



Fire Situation in Bolivia

Fire environment, fire regimes and the ecological role of fire

Every year Bolivia and other neighbouring countries, such as Brazil, Paraguay and Argentina, experience forest fires resulting either from land conversion to agriculture and cattle ranching, or natural pasture burning for grass renewal. The burning period starts with the dry season, which stretches from June to November depending on the particular precipitation regime of a given year. According to estimates from the BOLFOR Project and the Forest Superintendence, more than 100,000 hectares are burned each year in Bolivia.

Narrative summary of wildfire effects on people, property and natural resources

During August and September of 1999, what could have been considered a “normal year” turned into one of the worst environmental disasters in the last decade. The word *disaster* was used to describe the situation, since fires destroyed several villages and towns, killed and injured people and burned hundreds of homes. The worst fire took place in the town of Ascención de Guarayos. This event was a warning for institutions and projects, including BOLFOR, which started a follow-up effort using satellite images provided by the National Oceanic and Atmospheric Administration (NOAA), to examine fire behaviour in Bolivia.

Between August and September of 1999, more than 12 million hectares were burned in Bolivia. In order to summarize the results of the analysis of satellite imagery, the various and complex types of vegetation in the Bolivian lowlands were grouped by region. The area affected by fire in each region and broader vegetation type is shown in Table 1.

Table 1. Vegetation types grouped by region.

Burned area (ha)	Region and vegetation type
7,265,429	Grasslands
2,614,968	Chiquitano forest
1,363,884	Amazonian forest
865,584	Agriculture/land conversion areas
541,103	Chacoan forest
77,569	Chiquitano palm groves
20,938	Montane forest
12,749,475	Total area burned

Grasslands, where fire is used for pasture improvement and land-clearing, account for the largest burned areas and undoubtedly are where most fires started, as proven first during classification of NOAA images and later during classification of each fire by week of activity.

Fire classification by vegetation type also shows that wildfires entered forested lands in Santa Cruz and Beni Departments, especially in the former, where fire was used for land clearing within forested areas.

The 865,584 ha of agricultural lands which were burned included areas already deforested, which are under cultivation, as well as areas in process of land conversion.

In terms of production forest, the Chiquitano forest was the most affected with 2,614,968 ha burned, followed by areas under Amazonian forest.

In the year 2000, smaller figures are expected, nearing 4 million hectares (which still is a considerable amount) and to date most fires have occurred in pastures and wooded grasslands.

Wildfire impacts on people, property and natural resources (1999)

In order to determine the degree of damage caused by forest fires, over 25 field visits were undertaken to areas that were burned. In many of these visits, it was observed that no forest had been burned, particularly in Beni. However, in Santa Cruz the situation was different and a total of 30 plots were established in the forests most affected by fire, namely the Chiquitano forest.

According to the methodology used for the study, trees were classified by commercial value and the damage caused by fire. The summary of results is presented in Table 2.

Table 2. Damage caused by fires by hectare.

Cubic meters per ha in Chiquitano Forest				
Commercial value	DAMAGE CLASS			
	1	2	3	4
Very valuable	4.31	6.96	0.64	0.47
Valuable	1.76	1.51	0.16	0.09
Low value	9.08	16.72	2.32	1.69
No value	5.62	9.56	1.25	0.96

According to Table 2, cubic meters damaged and extremely damaged (classes 3 and 4) for the very valuable and valuable category reached 1.36 cubic meters per hectare. This figure extrapolated to the entire area of Chiquitano forest affected by fires (2,614,968 ha), corresponds to 3,556,356.5 cubic meters. According to information collected by field surveys, average stumpage value is \$10 per cubic meter, which translates into a total figure of \$35,563,565 (U.S. dollars).

Finally, these sources indicate that once the logs are harvested, yarded and milled, the value of timber produced would reach approximately \$350 million.

It is difficult to assign a monetary value to the damage caused by the fires. The calculations above (\$35 million for standing timber and \$350 million for processed lumber) are only an estimate of the losses resulting from forest fires.

It is worth noting that this somewhat “symbolic” calculation includes only the most valuable timber species in the sampling and only takes into account volumes from trees whose crowns/boles were damaged by more than 50 percent (class 3) or completely burned (class 4). We could add to this value the damage or losses that the trees will experience in the future in classes 1 and 2. Also, this calculation includes only the burned area in Chiquitano forest and does not take into consideration the losses due to burning of fence posts, power lines and posts, crops, homes, etc.

Carbon Emissions

Estimations on carbon emissions indicate that 82.64 million tons were released and 165.29 million tons of biomass were consumed. It is worth mentioning that the Chiquitano forest was the largest source of emissions, followed by grasslands (Table 3).

Fire management agencies in Bolivia

In Bolivia, the agency in direct charge of fire management and prevention is Civil Defence, which is under the Armed Forces. However, it does not have the human and financial resources necessary to effectively carry out its mandate. There are also other agencies such as the Ministry of Sustainable Development and Planning and the Forest and Agrarian Superintendencies, which are in charge of controlling, monitoring and preventing fires through planning and training programmes. Bolivia does not have forest rangers or teams of firefighters specialized in forest fires. Therefore, all government efforts are focused on training and prevention. Initiatives such as training courses on prescribed burning, planning and prevention have been implemented.

Table 3. Estimated carbon emission values by type of vegetation.

Estimated carbon emissions				
Area in ha	Vegetation type	Tons of consumed biomass per ha	Total tons consumed	Released carbon (million tons)
865584.39	Agriculture/land conversion areas	20.25	17,528,083.88	8.76
1363883.61	Amazonian forest	27.00	36,824,857.40	18.41
7265429.42	Grasslands	6.13	44,561,300.46	22.28
2614967.67	Chiquitano forest	21.60	56,483,301.67	28.24
541102.71	Chacoan forest	16.20	8,765,863.89	4.38
20938.06	Montane forest	25.00	523,451.56	0.26
77569.20	Chiquitano palm groves	7.75	601,161.29	0.30
TOTALS				
12,749,475.06		165.29	165.29	82.64

Wildfire Database

Table 4. Number of fires and area burned, 1990-1999 (recorded only for 1999)

Year	Total N° of fires. On Forest, Other wooded land and other land (N°)	Total Area Burned on Forest, Other wooded land and other land (ha)	Area of Forest Burned (ha)	Area of Other wooded land burned (ha)	Human causes (%)	Natural causes (%)	Unknown causes (%)
1999	31,245	12,749,475	4,540,893	8,208,582	99,9	0,1	0

Use of prescribed burns to achieve resource management objectives

Bolivia has standards for burning, established by the Ministry of Sustainable Development and Planning, which emerged due to traditional fire use by rural communities. These standards provide rules for conducting burns and take into account factors such as ideal environmental conditions (absence of wind, high humidity, low temperatures) and preventive measures such as building fire breaks, as well as monitoring fire progress and intensity. Currently most efforts are focused on training community leaders in order for them to disseminate information to their communities.

Public policies affecting wildfire impacts

The most important fire users in Bolivia are farmers and cattle ranchers who use burns as an agricultural tool for land clearing and pasture improvement. Another group of users whose impact is considerable, consists of land settlers and communities that use fire as a tool for “cleaning” their fields and converting land to agriculture and cattle raising. These people are the main focus of government policies and programmes in the form of technical bulletins, flyers and radio and press ads on the advantages of controlled burns and, ultimately, the total elimination of burning.

Also worth mentioning is the fact that Bolivia does not have assistance programmes or economic incentives for producers to modify or eliminate fire use, or switch to alternative and less harmful practices.

Sustainable land use practices used in Bolivia to reduce wildfire hazards and wildfire risk

A study carried out in 1999 by the BOLFOR Project shows that voluntary forest certification seems to be a strong incentive for forest protection. Concessions managed by forestry firms have built strong links with local communities in forested areas and thus have been able to coordinate actions to detect and successfully control fires before they reached the forest. This is one example that the sustainable forestry model is working.

On the other hand, the inclusion of municipal governments in the forestry model, through local social groups, has helped to demonstrate that forest resources are valuable and should be protected by the communities themselves.

Community involvement in fire management activities

After the 1999 fires, a public and private campaign was started to disseminate the results of the analysis of the damages caused by the fires in the form of seminars targeting cattle rancher associations, municipal forestry units, local social groups, indigenous communities and the general public.

Also, workshops have been presented on prescribed burning at the community level. Posters and bulletins using clear messages have been distributed showing the risks and threats of continued fire. Cooperating agencies have allocated special resources for these tasks, as well as funding courses on the topic of fire management. Such is the case with USAID's Office of Foreign Disaster Assistance, which has coordinated with local institutions to carry out courses in fire fighting for civil defense, park rangers, community leaders and members of environmental groups.

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http://www.fire.uni-freiburg.de/programmes/un/fao/Wp55_eng.pdf

IFFN/GFMC contribution submitted by:

Ignacio Martínez and William Cordero
BOLFOR - Proyecto de Manejo Forestal Sostenible
4to. Anillo esq. Av.2 de Agosto
Casssilla 6204
Santa Cruz
BOLIVIA

Fax: +591-3-480-854
Tel: +591-3-480-766 / 767
e-mail: bolfor@bibosi.scz.entelnet.bo