FIRE AND FOREST FIRES IN THE MEDITERRANEAN; A RELATIONSHIP STORY BETWEEN FORESTS AND SOCIETY

FIVE MYTHS AND REALITIES TO LEARN MORE

eFIREcom

Efficient fire risk communication for resilient societies

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Efficient fire risk communication for resilient societies

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Introduction

With the onset of summer and hot weather, it is also forest fire season. All over and practically on a daily basis, the news and media report on the occurrence of fires and the terrible devastating consequences they can have. With the huge amount of work done on prevention and suppression, why do we continue to experience these large forest fires over and over again? Why is it happening throughout the world? Can we prevent all fires, or do we need to learn to start living with fires? As citizens, owners of homes near or in forests, hikers, mushroom pickers or general users of natural spaces, does this issue affect us? Is there anything we can do to reduce exposure to risk and prevent fires?

The present document will try to shed light on these and other questions related to forest fires, in an informative way, but also based on in-depth technical and scientific research and study. Broken down into five sections, this booklet will set out the truths and what we all should know about some of the main myths and realities of forest fires. A brief introductory chapter and a final summary of key concepts complete the contents.

We advise reading the entire document by following the logical order so that the reader can learn about and deepen the knowledge on the concepts set out for each situation. After reading the entire document, the reader will have a broad vision of the phenomenon of fires in the Mediterranean region.

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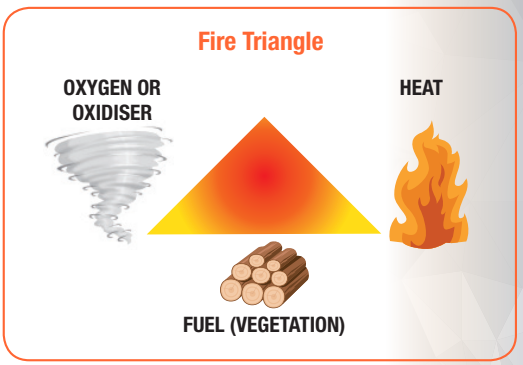
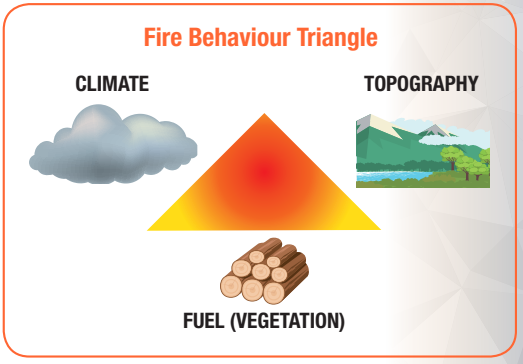
Fire and forest fires: starting point

Fire is the result of a chemical reaction, called combustion, where three simultaneous items are needed for it to occur: fuel (vegetation), oxygen (air) and a heat source (a spark, lightening or a smouldering cigarette are all examples). These three elements shape the so called "fire triangle" which is a graphic representation of the factors that determine the existence of a forest fire. If one of these components is not present, the combustion process does not occur.

After the ignition of the fire, the relief and the weather, but particularly the availability of plant fuel (for example, dense dry forests during summer), will determine how the fire spreads and whether it is small or large (with regard to the affected surface area) and more or less intense (according to the size and height of flames). These three factors shape the so called "fire behaviour triangle", which is a graphic representation of the elements that determine the way a fire burns and spreads over the territory. Given that we cannot remove oxygen from the atmosphere, or change the weather or a region's topography, apart from reducing the risk of ignition owing to the other factors, we can only change one factor of the fire behaviour triangle: fuel, referring to the amount and distribution of vegetation in the region. For a given weather and topography, the less vegetation present in the landscape, the less intense is the fire rate produced.





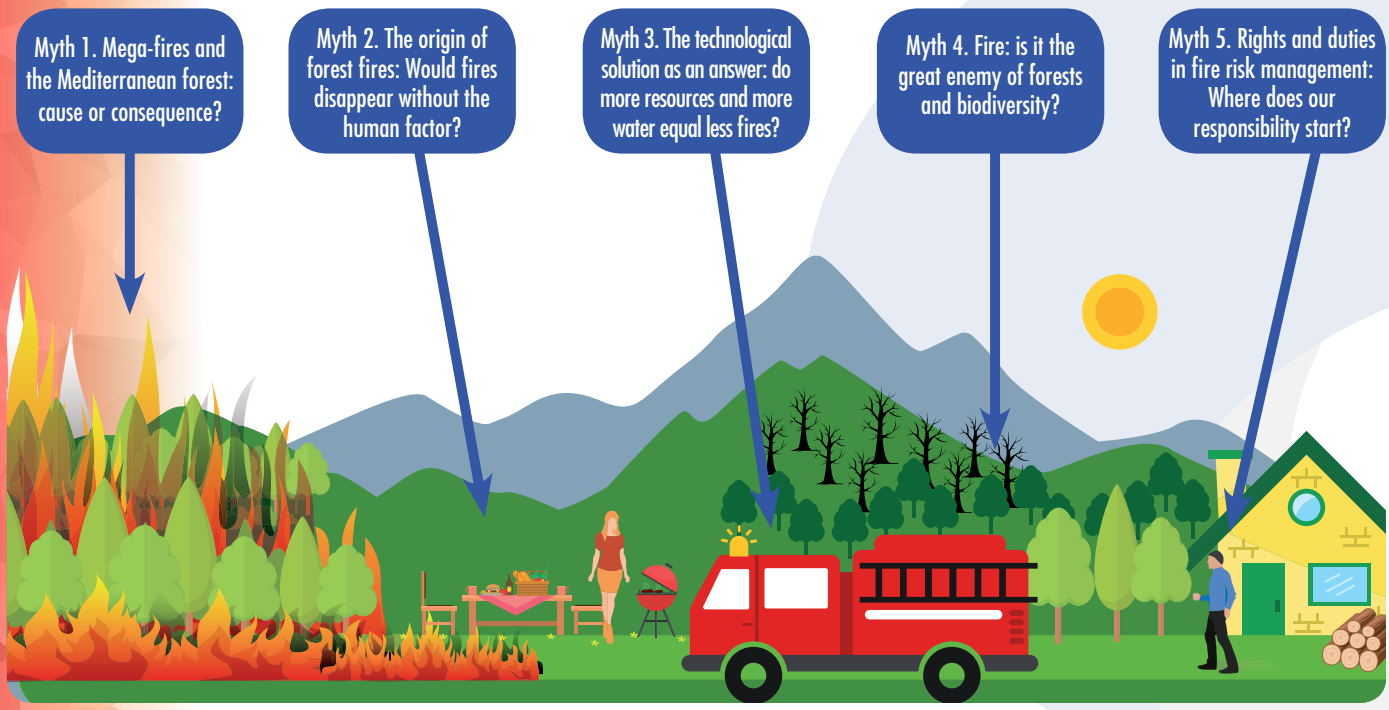
The climactic and biophysical characteristics of the Mediterranean setting means that the variables in the fire triangle are extremely well-represented during the hot and dry summer months. Under these conditions, vegetation is absolutely ripe for the occurrence of wildfires after ignition.

Some of these wildfires can be due to natural causes such as lightning. This could lead us to conclude that fire and wildfires are an intrinsic disturbance associated with the natural dynamics of the majority of Mediterranean forest systems, just like snowfall and

avalanches in high-mountain areas. Furthermore, fire has been used over the course of history as a useful tool to reduce wooded areas to plant crops, regenerate pastures, create open spaces for hunting and to eliminate farm vegetable remains.

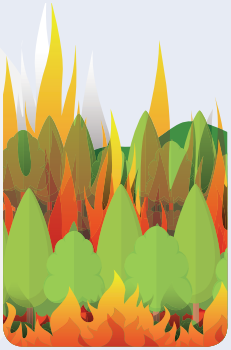
If fire and wildfires in the Mediterranean basin have always been part of its natural and cultural landscape since ancient times, what then has changed in the last decades to make them one of the main priority risks for the protection of people, homes and forests? Why—despite the efforts of an extensive and costly suppression system—do we keep having huge forest fires?

The answer includes social, economic and ecological factors that affect rural and urban landscapes of the Mediterranean and reveal that wildfires are not the cause but the consequence of matters that go much beyond forests, and the smoke produced by flames. Understanding well the entire phenomenon must let us to identify potential solutions and even how we can take part in these solutions as citizens.



Some terms used when talking about fires

- **Fire suppression capacity:** Technical capacity of the suppression resources to face and control a forest fire. This capacity could be over passed in case of high intensity forest fires which spread very fast and/or in case of simultaneous occurrence of forest fires in different locations.
- **Prescribed burn:** Use of fire as a management tool to prevent forest fire by reducing the non-desired vegetation or to recover highly value ecosystems. It can be used also as a suppression tool, taking the name of back-fire (burning a specific area to eliminate the vegetation before the wildfire reaches the area).
- **High-intensity forest fire:** Forest fire burning a large amount of available fuel and extreme weather conditions, which generates large flames with high-spread capacity over the territory.
- **Wildland-Urban Interface:** Zone of transition between unoccupied land (forest land or scrublands) and human settlements (isolate houses, communities or surroundings of uban areas).
- **Forest fire natural regime:** A specific frequency and intensity of forest fires in a particular territory, determined by natural cause (mostly lightnight) and which mainatin an ecological equilibrium between the different forest structures and ecosystem's formations.



Myth 1. Mega-fires and the Mediterranean forest: cause or consequence?

The Mediterranean landscape has been occupied and influenced by human society and its activities for thousands of years. The landscape's composition and structure have always been closely linked to the socioeconomic needs of each civilisation and each historical period. Over the course of the years, the transformation of the landscape has been primarily due to farming (converting wooded areas into croplands) and livestock (deforesting wooded areas to create pastures, and grazing on the undergrowth). In many places during the past years, these dynamics resulted in a mosaic shaped by crops, pastures and forests, often fragmented and sparse (with spaces between trees and nearly without scrub), from which the wood and firewood were used.

These forests suffered from fires, caused either by lightning or carelessness when putting out a campfire. However, forest fires could rarely spread intensively to large areas, as the lack of fuel continuity in forests and the low tree and scrub density in the understory did not cause either widespread fires or high-intensity fires with large flames that could reach the tree canopies, and they were therefore easier to control. Sometimes land managers (e.g. farmers) let the fire burn in order to help reducing the scrub and regenerate pastures, only putting fires out when they reached inhabited settlements or threatened crops.

In many Mediterranean regions, soil degradation after years of livestock grazing and forest overexploitation, and high erosion risks brought the need of implementing reforestation projects. Marshes, entire water basins, urban settlements, valleys sowed with crops and even tourism have all benefited from these projects.

During the past century, several changes in society have directly impacted on forests and the risk of fire. The rural exodus, the abandonment of farmlands and pastures, the transition to a fossil fuel model (from wood and coal to oil, gas and their derivatives), the lack of profitability of Mediterranean wood in a globalised market, and cuttings to improve forest plantations to protect the soil, have all led to natural reforestation and the extension of forests.

This in and of itself is not necessarily negative, as it allows for recovery of wooded areas and its associated biodiversity, at times, up to levels that have not been recorded in hundreds of years.

The difficulty rests in the fact that this process often occurs in an unorganised way in forests that had been previously managed. With no criteria to select or eliminate vegetation, forests become denser, with the grown of many young trees with small diameters that touch each other and compete negatively for resources. Understory vegetation grows without the impact of herbivore livestock or the presence of natural and recurrent wildfires caused by lightning. As a whole, the forests become more vulnerable to pests and diseases, drought, the possible effects of climate change and, clearly, to high intensity forest fires powerful enough to burn entire trees, in a vicious cycle.

Under these new forest conditions, fires take on a new magnitude and degree of intensity and virulence. Since there is enough accumulated and available fuel for them to feed on, forest fires release great energy and power and have a large capacity to spread and destroy. These fires are very difficult to control and put people at risk, as well as assets, property and the ecosystem's natural ability to recover. In addition to the changing land uses of many Mediterranean societies, climate change is an added factor that makes everything more difficult, bringing drier and hotter weather conditions which increase the duration and intensity of the fire season and strengthening the fire risk also during other periods of the year.

In a few decades the abandonment of forest uses and livestock grazing has developed into a forests grow, creating a continual and dense forest layer that contributes to the occurrence of mega-fires. An example of this dynamic is found in the central region of Catalonia. Left:Solsona region, Catalonia, mid-20th Century. Author: Photo archives of the Solsonès Distric Council. Right: current situation. Author: M. Serra

The combination of changes in forest use, increased forest fuel and the effects of climate change makes high-intensity forest fires to appear in uncommon areas, even where they have never been recorded in the past. Author: E. Plana

Therefore, while fire is an inherent part of many Mediterranean ecosystems and cultural landscapes, the land use changes that entails a loss in the farming mosaic and the build-up of fuel in forests are a main **cause** of the mega-fires occurrence that burn large areas with a high intensity. In a much less metaphorical way than it may seem, we can conclude that the extension and severity of forest fires are a reflection and a **consequence** of the present-day relationship that, as a society, we have with forests.

All in all, the important social, economic and environmental repercussions of large fires add a new dimension to risk managers (including forest managers, firefighters and land planners). This should let us imagine that, apart from having a widespread effective suppression system, without acting on the **spread capacity**—a region's capacity to produce a high intensity fire from a fire originated by human or natural causes—and the **vulnerability of people and assets**—the potential the fire has to cause damage when it comes into contact with vulnerable items—it will not be possible to effectively reduce fire risk.

Do pines burn more than holm oaks?

Holm oaks, cork oaks and kermes oaks are species that have lower flammability compared to tree species with resins such as pine and juniper, or those with essential oils like rosemary, although not rockrose. Likewise, with accrued drought and high plant density, equally intense forest fires can happen in both oak and pine forests, which can be even more difficult to control owing to the calorific power of oak wood (employed much more than pine in fireplaces due to this fact).

Myth 2. The origin of forest fires: Would fires disappear without the human factor?

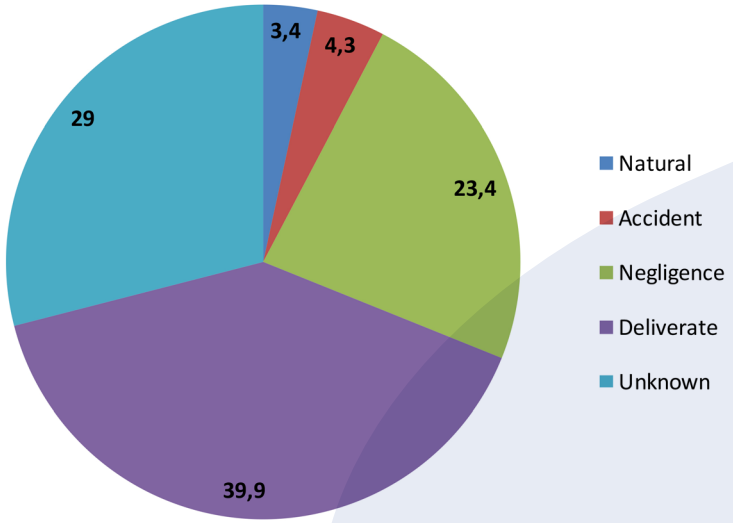
Fire risk comes from the combination of two elements: ignition risk, meaning that a fire can start, and spread risk, meaning that after it starts it can quickly grow, burning the vegetation it finds on its path, which acts as fuel and can lead fires to turn into mega-fires. Although it is obvious that there must be an initial ignition in order for a forest fire to start, it is also clear that an ignition source cannot evolve into a fire without the presence of fuel (available vegetation). In both cases, human and technological factors are determining factors, although they are not the only ones.

The cause of the fire's origin is normally detailed in official statistics expressly dedicated to causes of forest fires. The different causes are classified in broad categories, which are: Natural cause (primarily lightning in the Mediterranean setting), Negligence, Accident, Intentional, Unknown cause and Rekindle (fires poorly suppressed). Research into the origin of fires allow responsibilities to be allocated, where necessary, and the preventive policies to be drafted.

Some regulations, such as those related to cleaning the road sides, railways and under above-ground power lines, have been employed to reduce the risk of these types of ignitions. The ending of uncontrolled rubbish tips, the regulation of the agricultural burn calendar and campfires, the adaptation of recreational areas and adding covers and grilles to barbecues, all have the purpose of diminishing the impact of accidental and negligence fire ignition causes. Surveillance and dissuasion must be used to prevent negligent behaviours and reduce intentionality. All these efforts are essential to prevent the occurrence of forest fires, especially on high-risk days that are characterized by extreme weather conditions, such as hot days during drought periods. Simultaneous fire occurrence makes their control and suppression much more difficult. All in all, natural causes continue to represent a significant percentage of ignition causes.

An initially small fire causing a forest fire and then becoming a mega-fire is fundamentally due to environmental conditions and the response capacity of suppression crews. In this case, apart from the topography, weather conditions and the degree to which they favour the spreading

of flames, the amount and distribution of forest fuel is the most decisive factor. And this is above all influenced by the continuity of wooded masses and how vegetation is distributed within the forest. Dense wooded formations, with continuous strata of vegetation, can generate high-intensity fires that burn tree crowns and spread by jumping, emitting firebrands (bits of incandescent plant matter carried by thermal currents and the smoke from the fire) at long distances and producing spot fires that then become part of the forest fire. Dense woods in a mosaic landscape can create forest fires that can leap over croplands and continue spreading. Conversely, if the forest is not overloaded of fuel, the spreading of the fire is easier to control.



Distribution of fire ignition causes by group (%) in the European Mediterranean region during the period 2006-2010. Source: Ganteaume et al., 2012. A review of the main driving factors of forest fie ignition over Europe. Environmental Management

The development of preventive measures (actions to reduce fuel, improve forest access for the mobility of firefighting vehicles and personnel, etc., homes being self-protected and emergency plans for municipalities and populated hubs, better preparation and equipping of resources in the suppression system and the proper coordination of the stakeholders involved in emergency management) all improve response capacity. The first priority of the suppression crews is always to protect people and their assets. Suppression resources often must stop the spreading of flames through forests because they must protect people and houses from flames as the main priority.

Regardless of the originating cause of the fire, large continuous covers of dense forest vegetation contribute to the appearance of mega-fires. The spreading of mega-fires is mainly due to fire jumping, which let the fire spread beyond firebreaks 100s of metres wide, such as croplands, roads and motorways. Author: Fire Brigade of the Government of Catalonia

The human factor is a key factor in many fire situations. With respect to fire ignition, even when forecasting an ideal scenario in which ignition sources from voluntary and careless human actions are eliminated, natural and accidental causes will still remain, as well as other unplanned situations. With respect to fire spread capacity, there are two human factor that play a major role, both causing fuel accumulation:
(1) the upholding of forest and livestock uses
(2) the suppression fire policy. Each suppressed medium or small wildfire contributes to a fuel accumulation in that area; this fuel accumulation could contribute to produce a mega-fire out of the extinction capacity.

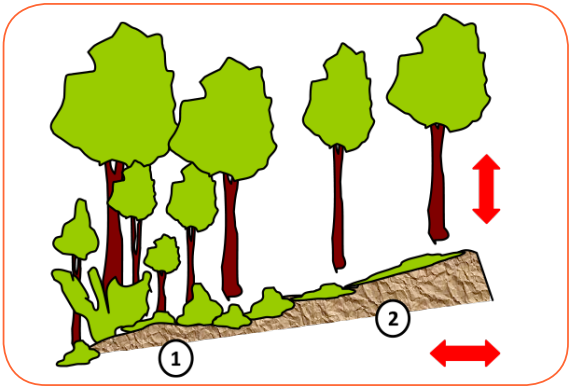
Despite all the significant efforts done and the regulations devoted to reduce the risk of fire ignition, it is also important to act upon the risk of fire spread. This would be the only way to revoke the present situation, where the control of the wildfire risk owes to the fire suppression capacity of our resources, and often leads to mega-fires.

Myth 3. The technological solution as an answer: Do more resources and more water equal to less fires?

What we call fire 'fighting' consists of a series of strategies and measures to reduce the number of fires that occur and supress the flames as quickly as possible. This includes a number of preventive measures, ranging from surveillance, to specific actions to deal with fuel, such as cleaning the road sides and creating strips or areas with little plant cover where it is easier to suppress forest fires. Likewise, a large part of the budget allocated to forest fire management is dedicated to the resources needed during extinction operations, namely land and aerial means like air trucks, helicopters... Some of these budgets are also dedicated to the extra personnel needed during the periods with greatest risk. Have all these resources helped reduce the number and spreading of forest fires?

While at national statistical levels, the main variable calculated to classify fires is the area affected and the ignition cause, at an operational level (fire brigade), the fire intensity and fire severity are more relevant and provide greater information, in terms of what is known as **suppression capacity**. Suppression capacity is the real possibility to fight the fire with the available technical and human resources with guarantees and safety. A forest fire is considered out-of-control when the fire front has an intense behaviour in terms of the speed at which the fire spreads (greater than 2km/h), flame height (greater than 3m) and presence of fires in tree crowns. Under these conditions, the fire is outside of suppression capacity and it cannot be fought or controlled either with aerial resources or ground resources, until its behaviour and intensity evolve to a more favourable state.

The control and suppression of forest fires do not only depend on the available resources, but above all, on the prevailing conditions that influence fire behaviour (weather, fuel and topography) that affects the real and effective capacity to suppress the fire. Reforestation of the landscape and the effects of climate change contribute to increase fire intensity during wildfires that systematically exceed suppression capacity. When there is fire jumping, spot fires start at long distances, making firebreaks useless and causing the fire to spread at speeds greater than the capacity of the fire-fighting resources.

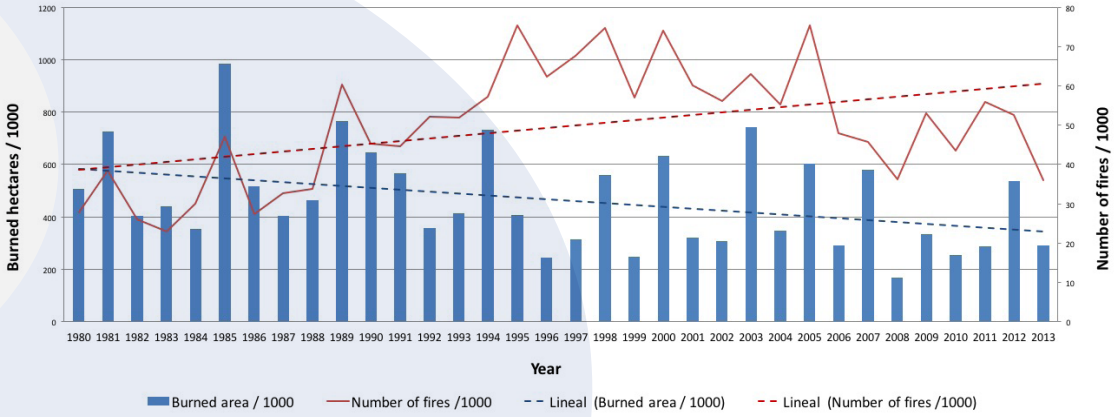


Different forest structures produce different types of fire intensities. The fire intensity is higher in 1 since fuel strata has vertical and horizontal continuity compared to 2.

Top: high intensity fire affecting all vegetation layers, outside of suppression capacity. Lower: A low intensity fire generated by a prescribed burn in order to remove undergrowth and keep forest structures that are resistant to high-intensity fires and within suppression capacity. Author: Fire Brigade of the Government of Catalonia

The scenario of a landscape being under risk of suffering from forest fires beyond the suppression capacity is common in many world regions. It is particularly relevant in those regions where large amounts of money are invested in suppression. Currently episodes of mega-fires continue to occur recurrently everywhere (not only in the Mediterranean, but also in other regions such as the USA, Australia and Canada). All in all, mega-fires occur due to highly-effective suppression resources acting in most forest fires. Especially, when action is taken quickly at an initial stage, while the fire's perimeter is still small. As a result, there is a tendency to reduce the number of fires, yet most of the remain ones exceed the suppression capacity and are responsible for the majority of burned areas. for example in the Mediterranean region, fires burn over 500ha, despite representing only 2% of fires, account for over 80% of burned area.

The risk of having a mega-fire is aggravated if there are simultaneous fire episodes that obligate suppression resources to be spread out and divided over the territory. Once again, the paradox of suppression, the majority of forest fires are caused by fuel overloading, contributing to the occurrence of mega-fires. To reduce potential mega-fires it is necessary to create landscape mosaic of burned areas from previous years. The patchiness can help to reduce the amounts of vegetation available for the mega fires.



Forest fire evolution (in burned area and number of events) in the Mediterranean region (Spain, France, Portugal, Italy and Greece), during the period 1980-2013. Source: European Forest Fire Information System

One can think that the fire brigade acts only at the end of the causal chain of forest fire risk. In turn, forest fires often spread into inhabited hubs that are not prepared to resist fire, obligating fire brigades to allocate resources to these areas to protect people and houses, converting the phenomenon of forest fires into a social emergency, in which civil protection becomes the priority and logically fire burning on forest areas are left unattended.

If suppression resources are limited when dealing with mega-fires, which strategy must be followed? Do we have to resign ourselves to living with devastating mega-fires? If action is not taken on the territory's capacity to generate and sustain forest fires that exceed the suppression capacity, there will not be a reduction on the mega-fire risk. The only way to prevent the potential of mega-fires is to take action on fuel loads. This means that forest structures that are resistant to crown fires should be distributed throughout the landscape and nearby areas with vulnerable elements.

New knowledge on specific fire behaviour patterns, which is defined according to local weather and topography, are letting us identify the best areas to act on vegetation and strategically anticipate the fires' movements as they occur.

Precisely, promoting the commercialisation of local agricultural products (to contribute on maintaining an agro-forestall mosaic landscape) and forest products (biomass boilers, wood, firewood, livestock grazing undergrowth). These are the most effective ways to ensure that fuel load is reduced and landscapes are adapted to fire disturbances.

Otherwise, if action is not taken on the fuel and on reducing the vulnerability of settlements, the society will have to assume that our suppression resources have a technological limit that cannot release us from the mega-fire risk.

Myth 4. Fire: Is it the great enemy of forests and biodiversity?

Forest fires determined by natural causes (primarily lightning) are a natural perturbation present in the majority of the planet's ecosystems. Mediterranean vegetation has a wide diversity of strategies employed to survive fire, such as thick barks to protect trees from the heat of flames (cork oaks, pines), sprouting capacity (holm oaks, oaks and a multitude of bushes) and the existence of 'serotinous' pine cones that require heat from flames to open and release seeds, which sprouting over the burnt ground with no competition.

When a fire affects a tree without killing it, it produces a wound on the contact part of the trunk and the flames. This wounds allow us to estimate the natural regime of forest fires of that ecosystem. In this case, it is a pine of 385 years old (counting the dark growth rings) which has suffered 19 low intensity forest fires along it's life (counting the wound signaled with a white arrow). Author: E. Plana

In some regions of the world, scientists have been able to reconstruct the functioning of natural forest fires' regime with surprising results. It has been found that forest structures with large trees spaced with gaps between the herbaceous stratum and tree crowns, have recurrent fire frequency intervals from between five to 30 years, and those fires burn only the undergrowth. Pasturing undergrowth and controlled surface burns can reproduce these forest structures that are 'self-resistant' to high-intensity fires. The main reason is that periodic fires eliminate the herbaceous and shrub strata, protecting tree crowns from flames). Another scientific finding was that in other cases, forests are adapted to infrequent fires. For instance, fire rotations of 100 or more years, and high-intensity fires. This particular fire regime consumes all the vegetation, starting a forest regeneration from scratch. This fire regime can potentially change the dominant tree species. In these cases, beyond the social perception of desolation after the fire, the ecosystem starts to regenerate naturally.

Pine groves that are fire-resistant in a natural park in Florida (USA), managed with controlled burns to reproduce the natural forest fire system. In this case, the objective is to generate large mature trees to favour the conservation of a protected bird that nests in the trees. Author: E. Plana

Austrian pine woods in central Catalonia (Spain) managed through understory grazing and traditional silvicultural treatments which reproduce the effects of low intensity fires. These effects generate fire-resistant forest structures. In the same area, the frequent marks from lightning on the trees trunks reveal the historical presence of natural fires. Author: E. Plana

From an ecological point of view, it will not always be necessary to associate fire to a harmful and negative element for forests. It will basically depend on the intensity and frequency of the fire and whether they can compromise the ecosystem's resilience (capacity to recover) and the environmental functions such as erosion control.

The loss of forest cover is precisely what makes soil extremely vulnerable to erosion, especially when there are episodes of torrential rains after fires (such as the cold drops in autumn). On the other hand, burned lands are often quickly occupied by miscellaneous plants and shrubs adapted to the effect of flames, either due to the germination of the seed bank or the sprouting of vegetation, limiting the effect of erosion. Furthermore, in the Mediterranean landscape, the fact that many forests often grow on former terraced farmlands also limits soil erosion. Thus, in most of the cases the Mediterranean ecosystem has capacity to recover the plant cover over burnt lands. Nevertheless, if fire frequency is high enough to jeopardise the recovery of vegetation, soil degradation and desertification processes can take place. Conversely, for low-intensity fires that do not affect tree crowns, the effects on the soil are minimal. Forest fires can also affect the water cycle (modification of aquifers) or erode ravines and slopes of mountains.

This has negative consequences particularly when forests play a protective function, for example stabilising the land against landslides and torrents of water.

With regard to biodiversity, high intensity fires can entail initial mortality of significant fauna, although new individuals can colonise the place from the surrounding lands that were not burned. Species from open habitats can appear in the site, paradoxically leading to an increase in biodiversity. Once again, low-intensity fires generally have a small effect on biodiversity, especially if the fire frequency is not above the natural regime that characterizes the ecosystem.

Cork oak sprouting only a few weeks after a forest fire. Author: E. Plana

Nature reserve in Florida (USA) where they let fires burn. In this case, the type of predominant pine is adapted to high-intensity fires. The fast occupation of the soil by light-seeking species protects from soil erosion, while young pine groves start to grow. Author: E. Plana

Man-made barriers to prevent avalanches in a forest affected by fire in the Alps. Climate change is making forest fires appear in uncommon places. Authors: E. Plana

Commercial use of burned wood in a fire-burned area in Tunisia. The extraction of burned wood helps regenerating the landscape. Leaving some trees standing is also good for biodiversity. Author: E. Plana

Natural regeneration of Aleppo pine woods 10 years after a high-intensity wildfire. While the forest recovers, the mosaic created by alternating burned and green areas with less vegetation is a good firebreak and suppression tool for possible fires. Author: M. Font

One of the most important changes in a burned area is the effect on the landscape. The black bare trunks convey a gloomy and sad image. The removal of burned wood helps to reduce and mitigate the emotional impact of a 'lost' landscape. Given the capacity of Mediterranean vegetation to quickly recover the burned areas, people who have not seen the wooded landscape before the fire, easily appreciate the new regenerating landscape, without thinking about the lost landscape. In specific cases of great scenic beauty, in addition to the emotional component, the effect of forest fires can have repercussions on tourist development. Once again, low-intensity fires, beyond some black marks at the tree bases, have no other landscape effects, and even generate forest structures in which it is easy to walk through and have a recreational use.

Beside the indirect effects on the soil, the water cycle or tourism, the effects of forest fires have a particularly prominent relation to the economic value of wood products. Usually, the burned wood can be sold, although normally at a lower price than unburned wood. In high-intensity fires involving productive pine groves, the recovery of the adult forest must be awaited before using the wood again. During a fire cork oaks suffer serious damage, as the blackened bark from which the cork is extracted loses most of its value. If the ecosystem changes and certain species are notable to grow, activities such as wild mushrooms' hunting can also be affected significantly. Once again, low-intensity fires do not have negative economic repercussions, and can even have positive effects. These positive effects can be given by the increased productivity of the lands, limiting the fuel loading and removing competition of vigorous trees or facilitating the grazing of ruminant species (regeneration of pastures under the wooded areas) and herbivores like deer and other species valued for hunting, which benefit from open spaces and the presence of fresh herbs.

In summary, plant adaptations reveal that fire has always been present in the Mediterranean ecosystem as a natural process. Some of these adaptations are against high-intensity fire, and others to low-intensity fires. Even though the fire is perceived as a social and economic problem, it is not always seen as such in ecological terms. Despite the fact that natural tempos are often longer than we would like, the true is that the landscape does regenerate and green returns from the desolation, evolving ecologically and changing our references. However, there must be safeguards to ensure that neither the intensity nor frequency of forest fires are greater than the threshold tolerable by the ecosystem. In this case, the recovery capacity of the forest can be impacted and desertification processes might start, which are extremely expensive to counteract.

Using fire as a forest management and prevention tool. "Good fires prevent bad fires"

In many regions around world, fire has been traditionally used by men as a land management tool, especially for grassland maintenance and to eliminate vegetation debris. In fact, the use of backfire, namely low-intensity fire to fight high-intensity forest fire as an extinction technique, is a traditional use of fire. Nowadays, risks associated to using fire as a landscape and forest management tool have increased in parallel to the changes in the landscape (presence of more continuous and dense forests), to the size of the population exposed and to the distribution of human activities on the territory (many commercial, touristic and industrial activities taking place near or within the forests). All this new risks required the revision of the rules of traditional fire use. Increasing the knowledge about forest fire ecology has allowed integrating the use of fire in forest management by means of prescribed burns which became a tool to prevent forest fires. Prescribed or controlled burns refer to a fire set intentionally to be used as a mean of vegetation management. Prescribed burns can control fuel growth and accumulation exposing the forest to a fire regime that improves the ecosystem's health. They allow to reduce the forest fuel load and prevent future extreme and severe large forest fires. The use of fire has to be applied under specific environmental conditions and relying on evolved techniques that demand a broad professional knowledge. The application of prescribed burning methods needs also to take into account the social acceptance and perception of fire and the related safety and health conditions (mainly linked to the smoke generated by the fire). Nowadays, prescribed burns are also used by firefighters as a tool to train the understanding and experiencing of the fire occurrence in safe conditions. Comprehending how a prescribed fire works allows learning to manage low-intensity forest fires by letting them burn while keeping them always under control. In the context of both prescribed burns and natural low-intensity fires, the following citation applies: "good fires prevent bad fires", as these types of fire foster forest and social safety (further information on how to fight fire with fire at: http://goodfires.org .

Performance of a controlled burn to reduce fuel load and prevent large fires.
Autor: Master FUEGO

Myth 5. Rights and duties in fire risk management: Where does our responsibility start?

During the last decades, the generalized tendency to build isolated houses and entire neighbourhoods nearby forested areas (what is technically known as a 'Wildland Urban Interface') has supposed an increase of the large-scale interaction between the forest risks and human settlements. Furthermore, the natural reforestation of many croplands after their abandonment has led to forests getting close to many towns and population hubs. In this context and with the increase in forest fire severity, it is more likely that high-intensity fires impact houses and the population, becoming a risk for people and infrastructures.

The exposed scenario is aggravated by the increasing risk of mega-fires spreading through the territory, entailing one of the main challenges that suppression resources, emergency and civil protection systems must deal with. If resources (vehicles, aerial resources, etc.) must be allocated to protect houses from fire, the fire spreading through the forest is then uncontrolled and it can spreads towards other settlements, exacerbating the emergency. Smoke, complex and narrow accesses of multiple housing complexes, the steep slopes of roads and the situations of stress caused by forest fires reaching housing complexes, increases the complexity of evacuations. Assisting people's evacuation has to be done as much in advance as possible, to avoid waiting until the last minute, when the risk of being entrapped by the fire is very high. It is also necessary to consider that high-intensity fires can emit red-hot vegetation (called firebrands) that are carried by thermal currents and winds at long distances, also houses located inside housing hubs can be affected by them. Firebrands can ignite constructions or flammable materials in gardens and initiate a new fire spots within housing complexes.

When the vulnerability of a populated hub, house or housing complex is being damaged by a forest fire front, with capacity to spread through the urban area, firefighters' priority is to protect people and houses. Nonetheless, them means are not always enough and in particular circumstances, the situation can endanger the population and lead to losses of valuable personal assets. What can we do to reduce the risk of this situation to take place?

Responsibilities for preventing the occurrence of forest fires and/or limiting their damages can be attributed to, on one side homeowners and land users, and on the other side to the public administration and land planners and managers. The two types of responsibilities are characterised as follows:

A) Homeowners and neighbours must be aware of the exposure to a fire risk and they should act consequently. They should try to minimise the vulnerability of houses against a fire, in particular by:

• Reducing the vegetation load in gardens that are directly touching the house constructions,

• Separating the most flammable items from the house walls (wood piles, miscellaneous items...),

• Being aware of the safety measures and protocols for evacuation of the area in case of a fire,

• Having water supplies and clean access pipes,

• Clearing of vegetation an area between the urban limit and the forest, creating a buffer without available fuel.

A residential area exposed to fire risk. Similar areas are a priority in the protection operations and the need of protecting these areas jeopardizes the ability of focusing efficient fire extinction strategies on forested areas. This highlights that it is very important to reduce homes' vulnerability to fire and to incorporate fire risk into the framework of land use planning. Author: Fire Brigade of the Government of Catalonia

Example of recommendations for protecting homes from forest fires. Source: Civil Protection, Interior Department of the Government of Catalonia*

(*)http://interior.gencat.cat/web/.content/home/030_arees_dactuacio/proteccio_civil/consells_autoproteccio_emergencies/incendi_del_bosc/documents/llibret_incendis_forestals_ang.pdf

In the present fire risk context, it is necessary that stakeholders from areas with high fire risk (e.g. forestlands, WUI, ...) act in a responsible way to prevent all dangerous situations and behaviours (negligent activities), especially during the seasons of high fire risk, for example by:

• Following the official recommendations on fire bans and road access requirements (which seek above all to ensure people's safety in the case of a fire event),

• Avoiding the use of tools that could produce sparks on the days with a greatest risk, applying to crop burns or burning plant remains,

• Employing barbecue covers and other safety items around barbecues, having water supplies available,

• Not lighting off fireworks near areas with forest vegetation,

• Notifying the emergency line if there is a fire,

• Reporting or warning negligent behaviours of irresponsible use of fire or situations that could generate a risk of fire.

All these recommendations contribute to protect houses, make the firefighters' work easier during a fire and, in short, increase people's safety and preventing the loss of property.

B) In order to reduce fire risk, the public administration and land planners must prioritise the integration of fire prevention and suppression measures into their planning.
It is essential to develop territorial plans (settlements, infrastructures, uses and activities…) that consider forest fires as a natural disturbance, just like floods and landslides. It is also important to deal with the dangerous situations of many settlements and houses, given the growth of forest area and the increased number of days of risk due to climate change. Finally, preventive forest planning is essential to reduce firebrand productions and to reduce the forest fuel in the homes' surrounded by forest.

Since fire risk cannot be completely suppressed, it is important to learn to live with fire. However, there is a great difference between living with small fires and living with destructive mega-fires that endanger people's lives and assets. A shared responsibility between governments and citizens is needed to avoiding the second situation.

Summary of key concepts

√ Fire and forest fires, primarily caused by lightning, are natural phenomena present in many Mediterranean ecosystems. The adaptation of the vegetation and the regenerative capacity of burnt lands are consequences of the flames. When the right conditions are present, extremely intense and widespread forest fires can occur, which have a large impacts on the ecosystem, the safety of people and private and collective assets. These mega-fires also have a strong impact on ecosystems and can overcome ecosystems' regeneration capacity. It is therefore fundamental to reduce risk levels and vulnerability to devastating mega-fires.

√ The reduction and abandonment of agricultural activities such as grazing livestock on undergrowth, the extraction of wood and firewood and the loss of mosaic landscapes with croplands and wooded areas, permit the overgrowth of forests and increase forest biomass in the territory. This accumulated biomass—with no management that favours suitable forest structures that prevent forest fires—under recurrent drought and heat cycles in summer months, acts as fuel and is a trigger for extremely intense fires, which can even jump over large distances without plant cover. These fires can spread out of control and exceed suppression capacity, despite the fact that there are many resources allocated to suppression.

√ In many Mediterranean areas, rural abandonment in recent decades has made the risk of suffering from intense fires greater. These fires spread extremely fast over large areas in very short periods of time. Further, this situation is aggravated by climate change and the lengthening of hot periods with drought-like conditions. This situation increases fire risk even in regions and ecosystems not accustomed to such intense fires.

√ At present, many of these forest fires could have an impact on urbanised areas, putting people and houses at risk. It is essential to raise awareness on exposure to risk and act consequently, adopting preventive measures, improving protection of housing settlements close to wooded areas and knowing how to proceed in the event of fire. As users of the forest environment, we must always make every effort possible to prevent situations that could lead to forest fires.

√ Contribute to promoting the commercialisation of forest products (wood, firewood, biomass, animal products from livestock holdings) and agricultural products (wine, grains, fruit groves...) from local farmers. This action would uphold sustainable forest management of woods and mosaic landscapes and is the best way to do your part in reducing the risk of mega-fires in the territory.

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