What is a fire and what is a forest fire?

1. FIRE HAS ALWAYS BEEN HERE. Juli G. Pausas, CIDE-CSIC, Valencia.

The Mediterranean climate is characterized by the coincidence of the warmest period of the year with the driest period, and by the presence of dry storms. Therefore, at least since the origin of the Mediterranean climate (a few million years ago), there have been natural fires in the region. During this period, many Mediterranean plants have evolved different adaptive strategies to survive and reproduce under recurrent fires. That is, fire has shaped Mediterranean landscape and its biodiversity since long ago. The Mediterranean biodiversity cannot be understood without fires and summer drought.

This statement does not mean that forest fires are always beneficial; each species is adapted to a specific fire regime, that is, to the frequency, intensity and seasonality of fires that occurred during the evolutionary history of the Mediterranean region (ecologically sustainable fire regime). Fire regimes outside this historical range can be detrimental to biodiversity. Therefore, fires per se are not detrimental to biodiversity, although there may be fire regimes that are. For nature conservation, it is important to favour ecologically sustainable fire regimes and to avoid ecologically unsustainable fire regimes.

For more information: Pausas J.G. 2012. Incendios Forestales. Catarata-CSIC.
www.uv.es/jgpausas/incendios

2. INTERACTIONS BETWEEN LANDSCAPE DYNAMICS AND FIRE REGIME. Cristina Montiel Molina, Complutense University of Madrid. Luis Galiana Martín, Autonomous University of Madrid.

Fire and the landscape have many aspects in common. Both have a natural and cultural character and a spatial dimension which transcends ownership structures as well as political and administrative boundaries. Both are dynamic realities of changing circumstances. Landscape is a result of its historical evolution, and fire behaviour also depends on past events and on the collective memory.

The current landscape is different from the landscape of the mid-20th century. The socioeconomic dynamics from the 50's, together with recent global changes have caused a transformation of the socio-ecological structures resulting in an increase in the frequency, potential size and intensity of fires that are becoming bigger, faster and more complex. This situation is even more challenging due to social demands, as the protection of people and goods is prioritised.

Actually, fires propagate throughout the landscape, influenced by the shape and by the availability of fuel arranged upon it. On the other hand, both landscape and fire have historically evolved together. For this reason, in order to efficiently prevent unwanted fires and protect communities from the risk of fires, prevention activities should be carried out at a landscape scale. Therefore, fire prevention should be integrated in the spatial planning and urban planning policies; in a similar way as the risk of floods is managed.

For more information: Montiel, C. (coord.) 2013. Presencia histórica del fuego en el territorio. MAAMA, Madrid.
https://www.researchgate.net/profile/Cristina_Molina3/publications

3. AGRICULTURAL USES OF THE TERRITORY AND RISK MANAGEMENT OF LARGE FIRES. Eduard Plana Bach. Forest Sciences Centre of Catalonia.

The agricultural and forest lands have a direct connection with the potential severity of forest fires. They impact on the quantity, distribution and types of vegetation found on the landscape. The management or lack of management of land, impacts on the quantities of fuel available to burn and the intensity and potential size of fire events. In the recent past, changes to agricultural intensification has degraded the historical mosaic landscape in marginal zones; this increases the continuity of fuel and removes potential windows of opportunity to contain fire spread. Furthermore, the industrialisation of farming has resulted in the abandonment of much of the upland pastures; and the reduction of wood extraction (forestry) and undergrowth removal (shepherding). Those activities have also favoured an increase of available fuel loads. The combination of these factors has triggered high-intensity fires with the capacity to consume large extensions and which often exceed the capacity of firefighting agencies, who are at times unable to prevent fire spread.

It is important to re-introduce processes that actively manage fuel availability by reducing fuel loads and redistributing it across the landscape. Planned fuel management through controlled burning and the incorporation of an agricultural policy supporting a landscape scale response to forest fire risk reduction, will have a radical effect, and redress the balance in favour of effective management of the fire risk in the future. This management involves the reduction of the fuel load contributing to transform young and dense woodlands to adult and less dense forests. The option of a non-managed landscape keeps the entire region in a high risk of large, powerful and severe fires. The current fire risk situation is a threat to people, property and the infrastructure, as well as the ecosystem itself, with the potential of worsening the fire risk due to climate change.

For more information:

Plana, E., Font, M., Green, T. (Ed.). 2015. Operational tools and guidelines for improving efficiency in wildfire risk reduction in EU landscapes. FIREfficient Project. CTFC Editions. 83pp

Plana, E; Font, M; Serra, M., Borràs, M., Vilalta, O. 2016. Fire and forest fires in the Mediterranean; a relationship story between forest and society. Five myths and realities to learn more. eFIREcom project. CTFC editions. 36pp.
http://efirecom.ctfc.cat/docs/revistaefirecom_en.pdf

4. EVERYTHING IS LANDSCAPE. Alejandro García Hernández. Department of Environment, Agricultural and Land policies from Junta de Extremadura.

It is common knowledge that the abandonment of any agricultural, industrial or urban land, will result in re-forestation of that land.

So, how in the past did our ancestors convert the forests to agricultural, urban and ultimately industrial landscapes? With one of the tools that has proved to be really effective as a land management tool, fire.

Fire is the tool that has contributed the most to the development of civilisation. It is essential for the preparation of food; lighting; heating; and has the capacity to transform materials and adapt the landscape to the population necessities. So,

fire should be seen as a friend rather than a foe and through its planned use it can assist in the management of the threat posed by large forest fires. Paradoxically, the "All against fire" is a well-intentioned but confusing slogan common in our societies.

Fire is an ecological element of many ecosystems that promotes diversity, is a tool that has the capacity to extinguish or contain a forest fire when water is not sufficient or available. The controlled use of fire in its strict professional application, has the potential to effectively manage areas of the landscape by reducing fuel loads to a level that can be controlled by firefighting agencies using more conventional firefighting tactics. So, fire should be viewed as a legitimate tool, that can be used as a prevention, preparedness or intervention method to compensate the abandonment of rural areas and reduce the impact of forest fire, both on the landscape and to communities.

For more information: What do we know about…? Forest Fires, (Juli G. Pausas, CSIC ed. Catarata)

The paradox of the fire, (Alejandro García Hdez.) http://fuegolab.blogspot.com.es/2014/09/la-paradoja-del-fuego-forestal.html

5. THE CLIMATE CHANGE WORSENS THE SITUATION. Raúl Quílez. Valencia Firefighting Consortium.

The main environmental factors affecting the quantity, availability and condition of vegetation and therefore, the fire behaviour of forest fires including fire spread and intensity are rainfall and temperature.

Rainfall has a clear effect on the growth of plants. It is not enough just to know the quantity of rain, but it is also important to know the phase of the plant cycle in which the rain is influencing its development. For instance, a period of drought even in the spring can cause a hydrological deficit that may result in large forest fires.

Temperature has a critical impact on the levels of relative humidity. Low levels of relative humidity affect the drought stress to both live and dead vegetation, and affects its "availability to burn: Significant heat waves have a notable impact on temperature and relative humidity. Currently, there appears to be an increase in the frequency of weather conditions that support increases to temperature and to periods of drought. This is supported by statistical evidence that shows increases to average temperature over recent years.

Forest fires, as we know them (in terms of frequency, seasonal variation, severity, etc.), are going through a period of significant change caused by the forest mass expansion and its interaction with the population. Another important change is the meteorological conditions that are becoming more supportive to forest fires, undeniably affected by the denominated climate change.

The climate change scenarios predict a reduction of rainfall in the spring and earlier heat waves in the summer. These changes will contribute to major fire suppression campaigns earlier in the spring. The environmental conditions will produce a more virulent and intense fire behaviour, limiting the capacity of the firefighting services to control and supress fires.

But… what do we know or believe to know about forest fires?

6. THE BAD USE OF A GOOD STATISTICS. Martín Alcahud. Fire analyst and school teacher, Castilla-La Mancha.

There exists a general opinion that all fires are bad, the causes of fires are usually human and intentional, and that the problem can be solved by changing human behaviour. Therefore, the solution is found through education, punishment and prevention. This vision is reinforced by a simplistic use of the available statistics. Statistics should be interpreted according to the geographic zones defined by the appropriate Ministry. Mixing and adding the information of the different realities, generates mathematically correct results, but difficult to relate back to the different realities, being misleading.

On the other hand, it is necessary to show the true reasons and causes of forest fires, which are often far from the ones that are usually considered, such as "urban interests", "wood trade" or similar; real "black swans". Such arguments that have a low influence but a high impact, cannot be used to generalize. Almost 70% of the so-called intentional fires come from the agricultural burns and regeneration of pastures. The act of including these causes in "*intentional*" fires, criminalise and distort the reality, disseminating a vision in which it seems that many people are interested in burning the forest. Calling this motivation by its appropriate name and managing this reality, the intentional fires percentage will be close to 20%. We therefore have a conflict between the current general prohibition, and the use of fire as a management tool in rural areas. We have attributed the undeniable damage of the forest fire to the use of fire as a management tool, although it is clearly not the same.

Providing information on the true reasons and causes is essential so that society can understand the real problem, allowing effective and realistic *fire managing* policies to be generated. These can then support the current prevention and forest fire extinguishing regulations. Following the simple message "fight against fire" is like wanting to fight against the rain of summer storms; it does not make any sense.

For more information: "Los incendios forestales en el sistema educativo: 10 ideas fundamentales como base conceptual necesaria."

7. WE MUST REACH THE MEDIA. Francisco Senra and Carlos Ruiz. INFOCA. Andalucía

Society is more urban than ever before. This reality has huge effects on the social perception about forests and rural environment in general and, particularly, about the management of forest fires. Society pictures a big flame front devastating everything without knowing the real impact of each fire on each type of vegetation. The "severity" of each fire is variable; affecting pasture, brushwood and woodland differently, depending on its "intensity". This point of view is the same when appreciating the consequences on the population, the wildfire prevention and suppression Agencies and the people who work in them.

Social education is a determining factor on making people understand the messages related to forest fires. Nevertheless, deficiencies regarding the contact between citizens, prevention and firefighting services are obvious and alarming.

The main information channel for the population is the media. However, news reports about forest fires are embellished by sensationalism and only appear during the summer season. However, the main problem comes from the wildland sector itself. The agencies involved fail to provide sufficient information in both quality and quantity about the emergency. Consequently, the information provided to the community is not from the firefighting services but from others, usually less accurate sources. This situation jeopardises the professional image of the prevention and wildfire suppression services and generates a level of mistrust.

Currently social networks are an opportunity to disseminate the appropriate messages into the population. The regional and federal administrations must develop communication services through these networks, not just as communication tools, but also using them for social education in which we are all responsible

Can we finish with forest fires?

8. FIRE SUPPRESSION IS THE ANSWER, BUT NOT THE SOLUTION. Luis Berbiela. Forest Management of the Environment Department from the Balearic Islands.

Public agencies have assumed the sole responsibility to fight forest fires. For decades, they have focused on trying to prevent negligent or intentioned ignitions, and tried to provide a faster response in order to intervene at an early phase of a forest fire emergency.

Successive summer advertising campaigns have focused on punishing people causing a fire. Even the law has been reinforced for this purpose. There has also been an increase in the number of available ground and air resources used to fight fires, not only in the firefighting agencies but also in the Military Emergency Services (UME), as well as the implementation of new technologies in order to help detect and control fires.

The reality is that while the fire suppression resources are increasing and getting better every year, effectively extinguishing 80 to 90% of the fires, the forest fire problem is getting worse.

The real danger, the uncontrolled large forest fires, will always occur during extreme environmental conditions (droughts, heat waves, wind storms, low humidity periods, etc.). Currently these forest fires are rare, but we must accept that we will have to cope with them more often, in more places and during more months. In order to coexist with something that can be so devastating, we must protect ourselves. Prevention is the key.

We must understand that the consequences are so serious and dangerous that what caused the fire seems to be almost irrelevant, so focusing only on reducing the initial cause of ignition, whether intentional or accidental, is not the only consideration to take into account in relation to prevention, because it does not change the result. How vegetation/fuel is managed, how fuel continuity is broken on the landscape and its resilience are crucial influences on preventing fires having a serious impact on government, communities and firefighting agencies.

The solution to reducing the impact of fire on society in the future, is not to provide more and more resources, trying to contain bigger and more intense fires that at times will be beyond the threshold of control; it is to manage the problem at source. The source of the problem is the amount of fuel available to burn and its continuity and arrangement on the landscape. It is through the smart management of the landscape and the reduction of fuel arranged on it that will allow the issue to be addressed. Policies should be concentrated on addressing the vulnerability of agroforestry spaces and the threat they pose to urban interfaces by increasing the patchiness of burned lands, reducing the fuel load and structure to keep communities safe.

Is it necessary to change the sensitivity against fires? the priority is to ask: Are you safe? Is your family safe? Is your home, neighbourhood, village safe? And then: What do you do to be safe? What should you do to be safer? All those questions have the objective to actively manage a landscape susceptible of burning in a fire.

9. FROM THE SMALL TO LARGE FIRES; FROM THE CONTINUOUS FIRE TO THE COMPLEX LARGE FIRES. PROFESSIONALISATION. Marc Castellnou. GRAF (Forest Actions Support Group) from Generalitat de Catalunya Fire Department.

The extinction paradox is a way to explain the adverse effect caused when there is an excessive pressure placed on the firefighting agencies to reduce the burned surface area caused by forest fires. The original success of this policy, which reduces the number of fires and the total area burned, unfortunately contributes to the development of larger fires. This is due to an increase of fuel loading over a period of time. These fires with more intensity, spread faster and burn over larger areas than the ones we had before the extinction policies.

This paradox is explained by the term 'fire generations' which can be used to explain how fire behaviour has evolved over the last decades. Due to the rural abandonment in the 50's, the first large forest fires occurred for the first time in decades, on what can be described as a landscape with a continuous vegetation. They are referred to as 1st generation forest fires. These fires can be controlled with fire crews and firebreaks. The 2nd generation of forest fires occurred due to the unstoppable process of fuel loading across the landscape. These fires are continuous and intense. During the 70's and 80's the administration responded to this type of fire by becoming more professional, specialised and by purchasing more effective equipment. However, in the 90's, a 3rd generation fire type appeared, in which the fire environment began producing fires which spread through convection, causing massive spot fires that spread more quickly. Subsequently, 4th generation forest fires started due to the increase of forest-urban interfaces. Finally, the 5th generation forest fires happened due to the simultaneous occurrence of large forest fires and fires in the forest-urban interface. Those have completed the series.

This process marks at the same time a professionalisation reality where each region has evolved according to its generational situation and fire types in an isolated way. It is necessary to adapt the competences and abilities of the fire services to the necessities of the fire moment (generation) to be able to create an open forest fire community. We do not all have the same paradox and type of fire generations. Knowing 'who is who' is essential to achieve a transversal and operational professionalisation in Spain.

Then, how can we coexist with this reality?

10. THE PERCEPTION OF RISK AND THE UNAVOIDABLE NECESSITY OF SELF-PROTECTION. Jaime Sendra, Francisco Miralles and Miguel Ángel Lázaro. supporting group of the Suppression Director (GADEX), Aragón.

The current emergency system gives a message to the citizens of protection (civil protection) against any kind of risk. In general, there is a global conscience that the citizens have the right to be protected. In these conditions, an elevated percentage of the population, live under a misleading feeling of absolute and total security. Most of the population believes that a large disaster will unlikely happen to them, "…this cannot happen to me". But, once a disaster event occurs, they believe that the firefighting agencies will go to defend them or even avoid the fire for them.

We have already point out that the current society lives in urban environments: around 80% of the Spanish population. For the last years, a significant portion of citizens are getting closer to the rural environments, either in second residences away from the urban areas, in vacation homes or in amusement-cultural spaces. This motivates a high dispersion of the settlements and creates landscape structures such as wildland-urban interfaces, generating new risks. These interfaces are more vulnerable to fires. During a fire event in such interfaces it requires a larger number and typology of resources increasing exponentially the difficulties to supress the fire and causing an unreal safety perception. The firefighting services may not have the capacity to extinguish those fires and attend all the simultaneous needs. However, citizens do not conceive this incapacity of the firefighting agencies to face those extreme situations.

On the contrary, it is assumed that the firefighting agencies have the capacity and obligation to attend and solve everything. This excessive trust on the system motivates the lack of a conscience of fire risk. When the reality is suddenly different… "the fire was approaching to MY field or to MY house and no-one came to supress it", the incapacity cause outrage among the population.

Against this we can only be aware of the real risk and promote the implementation of a culture of self-protection to generate urban environments prepared to receive the fire. In cases where the forest fire is in the forest-urban interface, structures should be defendable and the forest environment surrounding the structures should be managed to allow opportunities to extinguish the fire.

Citizens should think about their own environment, their goods and their lives. The administration should educate the society, especially the youth, design an appropriate regulatory framework and develop emergency and self-protection plans that can contribute to pre-design firefighting actions.

CONCLUSIONS AND SUGGESTIONS:

- ✓ Society should know, understand and assume **that fire and forest fires have always been here**. The fire, along with the human beings and their agricultural, farming and forestry activities are responsible for the actual peninsular landscape and its **biodiversity**.

- ✓ If the ecosystem grows freely and with no intervention (without management) **the fuel accumulation problem will get worse.** The climate change situation increases, together with other factors, the possibility of having scenarios in which fires are more frequent and intense. These fires are damaging for the forest and dangerous for the population.

- ✓ **It is not possible to eliminate fires completely from our ecosystems;** Fighting large forest fires and responding simultaneous to civil emergencies is **ineffective whatever the dimensioning of the firefighting agencies is.** It is just a lost battle and a waste of public resources.

- ✓ It is necessary to create a "Communication and Social Responsibility Strategy" which, assuming the current forest fire reality, generates a **shared personal, social and institutional responsibility.**

- ✓ It is possible to keep our landscape and its biodiversity by maintaining the generating factors. This includes promoting a sustainable use of **forest products** and **managing** the forest fuel.

- ✓ Therefore, it is necessary to recover a **sustainable fire regime** and this involves using **prescribed and controlled fires**, and the management (without extinction) of low intensity fires.

- ✓ **Self-protection** is indispensable in order to adapt the population to the fire and forest fires. A prepared human infrastructure is more resistant to face a fire and it increases the options of being defended by the firefighting agencies when a forest fire occurs.

- ✓ The aforementioned **is possible by**:

1. The integration of the forest fires risk in land management through **prevention policies** based on fire **ecology** itself. These will ultimately contribute to reduce the vulnerability of landscapes, infrastructures and homes to fires and will help us learn how to coexist with the forest fires.
2. The **professionalisation** of the fire agencies that will contribute to increase the cooperation among agencies facing large forest fires. This has to be led by fire specialists, that coordinated with transparency and homogeneity that will promote the compatibility among professionals at national and European levels.