá, Núcleo de Ordenamento Territorial, & Empresa Brasileira de Pesquisa Agropecuária, 2016), we hold that social and environmental factors must be considered.

On September 21, 2016, the ZSC was presented to the members of four state committees (Water Resources, the Environment, Sustainable Rural Development, and the Amapá Fund for Rural Development). The aim of this zoning document is to facilitate land-use planning for the areas of savanna in the state of Amapá. The ZSC quantifies the current use of Amapá's savannas and recommends the expansion of agricultural activities (Figure 3). However, the zoning document is flawed. Here, we highlight its key shortcomings and suggest ways in which the proposed land-use plan could be improved to better balance the three pillars of sustainable development: social, environmental, and economic (United Nations, 2016).

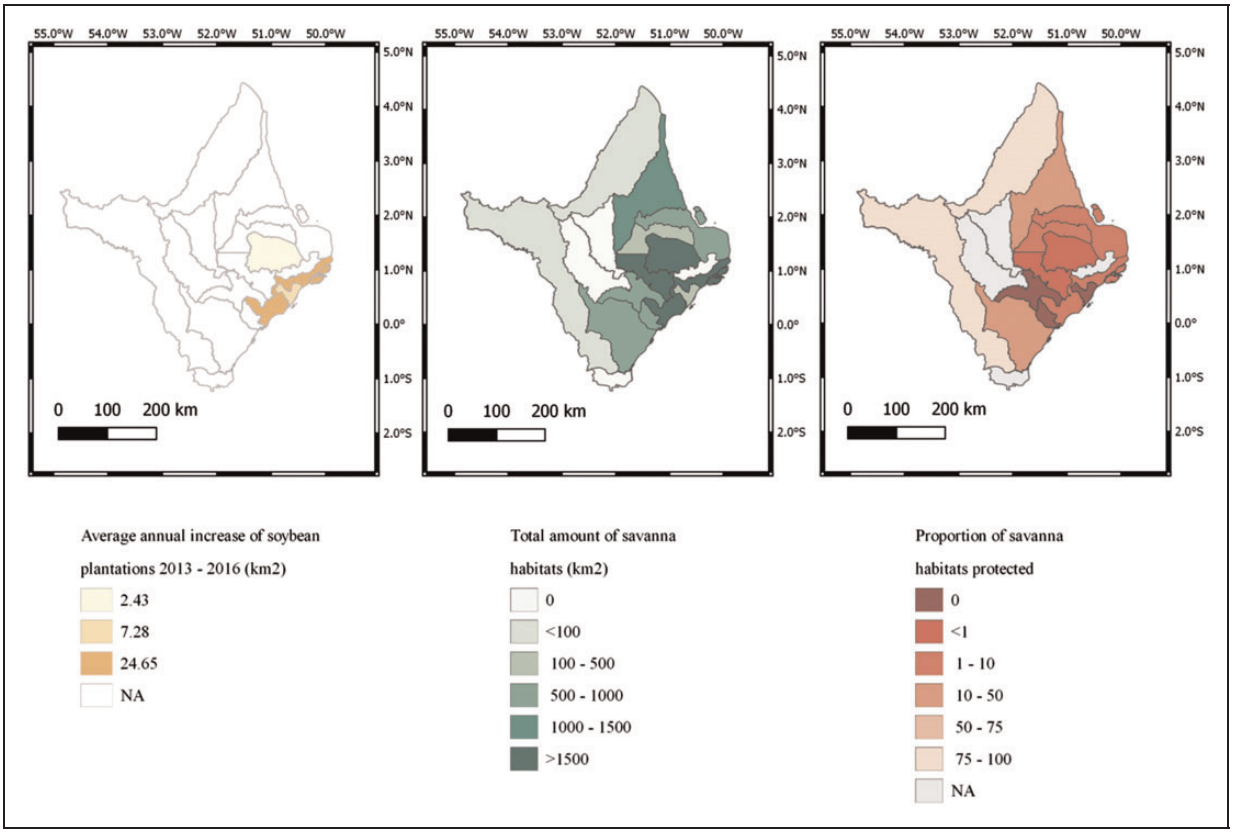


Figure 2. (a) Average annual increase in area planted with soybeans between 2013 and 2016 (IBGE, 2017), per municipality in the state of Amapá. (b) Total amount of savanna habitats (based on the Brazilian Institute of Geography and Statistics vegetation cover map for the Amazon) (IBGE, 2004). (c) The proportion of total area of savanna habitats contained within any kind of protected area, calculated using the shapefiles of "Conservation Units" and Indigenous Lands available from the Amapá State Environmental Secretariat (SEMA-AP, 2016) and the World Database on Protected Areas (WDPA, 2016).

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

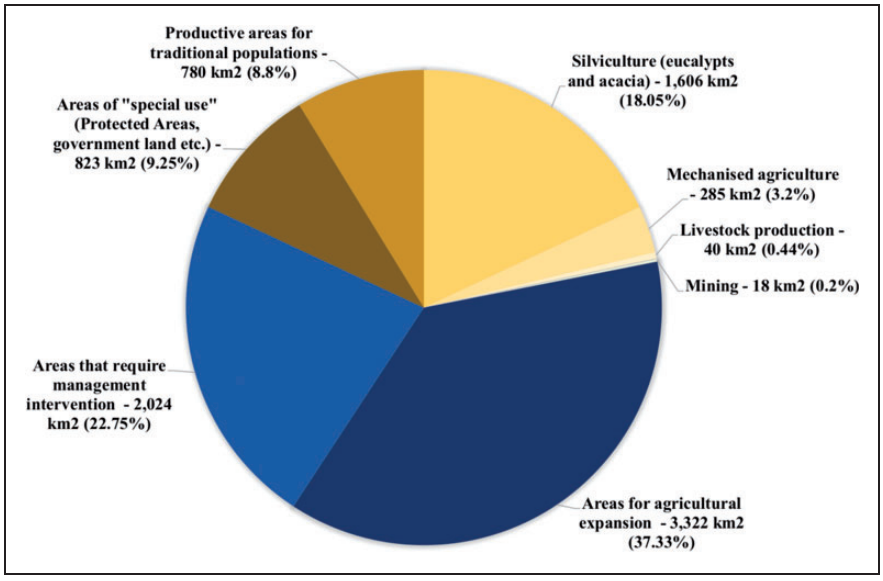


Figure 3. Current (brown) and planned future (blue) land uses in the savannas of Amapá, according to the state government's Socio-Environmental Zoning of the Cerrado (ZSC).

Brazilian Zoning Legislation Versus the ZSC

The new Brazilian Forest Code (Brazil, 2012) specifies a deadline of 2017 for all Brazilian states to submit an Ecological-Economic Zoning (*Zoneamento Ecológico Econômico* or "ZEE"), which should be prepared following the specific guidelines laid out by the Federal Ministry of the Environment (Brazil, 2006). The ZSC document uses nomenclature different from that which is legally recognized (i.e., ZSC vs. ZEE) and openly admits to not having followed the legal guidelines that would allow for its consideration as a ZEE (Governo do Estado do Amapá et al., 2016). For example, according to the guidelines, a ZEE should be carried out for the entire state, in contrast with Amapá's ZSC that considers only areas of savanna vegetation. Further, the ZSC was presented to the four state committees without having been previously presented to civil society in the state. This goes against Decree 4.297/2002 (Brazil, 2002a), which states that for a ZEE to be approved at the federal level, it must have resulted from an open and participatory process involving key stakeholders. The government decision to issue a zoning document that does not meet the requirements set out in Brazilian federal law (Brazil, 2002a) appears to represent a step in the direction of a business-as-usual scenario rather than a prioritization of sustainable development and biodiversity conservation.

The methodology used to develop the ZSC is not adequate as a basis for a socioenvironmental zoning of the savannas. The ZSC is based on soil classification and mapping derived from just 16 soil pits and an unspecified number of inventories of woody vegetation. Contrary to Brazilian legislation (Brazil, 2002a), no assessments were made in the field regarding fauna, ecosystem services or the social importance of the savannas, and no plans were included for monitoring and minimising social and environmental impacts. Indeed, the ZSC authors themselves admit that the zoning was carried out with the single intention of increasing the production of "*grãos*" (grains and pulses), especially soybeans, as a way to promote the economic development of the state. Despite obvious inadequacies in the methodologies used, the ZSC presents a plan to zone the savannas in Amapá. The conclusions made in the report regarding appropriate land uses across the savanna habitats cannot be supported by the methodology employed, and, as such, the ZSC should be disregarded. In the following sections, we highlight some specific requirements that should have been considered in the ZSC and that are essential for an appropriate zoning.

Biodiversity Inventories

No information was included in the ZSC regarding the faunal diversity of Amapá's savanna habitats. Despite just a small number of inventories having been carried out, evidence already shows a rich faunal community that varies across the savannas. Three hundred fifty species of invertebrates, 200 species of birds, 108 mammals (including 38 bat species), 26 species of fish and 41 species of amphibian, and 26 reptile species have already been recorded from Amapá's Amazonian savannas (Mustin

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

et al., 2017). The known fauna includes six mammals considered to be threatened, following the classification of the World Conservation Union (International Union for Conservation of Nature [IUCN]): *Myrmecophaga tridactyla* Linnaeus, 1758, *Priodontes maximus* (Kerr, 1792), *Tapirus terrestris* (Linnaeus, 1758), *Tayassu pecari* (Link, 1795), *Alouatta belzebul* (Linnaeus, 1766), and *Pteronura brasiliensis* (Gmelin, 1788) (IUCN, 2016). In addition, Amapá's savanna habitats are considered to be an "important bird area" due to their relevance for the conservation of two bird species—the shrike-like tanager *Neothraupis fasciata* and the rufous-sided pygmy tyrant *Euscarthmus rufomarginatus* (De Luca, Develey, Bencke, & Goerck, 2009).

Floristic diversity was only partially evaluated, considering only three woody species (Governo do Estado do Amapá et al., 2016). As such, the ZSC ignores the fact that 378 species of plants have been recorded in the savannas of the state, of which ~60% are nonwoody (Costa-Neto, Miranda, & Rocha, 2017). Amapá's Amazonian savannas are also home to two endemic plant species—*Axonopus amapaensis* G.A. Black and *Borreria amapaensis* E.L. Cabral & Bacigalupo (Costa-Neto et al., 2017; Rocha, Miranda, & Costa-Neto, 2014)—whose distribution was also not included in the ZSC.

Stakeholder Participation

Amapá's savannas are also home to a rich culture of traditional and indigenous populations that have strong links with the land upon which they live. In particular, 138 *quilombos* are located in these savannas (Silva, 2012), of which 31 have their lands officially recognized by the Brazilian Federal Government (Colares, 2010). Brazilian law states that these lands, once recognized, cannot be sold, mortgaged, rented, donated, or acquired by adverse possession, and that the deed to the land must be collective and in the name of an association of inhabitants (Prioste, Alves, & Camerini, 2011). This means that recognized *quilombos* represent land that is unavailable for the market as it stands in the current agribusiness model (Prioste et al., 2011). As such, this discrepancy between the number of *quilombos* in Amapá's savannas and the officially recognized number could be, in part, due to conflict with powerful agricultural producers and businesses who own large tracts of land and who seek to block the recognition of these *quilombos* in order to maintain these lands available for purchase (Prioste et al., 2011). Indeed, 44.4% of the agricultural land in Brazil is owned by just 1% of the landowners (OXFAM, 2016). Large landholders, therefore, have a strong influence in Brazilian politics and, by extension, on the granting of land rights to the *quilombolas* (people who live in *quilombos*) (Prioste et al., 2011). As such, the lack of recognition of the other 107 *quilombos*, together with the land-use changes proposed in the ZSC that identify large areas of Amapá's savannas for large-scale agriculture, leaves large areas open to procurement and development for agribusiness.

Economic Importance

Beyond their importance for local communities and for biodiversity conservation, the savannas in Amapá are important providers of ecosystem services, such as carbon storage, climate regulation, water and nutrient cycling, pollination, seed dispersal, natural pest control, ecotourism, and the production of fruits, fish, and other natural products. Considering the average value of ecosystem services provided by the world's savannas (Costanza et al., 2014) and the area occupied by savannas in the state, we estimate that, if intact, Amapá's savannas could provide the equivalent of around US$ 1.52 billion annually in ecosystem services. However, it is important to note that a significant part of this value has already been changed, given that 30.7% of the area has already been converted to agriculture, silviculture, and other productive uses (Governo do Estado do Amapá et al., 2016). The loss of ecosystem services would increase further if the zoning suggested by the ZSC were to be implemented, converting a further 37.3% of the area to soy plantations and pasture (see Figure 3). Most of Amapá's savannas are moderately vulnerable to erosion (Brazil, 1974), meaning that the land could rapidly degrade if converted to plantations and pasture, reducing the ecosystem value of these areas. In addition, the application of pesticides close to water bodies can compromise water quality, with impacts on biodiversity, fish production, ecotourism, and human health (Schwarzenbach, Egli, Hofstetter, von Gunten, & Wehrli, 2010), since some of the flooded environments in the savannas are used for swimming by the local population and by weekend visitors.

Conclusions

The relevance of Amapá's savannas to biodiversity, local communities, and ecosystem services indicates that these habitats need greater protection. Specifically, most of the areas currently within PAs are not sufficiently protected. It is also essential that new PAs should be created to increase the area protected to at least 30%. Highly biodiverse areas in which less than 30% of the original vegetation remains can be considered "hot spots" for conservation (Myers, Mittermeier, Mittermeier, Da Fonseca, & Kent, 2000), and 30% is also considered to be the "fragmentation threshold" (Pardini, Arruda Bueno, Gardner, Prado, & Metzger, 2010). Indeed, the Brazilian Ministry of Environment recognizes Amapá's savannas as being in the highest level of priority for

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

conservation and indicates the need for establishment of a strictly PA in the central portion of Amapá's savannas (Brazil, 2002b). However, expansion of PAs should not focus only on one area of the state (Figure 2). Amapá's savannas encompass different soil types and phytophysionomies (Figure 1; Brazil, 1974; Governo do Estado do Amapá et al., 2016), indicating a heterogeneous distribution of biodiversity. Protecting just one part of the savanna complex risks leaving part of its biodiversity unprotected.

Amapá's savannas are host to a rich and heterogeneous biodiversity that remains little-known and that must be considered before any kind of large-scale land-use change takes place. A more complete inventory of the biodiversity of these savannas, covering their full extent and including longer term sampling, would certainly increase the list of known species. Indeed, we assert that the ZSC could have been used as an opportunity to increase knowledge of biodiversity in the state's savannas; instead, the ZSC in its current form represents a real and serious threat to savanna conservation.

The ZSC also represents a threat to the way-of-life of the *quilombola* populations. We recommend that any zoning document must be produced in partnership with representatives of these communities and should identify strategies to avoid cultural deterioration and other negative impacts on the traditional and indigenous populations, including impacts resulting from modification of the ecosystem.

We recognize that agricultural production has the potential to generate wealth for the state of Amapá, but we emphasize that the savannas in their preserved state also provide economic benefits to the state via their ecosystem services. We are not against agricultural production. Indeed, we all require food production. However, given that a substantial part of the food consumed in Brazil is produced by family farming, and that this employs 70% of the country's rural workers (Brazil, 2011), we see small-scale family farming as the solution required to support truly sustainable development in the state of Amapá. In contrast, the type of agribusiness suggested in the ZSC generates very few jobs for local people and threatens traditional ways of life. In addition, since most of the production will be destined for export, soy plantations in Amapá will not contribute to reductions in the price of local food and will represent various negative environmental threats that may also translate into impacts on the health and well-being of local populations (e.g., Fearnside, 2001; Fearnside, & Figueiredo, 2015). Furthermore, owing largely to inefficient policies, lack of support for local family farmers (either financial or technological) and lack of investment in infrastructure, the production of rice, beans, maize, and oranges, which are among the most important family-farm products in the state, shrank continuously in Amapá over the course of the last decade (Governo do Estado do Amapá et al., 2014; IBGE, 2017). This highlights a rationale for the state government to consider increasing support to family farms in order to recover their productivity and increase employment instead of choosing to facilitate commodity production in a highly unequal land-distribution system. Sustainable development, which is among the stated objectives of the ZSC, requires economic development in concert with the maintenance of environmental equilibrium and guarantees of social justice. As such, achieving sustainable development in Amapá will not be possible without a participatory and open planning process that provides for the conservation of representative areas of Amapá's savannas, generates employment for local people, and protects and endorses the rights of traditional and indigenous populations.

Acknowledgments

We are grateful to C. R. Silva for valuable considerations during our first discussions on this subject. We are also grateful to an anonymous reviewer who made valuable comments on a first version of this paper and to Dr. Jane McDonald who kindly revised the manuscript for English. Finally, we thank the Pro-Rector of Research and Post-Graduation of the Federal University of AmapÃ for contributing partially with the costs of this publication.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: R. R. H. is supported by CNPq (447432/2014-1), the Conservation Leadership Programme (02327917), the Rufford Foundation (22322-1) and Primate Conservation Inc. (PCI: 1357). K. M. is supported by a Marie Skłodowska-*Curie* Individual Fellowship. J. M. C. S. is supported by the University of Miami and Swift Action Fund. W. D. C. is supported by a postdoctoral scholarship (CAPES—PNPD). P. M. F. is supported by CNPq (305880/2007-1; 304020/2010-9; 573810/2008-7; 575853/2008-5), Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM: 708565), Instituto Nacional de Pesquisas da Amazônia (INPA: PRJ15.125), and the Brazilian Research Network on Climate Change (Rede Clima) (FINEP 01.13.0353-00).

References

Barbosa, R. I., Campos, C., Pinto, F., & Fearnside, P. M. (2007). The ''lavrados'' of Roraima: Biodiversity and conservation of Brazil's Amazonian savannas. *Functional Ecosystems and Communities*, *1*(1): 30–42.

Brazil. (1974). *Projeto Radam – Folha NA/NB.22-Macapá: Geologia, geomorfologia, solos, vegetação e uso potencial da terra* [Radam Project – Leaf NA/NB.22-Macapá: Geology, geomorphology, soils, vegetation and potential land use]. Rio de Janeiro, Brazil: Departamento de Produção Mineral.

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

Brazil. (2002a). *Decreto 4297/2002* [Decree 4297/2002]. Retrieved from http://www.planalto.gov.br/ccivil_03/decreto/2002/d4297.htm.

Brazil. (2002b). *Biodiversidade brasileira: Avaliação e identificação de áreas e ações prioritárias para conservação, utilização sustentável e repartição dos benefícios da biodiversidade nos biomas brasileiros* [Brazilian Biodiversity: Evaluation and identification of priority areas and actions for conservation, sustainable use and sharing of the benefits of biodiversity in Brazilian biomes]. Brasília, Brazil: Ministério do Meio Ambiente.

Brazil. (2006). *Diretrizes Metodológicas para o Zoneamento Ecológico-Econômico do Brasil* [Methodological guidelines for the ecological-economic zoning of Brazil]. Retrieved from http://www.mma.gov.br/destaques/item/7529-diretrizes-metodologicas.

Brazil. (2011). *Agricultura Familiar – Segunda Parte* [Family agriculture – Part two]. Retrieved from http://sistemas.mda.gov.br/arquivos/1184712943.pdf.

Brazil. (2012). *Lei n° 12.651, de 25 de maio de 2012* [Law no 12.651, of May 25, 2012]. Retrieved from http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm.

Brazil. (2016). *Decreto N° 8.713, de 15 de abril de 2016. Regulamenta a Lei no 10.304, de 5 de novembro de 2001, no que se refere à transferência ao domínio do Estado do Amapá de terras pertencentes à União* [Decree No. 8.713, dated April 15, 2016. Regulates Law No. 10,304, of November 5, 2001, regarding the transfer to the domain of the State of Amapá of lands belonging to the Union.]. Retrieved from http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/decreto/D8713.htm.

Carvalho, W. D., & Mustin, K. (2017). The little known, highly threatened and under-protected Amazonian Savannas. *Nature Ecology & Evolution*, *1*(4): 0100 doi:10.1038/s41559-017-0100.

Colares, M. S. P. (2010). *Comunidades remanescentes de quilombos em Macapá: Mapeamento dos resultados da política de assistência social* [Remaining communities of quilombos in Macapá: Mapping of results of social assistance policy] (Masters dissertation). Universidade Federal Fluminense, Niterói, Brazil.

Costa-Neto, S. V., Miranda, I., & Rocha, A. E. S. (2017). Flora das savanas do estado do Amapá [Flora of the savannas of the state of Amapá]. In: A. Bastos, J. Miranda-Júnior, & R. Silva (Eds.). *Conhecimento e manejo sustentável da biodiversidade amapaense* (pp. 65–94). São Paulo, Brazil: Blucher.

Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S. J., Kubiszewski, I., . . . Turner, R. K. (2014). Changes in the global value of ecosystem services. *Global Environmental Change*, *26*, 152–158. doi:http://doi.org/10.1016/j.gloenvcha.2014.04.002.

De Luca, A. C., Develey, P. F., Bencke, G. A., & Goerck, J. M. (2009). *Áreas importantes para a conservação das aves no Brasil. Parte II – Amazônia, Cerrado e Pantanal* [Important areas for bird conservation in Brazil. Part II – Amazon, Cerrado and Pantanal]. São Paulo, Brazil: SAVE Brasil.

Drummond, J. A., Dias, T. C. A. C., & Brito, D. M. C. (2008). *Atlas das Unidades de Conservação do Amapá* [Atlas of the conservation units of Amapá]. Macapá, Brazil: IBAMA-AP/SEMA-AP.

Fearnside, P. M. (2001). Soybean cultivation as a threat to the environment in Brazil. *Environmental Conservation*, *28*(01): 23–38. doi: 10.1017/S0376892901000030.

Fearnside, P. M., & Figueiredo, A. M. (2015). China's influence on deforestation in Brazilian Amazonia: A growing force in the state of Mato Grosso. In: R. Ray, K. Gallagher, A. López, & C. Sanborn (Eds.). *China and sustainable development in Latin America: The social and environmental dimension* (pp. 229–265). New York, NY: Anthem Press.

Governo do Estado do Amapá, Secretaria Estadual de Ciência e Tecnologia em Macapá, Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá, Núcleo de Ordenamento Territorial, & Empresa Brasileira de Pesquisa Agropecuária. (2016). *Zoneamento Socioambiental do Cerrado do Estado do Amapá: Relatório técnico sintetizado* [Socio-environmental Zoning of the Cerrado of the state of Amapá: Synthetic technical report]. Macapá, Brazil: IEPA.

Governo do Estado do Amapá, Secretaria Estadual de Ciência e Tecnologia em Macapá, Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá, Secretaria de Estado do Meio Ambiente – Amapá, Instituto do Meio Ambiente e de Ordenamento Territorial do Amapá, Secretaria de Estado do Desenvolvimento Rural – Amapá, Instituto Estadual de Florestas – Amapá. (2014). *Relatório Final – Zoneamento Ecológico-Econômico do Cerrado do Amapá: Estratégias para a Sustentabilidade e Desenvolvimento Inclusivo* [Final report – Ecological-economic zoning of the Cerrado of Amapá: Strategies for sustainability and inclusive development]. Retrieved from http://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/1009782.

Instituto Brasileiro de Geografia e Estatística. (2004). *Mapa de Vegetação do Brasil* [Map of vegetation of Brazil]. Scale 1:5.000.000. Retrieved from www.ibge.gov.br.

Instituto Brasileiro de Geografia e Estatística. (2017). *Banco de dados SIDRA. Senso Agropecuário* [SIDRA database. Agricultural census]. Retrieved from http://www.sidra.ibge.gov.br/bda/tabela/listabl.asp?c=1612&z=&o=.

International Union for Conservation of Nature. (2016). *The IUCN red list of threatened species. Version 2016-2*. Retrieved from http://www.iucnredlist.org.

Mustin, K., Carvalho, W.D.C, Hilário, R.R., Costa-Neto, S.V., Silva, C., Vasconcelos, I.M., . . . Toledo, J.J. (2017). Biodiversity, threats and conservation challenges in the Cerrado of Amapá, and Amazonian savanna. *Nature Conservation, 22*, 107–127. doi: 10.3897/natureconservation.22.13823.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature*, *403*(6772): 853–858. doi:10.1038/35002501.

Nogueira, E. M., Yanai, A. M., Vasconcelos, S. S., Graça, P. M. L. A., & Fearnside, P. M. (2017). Carbon stocks and losses to deforestation in protected areas in Brazilian Amazonia. *Regional Environmental Change*. Advance online publication. doi:10.1007/s10113-017-1198-1.

OXFAM. (2016). *Desterrados: Tierra, poder y desigualdad en América Latina* [Banished: Earth, power and inequality in Latin America]. Retrieved from https://www.oxfam.org/es/informes/desterrados-tierra-poder-y-desigualdad-en-america-latina.

Pardini, R., Arruda Bueno, A., Gardner, T. A., Prado, P. I., & Metzger, J. P. (2010). Beyond the fragmentation threshold hypothesis: Regime shifts in biodiversity across fragmented

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

landscapes. *PLoS One*, *5*(10): e13666 doi:10.1371/journal.pone.0013666.

Prioste, F. G. V., Alves, C. C. N., & Camerini, J. C. B. (2011). Quem tem medo da Constituição Federal? Quilombolas e direito ao território. In: S. Sauer, & W. Almeida (Eds.). *Terras e territórios na Amazônia: Demandas, desafios e perspectivas* [Lands and territories in the Amazon: Demands, challenges and perspectives] (pp. 297–316). Brasília, Brazil: Editora Universidade de Brasília.

Rocha, A. E. S., Miranda, I. S., & Costa-Neto, S. V. (2014). Composição florística e chave de identificação das Poaceae ocorrentes nas savanas costeiras amazônicas, Brasil [Floristic composition and identification key of the Poaceae occurring in the Amazonian coastal savannas, Brazil]. *Acta Amazonica*, *44*, 301–314. doi:10.1590/1809-4392201305173.

Schwarzenbach, R. P., Egli, T., Hofstetter, T. B., von Gunten, U., & Wehrli, B. (2010). Global water pollution and human health. *Annual Review of Environment and Resources*, *35*, 109–136.

Secretaria de Estado do Meio Ambiente – Estado do Amapá (2012) *Vegetação do Estado do Amapá* [Vegetation of the State of Amapá]. Macapá, Brazil: Governo do Estado.

Secretaria de Estado do Meio Ambiente – Estado do Amapá. (2015). *Boletim do desmatamento no estado do Amapá – Biênio 2013/2014* [Deforestation Bulletin in the state of Amapá – 2013/2014 Biennium]. Macapá, Brazil: Governo do Estado do Amapá.

Secretaria de Estado do Meio Ambiente – Estado do Amapá. (2016). *Shapes*. Retrieved from http://www.sema.ap.gov.br/interno.php?dm=745.

Silva, E. (2016). A última fronteira da soja [The last border of soybeans]. *Revista Globo Rural: Editora Globo*, *371*, 28–33.

Silva, M. G. (2012). *Territórios quilombolas no Estado do Amapá: Um diagnóstico* [Quilombola territories in the State of Amapá: A diagnosis]. In Anais do XXI Encontro Nacional de Geografia Agrária. XXI Encontro Nacional de Geografia, Uberlândia-MG. Uberlândia, Brazil.

United Nations (2016) *Global sustainable development report 2016*. New York, NY: United Nations, Department of Economic and Social Affairs.

World Database on Protected Areas. (2016). *World Database on Protected Areas*. Retrieved from https://www.protectedplanet.net/.

Downloaded From: https://bioone.org/journals/Tropical-Conservation-Science on 28 Mar 2024
Terms of Use: https://bioone.org/terms-of-use