

Villaflores: Municipal Forest Fire Management Model¹

Pedro Martínez Muñoz² and Carlos Alberto Velázquez Sanabria³

Abstract

As provided for in the General Law on Sustainable Forestry Development, the Municipality of Villaflores has worked on a continuous basis since 2002 to reduce the damage caused by forest fires as part of its working agenda, in conjunction with Federal and State agencies and NGOs. The work plan has the following phases: a) **Inter-agency coordination**: participation of governmental agencies and NGOs; b) **Pre-suppression**: actions enabling the preparedness of resources (human, material and financial), highlighted by the establishment and operation of a Municipal Forest Fire Control Center; c) **Prevention**: actions to increase the participation of the general population; d) **Inter-municipal linking**: strategy to foster backup, validation and support among different municipal departments; e) **Detection and Suppression**: fire discovery and notification of staff responsible, who are dispatched under the principles of **initial attack**; f) **Social Participation**: aimed at **critical communities**, involving small farmers, children, youth and women, and also the participation of farmer organizations (UPROSIVI) and civil organizations (BIOMASA, FMCN, AMBIO, CBMM); and h) **Education and Training**: capacity building at the community and technical level, in order to have personnel qualified, skilled and trained in the subject area.

So far efforts have yielded the following results: 1) Decrease in the area affected per year, **from an average of 7,000 hectares between 1995-2001 to an average of 751 hectares**; 2) Empowerment in the subject by civil society, through UPROSIVI; 3) Training of 52 technicians and specialists and 105 community firefighters; 4) Resource allocation for alternative production and environmental projects; 6) Network of 30 community fire brigades in support of the program; 7) Development of a Municipal Forest Fire Information System; and 8) 74% contribution in days/man participation in prevention and suppression activities.

Keywords: Forest law, fire program, social participation.

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² Forestry Technician Ranger and wildfire consultant to the Villa Flores Municipality, Chiapas, Mexico; email: pmtz@hotmail.com.

³ Agronomist Engineer and Technical Consultant to UPROSIVI, and representative of BIOMASA; email: biomasa_ac@hotmail.com.

Introduction

When we think of improving service to forest fires, it is essential to have the participation of civil society, so we have to use what is mentioned in the General Law for Sustainable Forest Development, which lays down rules for carrying out actions related with fire management, involving the public administration offices of the three levels of government and society in general. Also, more specifically, the Mexico Official Policy (Norma Oficial Mexicana [NOM-015-SEMARNAT/SAGARPA] 2007) also provides the technical specifications of the methods of fire use in forest and agricultural lands, in order to prevent and reduce forest fires. In addition, on October 29, 2008, the Sustainable Forest Development Act was published for the State of Chiapas, in which are given powers and duties to the municipalities of the state for the implementation of actions related to the Integrated Fire Management. Considering the above legal framework, and before the phenomenon of climate change as the main process affecting safety and welfare of society and environment, the institutions, both governmental and nongovernmental, must commit to develop actions that contribute to the protection, conservation, restoration and sustainable use of natural resources of Mexico, particularly the forests, as an urgent action, considering that they are generating ecosystems of goods and environmental services on which we depend as humans. Taking in account what has previously described, the Villaflores Municipality, Chiapas, made the decision to develop actions to help reduce the environmental problems associated with the occurrence of forest fires since 2002 in an uninterrupted way, as part of its work agenda which attends permanently.

Legal Framework of Forest Fires

The division of responsibilities in preventing and fighting forest fires for the Federation, the States, the Municipalities and the owners of forest resources, is mentioned in various legal instruments in our country, as the General Law for Sustainable Forest Development (LGDFS-Spanish acronym) in the Articles 12 Fraction XVI, 13 Fraction XIV and XV, 15 Fraction XI, 123 and 124; Law for Sustainable Rural Development in the Articles 19 and 20; General Law for the Ecological Balance and Environment Protection (LGEEPA); as well as the Official Mexican Standard 015 SEMARNAT-SAGARPA/2007 which regulates the use of fire in agricultural and forest lands. These instruments also refer to decentralization of resources, functions and obligations, as well as social participation.

These legal mandates, identifies three aspects that make PPCIF of Mexico, which are listed below:

A) Federation

- ☐ SEMARNAT
- ☐ CONAFOR
- ☐ CONANP
- ☐ SAGARPA
- ☐ SEGOB - CIVIL PROTECTION
- ☐ Other federal support offices
 - B) Governments of States and Municipalities
 - C) Owners and/or landholders of forest lands.

The Article 123 of the LGDFS states that to CONAFOR corresponds to coordinate actions of prevention and specialized fighting of forest fires, as well as to promote assistance from other departments and agencies of the Federal Public Administration (APF), of the states and municipalities in terms of the distribution of responsibilities (mentioned in Articles 12, 13, and 15 of the LGDFS) and of agreements and treatments signed.

For a long time, there has been the perception that the initial attack is the responsibility of the Federal Government, however the LGDFS is clear by giving landowners and landholders of forest land and preferably forestlands, as well as municipal and state governments, the attribution of the initial attack of wildfires and to CONAFOR the attribution to support these levels of government and landowners, through extended attack or specialized firefighting.

Service at National Level

The National Program for Forest Fire Protection (PNPCIF-Spanish acronym) has a history that goes back beyond the decades of the 50's – 60's, through which it has evolved according to prevailing circumstances and conditions. The program has been staying at the ex-Ministry of Agriculture and Livestock (SAG-1946), Ministry of Agriculture and Water Resources (SARH-1976), the Secretariat of Environment, Natural Resources and Fisheries (SEMARNAP-1994), the Ministry of Environment and Natural Resources (SEMARNAT-2000), and now at the National Forestry Commission (established in 2001, although the Program for Forest Fire Protection was transferred from SEMARNAT to CONAFOR in 2002). During all these transfers and department changes, the PNPCIF has been subject to evolution and development, motivated by different program managers.

Historically, the PNPCIF is one of the most advanced in the field in Latin America, so that in many cases it has provided technical support to other countries in the region, including Guatemala, Paraguay, Belize, Costa Rica, etc. It is considered a

strong program in Latin American, but not as developed as in countries such as U.S., Australia, Spain and Canada.

Service at State Level

It is in December 1994, when the Ministry of Environment, Natural Resources and Fisheries (SEMARNAP) transferred to the State, the authority in forestry and the service responsibility to wildfires. In October 2008, the Sustainable Forest Development Act is published for the State of Chiapas, which specifies that the State designates the Department of the Rural Field (Secretaría del Campo, in Spanish), as the institution responsible for coordinating, supervising and implementing actions to prevent, fight and control the wildfires in the state, asking for participation from federal, state and municipal governments, as well as NGOs and society in general.

Although, the State Government has channeled additional budgets and has invested in the training of the technical personnel, operational and administrative infrastructure of the State is still limited to fully assume responsibility stated in the Act, so that the responsibility for the coordination of protective actions against forest fires is still shared with the federation. Derived from this inter-institutional coordination, in recent years, Chiapas has not occupied, nationally, the top in terms of areas affected by forest fires. The operational organization for the service of forest fires has been given by working along with the State Center for Forest Fire Control (CECIF-Spanish acronym) and Regional Centers for Forest Fires (CRIF-Spanish acronym), with the participation of representatives of the agencies involved in this issue at State level, and 25 municipalities have been determined critical by fire incidence and hazard.

With this scheme of work, there have been great advances in the state, consider it as one of the most developed states in forest fire protection nationwide. In Chiapas, a strong coordination has been established among units of the three levels of government, NGOs and civil society, development of local capacities in specialized areas of forest fires; specialized equipment, among other things.

Experience of the Villaflores Municipality:

The Municipality of Villaflores (Figure 1) has an area of 1, 232.10 km², of which has a forest area of over 70, 000 ha, consisting of woodlands, forests and secondary vegetation in various strategic areas such as the Reserve of the Biosphere "La Sepultura", the Forest Reserve "The Frailescana", the Cerro Nambiyigua, the Cerro Brujo, among others, which are constantly threatened and affected by forest fires. In the period 1995-2001, the Municipality of Villaflores was affected by forest fires in

51.926 ha, which represented 41% of total problems of the Frailesca region. The above figures indicate that during the mentioned period, the Municipality of Villaflores was the most affected by forest fires in the State of Chiapas. The Biosphere Reserve "La Sepultura" (REBISE) and the Protected Area of Natural Resources "La Frailesca" (APRN La Frailesca) are located in part of its territory, where there are diverse ecosystems such as the Tropical Montane Cloud Forest (endanger species), pine forest, high and semi-evergreen forests, among others.

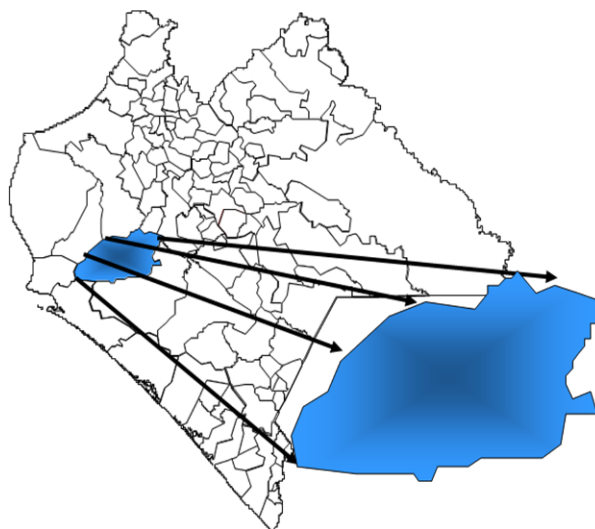


Figure 1—Location of the Municipality of Villaflores.

The forest fire problem that occurs in the Municipality of Villaflores is due to excessive use of fire in agricultural activities, it is to be understood that this region is considered the "breadbasket of the state of Chiapas", for its high yields in corn that has been obtained, but, lately, there have been other causes for fire occurrences such as lightning strikes, smokers, hunters and trash burning. In the past 15 years, the municipality of Villaflores has been placed between the first places affected by forest fires and incidence, which has brought, side effects of this phenomenon, among them the loss of vegetative cover, erosion and mudslides, mostly in the upper part of the mountain area.

In the Municipality of Villaflores until 2001, service to forest fires was traditionally a task for the Federation together with the State Government, along with the Honorable Municipal Council which preferentially supported with logistics resources without a defined initiative in this area. The Municipal Program for Forest Fire Protection starts in 2002 which has been the basic premise of protecting natural resources through participation and strengthening of local capacities, and the promotion of productive alternatives for the use of fire. After ten years the results of

this program have been constant and obvious as it has reduced the affected area of 3,851 hectares in the year 2001 to 168 h affected in the last critical season (2012), as well as a technical team of specialists has been consolidated, an effective interagency coordination has been developed, and these activities have been empowered by a community organization (UPROSIVI) with developers and community brigades with the "initial attack" strategy of 2005, with which a municipal model of service to forest fires and Integrated Fire Management has been established.

Due to the success of the firefighting strategy in the municipality, another problem has been developed which is the accumulation of combustible material available to burn in the forests that conjugated with existing steep topographic conditions and extreme weather (such as those presented in the critical period), can cause rapid fire spreading of large magnitude. To solve this problem, the Municipal Information System for Forest Fire Management was developed, first phase, where different activities are posed to help us to improve decision-making in fire management and, especially, to predict fire behavior when wildfires occur or prescribed burns are conducted (as an effective way to manage fuels), this is as a supplement to the fire prevention strategy of the existing Municipal Program, in addition to the Management Plans of the Biosphere Reserve La Sepultura (REBISE) and the Protection Area of Natural Resources (APRN) La Frailescana, for reducing the risk and disruption of forest fires that impact severely on this municipality. This strategy was based on the realization of a diagnosis of the perception of fire, mainly focused on two aspects, the historical (causes and effects of fires in the area, ignition sources and frequency, efficiency indicators, burn seasons, records of burning schedules, surface size, etc.), and social (problems, the relationship of fires with activities, resources and management of ANP, linking problems with other institutions and organizations involved in the management and conservation actions, etc.).

Phases Of The Fire Management Program In Villaflores, Chiapas

At first, it is important to mention that several actors are involved in the Fire Management Program of Villaflores, from the leadership that has established the H. Municipal Council, including the participation of other environmental and agricultural agencies, highlighting the involvement of institutions of higher and primary education, in addition to NGOs, technicians, professionals, volunteers, environmentalists, journalists, housewives, but especially farmers living in rural areas who use fire as a tool in the preparation of their plots.

In this situation it is logical that there is a level of knowledge and experience at different levels on forest fires, reason why it is necessary to design strategies to address the problem of forest fires, based on "diagnosis and rigorous analysis" as currently happens with Municipal Program of Villaflores, having a methodology for priority areas product of the Municipal System for Forest Fire Management. In this sense, through the reference program, two components are attended: the institutional or classical and social component, with the remaining task of moving towards an initiative of Integrated Fire Management, when one has the conditions to develop the ecological component based and grounded in the knowledge of fire ecology.

The Fire Management Program is designed and made within the framework of public policies on environmental and forestry issues, which for this case, it has a medium-term orientation and is integrated into the State and Regional Program in the field, linking its development and implementation with that of the Biosphere Reserve "La Sepultura" (REBISE), considering that the largest part of area with woods and forests of the Villaflores municipality is located within such ANP. Based on this Municipal Strategic Program, annual operational programs are developed to guide actions in the short term. The Villaflores Municipal Program for Fire Management at medium term is based on an "evaluation of protection priorities" methodology supported by the expertise provided by analytical treatments relative to procure "risk", "danger" and "potential damage". In this case, to know the fire risk an analytical study was performed along with an evaluation of factors that determine the origin or beginning of such disasters in the municipality of Villaflores (problem of fire occurrence), distinguishing 2 fundamental components: historical risk that relates to strategic data in a given time interval and potential risk, which refers to the various human actions that can start fires, and agricultural burning, population density (mainly rural), walkers in forest areas, hunters, etc. The wildfire hazard refers to the analytical study and evaluation of environmental factors that influence the degree of easiness of the vegetation to ignite (burn) and spread the fire, as well as plant fuel characteristics and conditions of ground, mainly slope class, besides the prevailing weather conditions at the time of occurrence of the fire. The potential harm considers the evaluation of potential losses or economic, cultural, social and ecological inflictions that could exist if the presence of wildfires. As a result of the three analyses mentioned above maps of risk, danger and potential damage were obtained adding the scores of the weights of each of the factors scored, with the support of GIS were joined together and once overlapping as layers of information, eventually resulted in a map of priority areas of service for forest fires in the municipality of Villaflores, Chiapas.

The above mentioned was done in order to plan decisions for the prevention, control and management of fire and make efficient resource allocation priorities in

conservation and protection against this phenomenon. For a better understanding of the above, priority of service was divided into five levels: very low, low, medium, high and very high, depending on the score, that is, if the score was low, the range of value is very low, or if the score was high, the value range is very high.

Protection priorities in the municipality of Villaflores are considered, in order of importance and characteristics as:

- 1) Areas core of the NPA's;
- 2) Uninterrupted forested areas as buffer zones and influence of the reserves, including strategic clumps (which have protective, economic, social, cultural or political value),
- 3) Isolated forested areas, which are interspersed with crops, but they also have protective, social, economic value, etc.
- 4) Areas with vegetation in recovery process (shrub), not considered of great value, but are adjacent to lands that require protection (high value) and if a fire occurs there is a danger of spreading.

Based on this analysis of priority of service the following phases of the Municipal Program have been developed:

A) Inter-agency coordination: during the ten years of the program an interagency framework has been formed by which institutional arrangements are made required for the planning, operation, monitoring and evaluation of strategic actions, participating, at least ten government institutions and civil society organizations, under the leadership of H. Municipal Council. Among the involved institutions are CONAFOR, SEMARNAT, CONANP and SAGARPA (at Federal level); Secretariat of the Countryside (at State level); BIOMASA, FMCN, UPROSIVI, AMBIO, PRONATURA South (NGO's); Autonomous University of Chiapas (Education sector), among others.

B) Pre-suppression: related to actions that have allowed to have prepared all human, material and financial elements prior to each critical period of fire, highlighting the establishment and operation of a Municipal Forest Fire Control, an agency that has the task to plan, coordinate and engage the participation of the agencies involved in addressing the problem of forest fires in the municipality, performing at least 15 basic actions for each critical period. This center is integrated by an organization established 100% with technicians and specialists of its own H. Municipality Government, receiving additional technical and logistical support from other institutions as CONAFOR, CONANP and the Chiapas State Government.

C) Prevention: conceiving that prevention intends to prevent forest fires arising due to preventable causes, and by considering that this is an important phase of the program, it is applied in three modalities: "cultural, physical, and legal", whose actions are enabling increased participation of the general population, for serving the

problem of fires in the municipality. In this category, we can mention that in the municipality a joint strategy is developed with CONANP/REBISE, of cultural prevention in the mountains, where they develop coordinated actions between community promoters of the reserve with technicians of the H. Municipal Council, among the activities that have been done in several communities and the Municipality we can mention allusive parades, blanket contests, videos and posters and expositions, special mention receives the Environmental Fair "A qué le tiras cuando quemas, Mexicano"-what do you expect when you burn, Mexican"- made in 2005, with the support and participation of more than 20 agencies, which recorded an attendance by more than 6000 people, mainly children and young people, in just two days of the event.

D) Intra-municipal Linkage: this is a strategy where, in principle, the Fire Program is backed up by the C. Mayor, validated by the Honorable Council, receiving the support of at least 8 directions of the own H. Municipality Council during its development. This is the internal linking that greatly strengthens fire management actions in Villaflores. Among the main areas that support we can enlist Municipal Civil Protection, Agricultural development, Social Communication, Treasury, Municipal Public Security, Municipal Health, Administrative Office, among others.

E) Detection and firefighting: it has a strategy of immediate discovery of fire which means not only the detection of fire in its early stages, but also locates their exact position and warns the staff responsible for firefighting.

The dispatch of the brigades is done under the principles of initial attack, i.e., it seeks to reduce the times of firefighting after receiving the warning, so that the attention of the disaster starts in the first 60 minutes of their development, in order to extinguish them within the first 12 hours of starting. In this regard, the control and firefighting phase is based on a network using radio communication covering more than 90% of the municipal area, with which is monitored, from the communities, the daily fire situation and/or other emergencies. For this, it has the support of two municipal brigades, 10 community brigades under a professionalization process and 20 organized community groups called "agroecological committees", located in priority areas, with voluntary participation. It is worth noting that in these actions the ejido⁴ authorities play a crucial role since they are organizing the participation of these groups.

F) Civilian Participation: it focuses preferentially in 30 rural communities at more critical stage by wildfires, according to the map of priority areas, involving peasant farmers who use fire through extension work, children and young people,

⁴ A legal land tenure designation in which land title is hold communally by all ejido members as group.

with actions of environmental education; women through personal interviews or participatory workshops; elders for his great wisdom and with roots that preserve their customs and traditions, peasant organizations, as key allies of the municipal program, through the management and development of projects related to fire management, for example, the Unión de Productores de la Sierra de Villaflores (UPROSIVI – Sierra de Villaflores Producers Union), deserving recognition for the Conservation of Nature in 2010; civil society organizations, as allies in the management of external resources that strengthened and innovated the program (as an example; BIOMASA, A. C., Mexican Fund for Conservation of Nature, AMBIO, Mesoamerican Biologic Corridor, including the U.S. Forest Service); and governmental institutions, to comply with the environmental regulations in this country. A separate point is that there are communities where land planning work, bylaws proposals for the use of fire and the Community Plans of Integrated Fire Management have been generated in a participatory and actively way with each of them, now these 5 types of jobs have been developed completely in five communities and in 3 are on process.

G) Education and Training: a process of strengthening of local capacities in the community and technical level is developed in order to have qualified, skilled and trained personnel in the subject, emphasizing the safety aspects of firefighters and threatened population. As a cross-cutting strategy, there is staff which has taken a comprehensive training process, participating in courses supported by the curriculum that CONAFOR applies nationally. In this case, we want to improve human security to move towards the formation or preparedness of "fire-adapted" communities, i.e., through provided training conditions so people can live in harmony with normal or abnormal existence of forest fires and their effects, through the organization, improving techniques, infrastructure, protective equipment, etc., that provide an appropriate level of protection against fire phenomenon. On the other hand, a knowledge management is sought through the collection and systematization of information to guide the appropriate use of traditional and local techniques together with results that could generate the specialists and researchers in this field, whereas traditional knowledge can provide much information that is not obtained or identified by the technical work or research.

Results

1. Reduction in areas affected by forest fires over 7,000 hectares period 1995-2001 (when there was no municipal planning) to 700 hectares per year average since the municipal program of fire management exists, registering in addition historical

figures with minimal damage in the years 2008, 2010, 2011 and 2012 were 74, 187 205 and 168 hectares respectively;

2. Empowerment of fire management actions on the part of civil society, through the peasant organization "Union of Producers of the Sierra de Villaflores (UPROSIVI);
3. Training of 52 technicians and specialists and 105 community brigades;
4. Application of alternative projects to reduce the use of fire, for example in 2011 more than \$ 8,000 000 (eight million pesos) were allocated by various institutions;
5. Network of 30 brigades and community committees in support to the municipal program of fire management;
6. Technological advancement to have the first Municipal Information System for Forest Fire Management statewide;
7. The municipality contributes 74% of the participation days/man in the prevention and firefighting in relation to other institutions involved;
8. Origin of an effective and efficient strategy contributing to global and local climate change adaptation.

Beneficiaries of the program

- A) Indirectly the program benefits a population of more than 98,000 inhabitants of the municipality of Villaflores protecting and conserving more than 70,000 h with trees in the municipality; significantly reducing emissions of carbon dioxide produced by smoke and thus undermining global and local warming, improving air quality, protecting springs and water sources for the population, among others.
- B) In average directly 70 firefighters, through official brigades of the municipality and community are benefited.

Transition to the Integrated Fire Management

It is believed that the fire management program of the Villaflores municipality has been institutionalized since it is accepted and supported by internal and external agencies, because of their success and permanence, on the other hand, there are technical, logistical and political conditions for the program to be officially recognized as a "pilot model" for decentralization of resources and functions by regulatory institutions, thereby strengthening the budgetary allocation of human resources with the required technical level as well as material resources. This would help in generating new public policies in this area and the creation of resource transfer agreements and functions from the Federation to the State Government to the Municipality and organized groups of civil society and communities. It is important to emphasize that to achieve this purpose, the two governmental levels above

mentioned must procure integration and allocation of packages and services to facilitate appropriation and empowering of such responsibility since the future strategy of fire management suppose the need to multiply the response capacity against forest fires, particularly at community level (woodlands and forests). Therefore, it is required to strengthen local capacities both at this and at municipal level, in order to acquire knowledge and capacity for action to develop organizations capable of addressing the problem of fires under the environmental, social, political and economic current and future conditions. In this case, in the short and medium term the municipal Villaflores program must have the conditions to begin with the development of the ecological component, under an "adaptive management", considering that the basic and applied scientific research, is the fundamental source of information to move towards a true Integrated Fire Management.

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