

Key messages

- Human pressures and climate change are altering forest fire regimes in Bolivia.
- Forest fire management in the country must adopt an integral approach that can balance contingency and supervisory control measures with interventions for the prevention and adequate use of fire that will be responsive to the needs and challenges of the problem at hand.
- Understanding the role of fire from an ecological perspective is necessary in order to develop adequate strategies in accordance with circumstances.
- All fire management strategies must include and promote community participation and collaboration between the different sectors and stakeholders involved in the issue, so as to achieve real ownership by the community and guarantee its sustainability over time.
- Effective answers to the problem must be incorporated in public policy instruments, which in turn must be integrated into the wider context of territorial management, so as to contribute to the sustainable management of natural resources, local development and conservation of the environment.

Community-based Fire Management: A Participatory Approach Towards Forest Fire Management in Bolivia

In the past few decades, forest fires have become one of the main threats to forest and biodiversity conservation in Bolivia, causing environmental, economic and human health damages. Current tendencies show an alteration in fire regimes influenced by demographic growth, land use pressures and climate change.

In this regard, forest fire management in the country requires the adoption of integral approaches that might balance contingency and supervisory control measures with preventive measures, taking into consideration the fire use needs of the population, and promoting community participation and the collaboration of the different stakeholders involved in this situation.

Introduction

Bolivia is the eighth richest country in the world in biodiversity, and the fifteenth in forest cover. Nevertheless, in the last few decades, forest fires have become one of the principal threats to forest conservation and the biodiversity they harbor, causing environmental, economic and human health damages. These impacts are felt even more in rural populations whose livelihoods depend on natural resources and who are more exposed and vulnerable when faced with these types of events.

The most common causes of forest fires in Bolivia are anthropogenic in origin. They are related to the inadequate use of fire in agricultural/livestock practices, carelessness in fishing and hunting activities, cigarette butts discarded by the roadside and the burning of trash.

This situation is exacerbated by climate change, with warmer and drier conditions that increase the risk of fires. In effect, the changes detected in recent and future climate change scenarios coincide with temperature increases and precipitation decreases in the whole country, with more pronounced changes during the dry season^{1,2}. In turn, phenomena such

as El Niño and La Niña have a strong influence on climate and extreme events in Bolivia, and they are being potentially magnified by climate change.

The harsh droughts and frosts that were a scourge to the country during the 2010 winter, associated to the La Niña phenomenon, contributed toward generating the conditions for the most extreme fire season endured by the nation, where the burned area came to approximately six million hectares in the whole of the nation's territory³.

Although in the last three years forest fires have diminished in relation to earlier years, the tendency observed in recent decades is of continuous growth. During the 2000 to 2013 period, the accumulated area burned in the whole country came to approximately 32 million hectares, with Santa Cruz and Beni being the most affected departments.

The greatest fire incidence occurs mainly in non-forested areas that include natural grassland vegetation formations, cerrado and low-height vegetation. In forested areas, fires have affected a surface area of over nine million hectares in the

last 14 years, principally in Amazonian forest and in the Chiquitania. In protected areas, the affected surface area is mainly concentrated in the San Matías Integrated Management Natural Area, and the Otuquis, Noel Kempff Mercado and Isibore Sécure national parks.

The forest fire issue in our country generates an intense public debate in the search for tangible solutions that will allow a decrease in their impact. This paper sets out the main challenges, approaches and means to responsibly address the situation.

Fire management, technical interventions and community participation

Diverse points of view and approaches to address forest fire management have been evolving in recent decades. The traditional approaches for handling these issues have been fundamentally concentrated on the negative aspects of fire and on the adoption of protection policies, based on fighting and suppressing fires, and the application of coercive and punitive legal measures. However, the effectiveness of this type of approach has turned out to be very limited in practice due to a diversity of factors. Among these are a lack of knowledge of the social and ecological context in which fires develop, the lack of control and participation in decision making at the local community level, and the fact that its implementation is subject to the capability and resources of the relevant government institutions.

Currently, the approach that acknowledges that fires must be managed is acquiring greater importance, with management understood as the set of actions directed toward a goal, which in this case seeks to reduce threats and damages caused by forest fires. More concretely, fire management refers to interventions directed

not only at fire control or suppression, but also at prevention and the adequate use of fire for specific ends, which may be for agriculture or natural resource management.

As long as the use of fire is a common practice in agricultural activities, because it is a cheap and easily accessible tool, and as long as conditions to adopt alternatives to the use of fire do not exist in our country in the short term, it becomes almost inevitable that we must acknowledge its use as necessary in order to guarantee the provision of food for the population. Therefore, promoting the adoption of adequate practices for a responsible and planned use of fire is a strategic issue in forest fire prevention.

Another important aspect in fire management consists in understanding its role from an ecological perspective, where it is acknowledged that fire forms a part of the dynamics of many ecosystems and that, therefore, suppressing it would alter these natural dynamics. An integral approach to fire management must consider both the beneficial as well as the detrimental uses of fire so as to develop adequate strategies that allow taking advantage of the benefits and minimizing the damages, depending on circumstances.

Hence, the application of prescribed fires has been expanding in many countries with diverse management objectives, whether it be to reduce the forest combustible loads and control fire propagation in fire-sensitive ecosystems, or to maintain the desired state in fire-dependent ecosystems. It must be noted that these types of measures must be supported by a solid base of information and knowledge on the expected effects of their application.

In Bolivia there is still much research to be done on fire regimes and behavior in the different ecosystems. However, we must be aware of alterations in the historic regimes due to human pressures and climate change. This situation is generating scenarios in which for vegetation

Our Community-based Fire Management Initiatives in Bolivia

- Fundación Amigos de la Naturaleza promotes the development and strengthening of fire management programs, projects and initiatives in the departments of Santa Cruz and Beni.
- The project "Community-based fire management around protected areas in the Bloque Chiquitano" is an initiative aimed to reduce the vulnerability of ecosystems and population in the face of forest fires and climate change. Its interventions are established throughout the Laguna Concepción, Santa Cruz la Vieja and Tucabaca protected areas, between the municipalities of San José de Chiquitos, Roboré and Pailón in the department of Santa Cruz. This initiative is being replicated in the municipality of Riberalta in the department of Beni with the "Community-based Fire Management in the Northern Bolivian Amazon" project.
- Through these initiatives, a set of activities, tools and plans are developed in a participatory manner with communities, so as to strengthen local capabilities in the establishment of good practices in fire management. An early warning system is being implemented that generates useful information for forest fire prevention, control and monitoring at the regional and community level. At the same time, coordination mechanisms are being strengthened for fire management and the construction of public policies with a fire-management and adaptation-to-climate-change approach.

types where fire acted as a regulating mechanism in their structure and composition, and therefore of the state of conservation of the ecosystems -such as the case of the natural grasslands of the Beni plains, the Pantanal and the Cerrado formation- fire behavior has come to take on huge proportions as a factor in the degradation of the above, fostering the appearance of invasive species such as the dry-brush sujo, and exercising greater fire propagation pressure on the high forest cover.

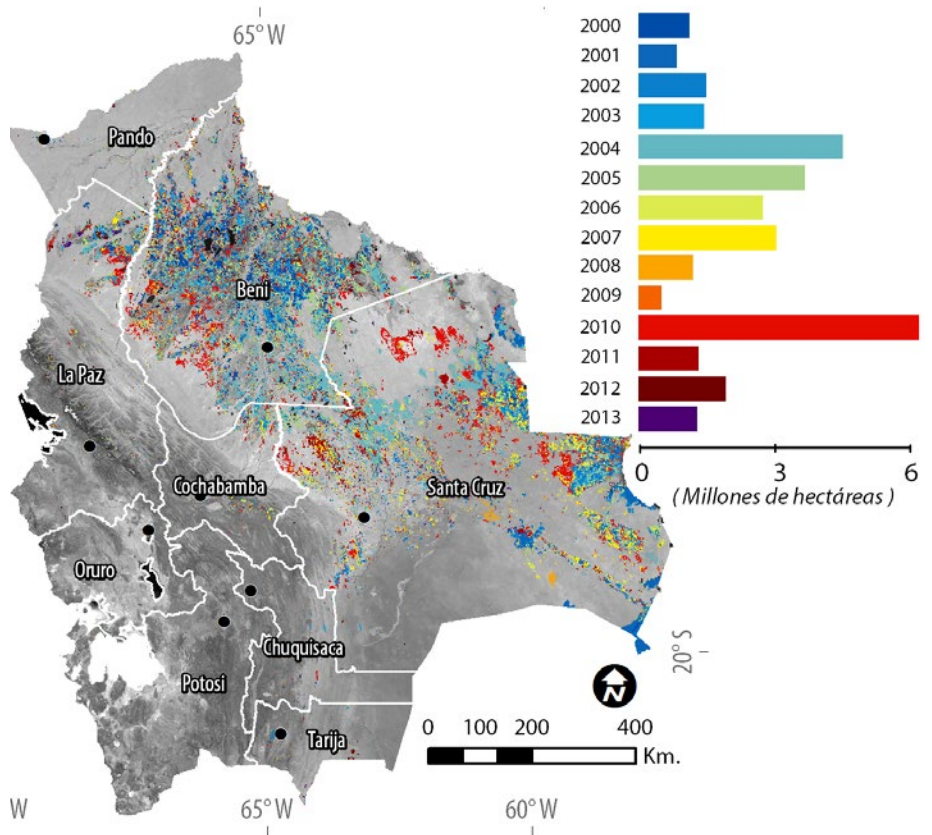
Of course, in facing progressively more extreme events, preparedness and response capacity to fight and control forest fires will continue to be a strategic component in fire management. This involves counting on forest fire monitoring and early alert systems; coordination and inter-institutional cooperation for emergency preparation and response; trained and organized fire-fighting personnel, including professional firemen and community brigades; as well as response equipment and infrastructure such as cistern trucks, fire stations, tools and access roads, among others.

Since there are a great diversity of stakeholders involved in this complex issue which includes the members of rural communities; ranchers; authorities and officials from government institutions; productive and social organizations; mass media; academic, conservation and scientific institutions, with perceptions and stances on the issue that are frequently extremely varied and opposed; it is necessary to count on policies and programs based on robust situational diagnosis and analyses that will allow adequate responses to the multiple challenges, balancing the needs and interests of the population.

Public policies must be consistent to address the problem adequately and avoid counterproductive effects. The expansion of the agricultural frontier and of new settlements is related to the occurrence of fires. This can be demonstrated when one observes that 65% of the areas burned in the whole country were concentrated at a distance no greater than a kilometer from deforested areas, these being the areas that were burned only once in the last 14 years. This highlights the importance of territorial ordering in prevention strategies and the need for counting on a political and regulatory framework that will establish clear processes and procedures that are adequate to the social and ecological context in which they must be applied.

All strategies must include and promote community participation in fire management.

Area burned in Bolivia from 2000 to 2013



This implies the establishment and promotion of participatory processes with the population in the search for solutions to their problems in relation to their territorial management, their natural resources and forest fires. Said processes must be developed from decision-making through the implementation of measures, promoting collaboration and the desire to work for the common good among individuals, so that there might exist a true appropriation of the initiatives and interventions in fire management on the part of the communities and, thus, be able to guarantee their sustainability through time.

This participation must be promoted at every level to arrive at collaborative fire management amongst the different sectors and stakeholders that will permit the coordination of efforts and resources for the prevention and control of forest fires in our country.

Conclusions

The tendencies observed in recent decades show an alteration in the fire regimes in Bolivia influenced by demographic growth and the pressures of soil-use activities in rural areas. Climate change adds to these pressures by generating conditions that make forests more prone to forest fires.

Faced with this situation, forest fire management in our country must adopt an integral approach that can balance contingency and supervisory control measures, widely implemented during the fire season, with preventive actions that must take into consideration the fire usage needs of the population, and which will promote community participation for a responsible use of fire as well as collaboration between the different stakeholders involved in the issue.

Fire management involves a continuous learning process that requires the participation of all the stakeholders who find themselves implicated both in the causes and in the management of forest fires. Consolidating sustainable fire management strategies requires the appropriation of the same by communities and inter-institutional cooperation at different levels.

Finally, effective responses to the problem must be incorporated in public policy instruments, which in turn must be integrated into a wider context of territorial management in order to contribute to the sustainable management of natural resources, local development and conservation of the environment.

Fundación Amigos de la Naturaleza is a non-profit civil society organization created in 1989. We develop and promote innovative paths of integrated and sustainable development with technical and scientific support, while maintaining our commitment to the conservation of Nature.

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Terminology

Forest fires: Any non-programmed fire that expands without control through the forest (or brush), regardless of its origin, which may require a response in order to suppress it, or some other measure in accordance with established policies.

Fire management: All the actions necessary to prevent, control and use fire, so as to reduce threats and damages caused by forest fires.

Fire regimes: This refers to the extent or scope of the historic variation in the frequency, seasonality, intensity, severity, and size of fires, and the synergy these may have with other disturbing agents to which an ecosystem has been subjected to over a long period of time.

Fire behavior: This is the manner in which fires react to the effects of the variables of the surroundings in which it is taking place. It is determined by the complex of combustible elements, meteorological and topographical conditions, and may be characterized through variables such as propagation velocity, flame height, and intensity, among others.

Fire-sensitive ecosystems: Are those that have not developed with fire as an important and recurrent process, such that their species lack adaptation capabilities for responding to fires. The structure and composition of the vegetation tends to inhibit ignition and fire propagation, but as fires become more frequent and extended the ecosystem can be displaced toward vegetation with greater fire propensity.

Fire-dependent ecosystems: These are those where fire is essential and the species have developed adaptations to respond positively to fire to facilitate their propagation. That is to say, the vegetation is flammable and has a propensity toward fire. Frequently these are called fire-adapted or fire-maintained ecosystems.

Prescribed fires: Are a type of controlled burn that is carried out for the specific purpose of modifying the fuel load, the composition of vegetation, and the conditions of the habitat. This type of fire is carried out under an approved plan in a determined area, to fulfill specific management objectives.

About the authors

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