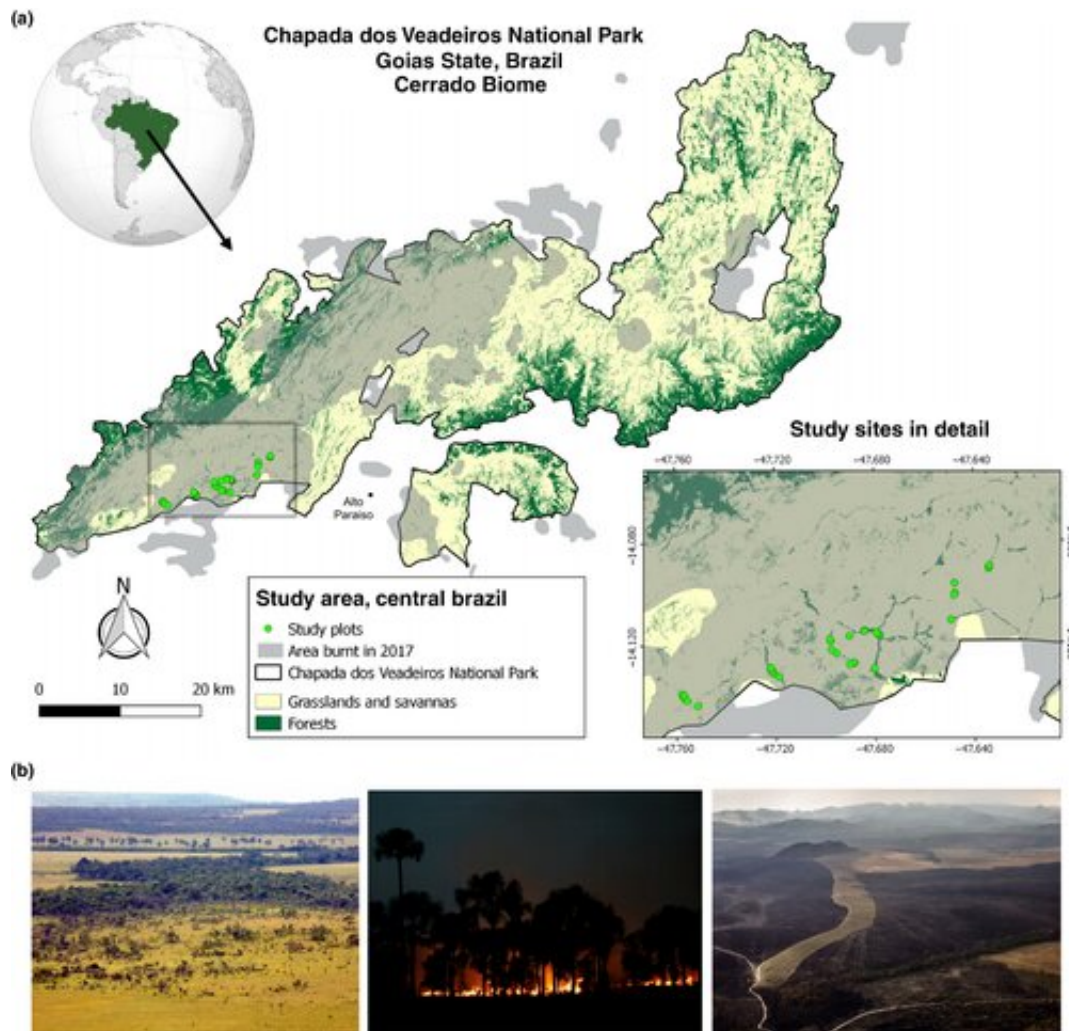


Riparian forests in the savannah: Fires also threaten Brazil's second largest ecosystem

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The 2017 wildfire at the Chapada dos Veadeiros National Park. (a) Map of the study region, in Central Brazil, showing in green forested areas, in grey the area affected by the wildfire, and in light green circles, our field study sites. (b) Photos show: (left) savanna landscape with riparian forests and palm swamp savannas along streams; (centre) fires at night, burning riparian ecosystems;

(right) landscape burnt by wildfire, except for a fire break. Photo credits to B.M. Flores (left) and F. Tatagiba (ICMBio) (centre and right)

In recent years, wildfires have become increasingly frequent in the Brazilian savannahs, also severely affecting the riparian forests. Investigations carried out with a scientist from the University of Hohenheim in Stuttgart have now shown how great the threat to these sensitive ecosystems actually is: "The loss here is even worse than in the tropical rainforest of the Amazon, because the area affected is larger," said Dr. Anna Abrahão. Tropical savannahs are among the world's most biodiverse habitats and one of the most threatened ecosystems. In addition to the typical grasslands and shrublands, there are also evergreen forests, especially along the damp banks of streams and rivers. The results of the study, conducted by 20 researchers from various Brazilian and international institutions, have now been published in the *Journal of Applied Ecology*.

The Chapada dos Veadeiros National Park, a UNESCO World Natural Heritage Site, is located in one of the oldest and most biologically diverse tropical habitats in the world, the Cerrado. With an area of more than two million square kilometers, the savannah landscape located in Brazil's central plateau is almost six times as large as Germany and—after the Amazon [forest](#)—the second largest ecosystem in Brazil.

It provides a habitat for around 12,000 [native plant](#) and [animal species](#), including many species that can be found exclusively there. The riparian forests in particular are important habitats for large animals such as jaguars, for which they serve as hiding places in the open savannah areas.

At the same time, the Cerrado is under enormous pressure from

agriculture and livestock farming. Annual vegetation loss rates are even higher than those in the Amazon region. Particularly in the nature reserves, large-scale, destructive wildfires regularly occur, seriously endangering the biodiversity in this area.

In October 2017, a large wildfire spread over the savannah landscapes of the Chapada dos Veadeiros National Park. It burned more than 86 thousand hectares, which is more than 80% of the park area. A 20-member international research team has now investigated the extent of the consequences of this [fire](#), especially for the riparian forests in the tropical savannah.

Treetop canopy decreased from 90 down to 20 percent

Using satellite images from Google Earth, the researchers determined the loss of forest cover over an area of 90 hectares between 2003 and 2019. They compared the results with field data collected in 36 forests scattered over the burnt landscape.

While in 2003 more than 90% of the area in the riparian forests was still covered by the canopy of the trees, this area decreased to 20% in some forests after 2017. More detailed investigations on site showed that the [forest fires](#) killed an average of 50% of the adult trees and 88% of the tree shoots.

However, not all forests were affected to the same extent. "To our surprise, the forests that were flooded during the rainy season were the most damaged. Some of these forests have even been completely destroyed," stated Dr. Bernardo Flores of the University of Campinas in Brazil and first author of the publication.

The scientists see one reason for this in the relatively thin bark of the trees. For although the riparian forests grow in an environment where

there is frequent fire, the fire itself rarely reaches them: Their soils have sufficient moisture to prevent fire spread. As a result, most tree species in riparian forests form only relatively thin bark and are much more fire-sensitive than trees in the open savannah.

Savannahs are only tolerant to natural fires

Normally, the ecosystems of tropical savannahs are tolerant towards regular fires. "Natural fires are usually caused by lightning during thunderstorms. These fires are usually quickly extinguished by the subsequent rain. In addition, thunderstorms usually occur during the [rainy season](#), so that the soil and vegetation are moist and not so easily flammable," said Dr. Abrahão.

"But people usually start fires in the middle of the dry season, when the grass and also the forests are dry and burn well," Dr. Abrahão stated. "Since the Brazilian government has placed less and less emphasis on environmental protection in recent years, the number of fires has also increased dramatically."

Agriculture and climate change increase the risk of fire

Another reason for this is certainly the increasing expansion of agricultural land in these regions, which has led not only to the loss of natural habitat but also to the introduction of alien plant species.

Thus, non-native grasses planted on pastures as cattle feed spread into the adjacent [savannah](#) and displace the native species there. In addition, the alien species usually produce more biomass and thus provide additional fuel for the fire.

At the same time, due to climate change in recent decades, an extension of the so-called fire weather season has been observed in the tropical savannahs around the world. High temperatures, low rainfall, low humidity, and often strong winds combine to increase the risk of fire. In tropical South America, this period today lasts 33 days longer than it did 35 years ago.

Entire ecosystem is in danger

In most tropical forests, a single wildfire usually burns between 23% and 44% of the trees. In seasonally flooded riparian forests, however, a single forest fire event can kill 60% to 100% of all adult trees, according to one of the researchers' findings. In addition, the exposed areas increase soil erosion.

The loss of these riparian forests can have negative effects on all flora and fauna as well as on the ecological balance of the park. Thus, invasive grasses and other opportunistic plants, such as climbers and ferns, were able to spread rapidly within a few months in the most damaged areas. Although the destruction of the forests has created space for new plant species, a completely new biocenosis is emerging at the same time, and it usually contains fewer species.

Monitoring further development of the damaged ecosystem

The researchers intend to observe further developments in the coming years. After all, the question is whether severely disturbed riparian forests can recover and return to their original state, or whether this process is halted by opportunistic plants and natural forest regeneration is stopped.

With the results of their investigations they also want to contribute to developing strategies for integrated fire management in these landscapes. For example, targeted, controlled fires could help to reduce combustible biomass, restore landscape diversity, and reduce the spread of forest fires.

More information: Bernardo M. Flores et al. Tropical riparian forests in danger from large savanna wildfires, *Journal of Applied Ecology* (2020). [DOI: 10.1111/1365-2664.13794](https://doi.org/10.1111/1365-2664.13794)

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