TOPIC SPAIN – NET4FOREST: **Adapted prevention management of wild fires in private forests.**

Wild fires are a permanent threat in the dry regions of the Mediterranean Sea. Although, wild fires are increasing due to climate factors and also the abandonment of the uses related with forestry, rapidly climbing from the southern parts of Europe to the Central and Northern parts year by year. Here in Catalonia, in the last 30 years a lot of efforts from the public bodies, private associations, owners and research centres has been put together to prevent the risk of the fires and mitigate its effects afterwards. The result is a strong knowledge on prevention and mitigation in cooperation with different bodies responsible of the management. Also the private owner plays an important role in this equation as the responsible of their own forest and the maintenance of its quality and favourable conditions against fires. From Catalonia we propose to share this knowledge as a measure to pre mobilise the actors and to provide the adapted management techniques used here to be applied in other European regions, which are facing nowadays or we'll be facing in the close future the same problematics.

Notes:

We've selected this topic as it is the one which we have more expertise in and we think it can be really positive for the rest of the partners. Also because it will bring an added value to the knowledge generated in the project as no other partner is facing this. We are agreeing that the different climates in Europe are affecting directly its forest management so it can be difficult to apply techniques from the Northern part to the Mediterranean region. That's why this topic can be easily transferred to these regions and act as a guide for the Central parts of Europe, which are starting to deal with this problem.

Adapted prevention management of wild fires in private forests.

1. **Forestry works recommendations.**
    - Forest management recommendations at National Level.
2. **Methodology to identify strategic management spots (strategic areas).**
    - Typology of fires according to the propagation pattern.
    - New types of great wildfires due to climate change reasons.
    - Forest fire structure relationships and incidence of forest management in the fire behaviour.
    - Different types of fuel in the forest.
    - Main silvicultural treatments for the fire prevention.
    - Fire prevention planning and efficient treatment location.
    - Prediction of future fires by means of analysing the historical ones.
    - Controlled burns as a tool for fuel reduction and consequently the risk of great wildfires.
3. **Global organisation of the wildfire prevention in the Catalan society and at EU level.**
    - Sustainable forestry documents in Catalonia.
    - Different forestry management instruments in Catalonia.
    - Main actions undertaken in relation to forest fires prevention, monitoring and restoration at eu level.
    - Main legal frame for forest fires prevention, extinction and restoration in EU context.
4. **Summary of key concepts.**
5. **References.**

1. Forest works recommendations.

Mosaic landscapes and different uses (introduction).

The climatic and biophysical characteristics of the Mediterranean context make the variables affecting the fire very well represented during hot summers and dry. In these conditions, the vegetation is in a favourable condition for the appearance of wildfires once a forest fire has begun.

If the fire in the Mediterranean basin has been part of its natural and cultural landscape since very ancient times, what has changed over the last decades to turn wildfires into one of the main risks and priorities for the protection of people, houses and forests? Why, despite all the effort in an extensive and expensive system of extinction, we continue to suffer from wildfires?

The answer includes social, economic and ecological factors that affects the rural and urban landscapes of the Mediterranean.

The Mediterranean landscape has been used and influenced by human society and its activities for thousands of years. The composition and structure of the landscape has had a close relationship with the socio-economic needs of each civilization and moment. Over the years, landscape transformation has been dominated by agriculture (converting forest lands into fields) and livestock (deforestation of forest lands for pasturing).

In many places, these dynamics resulted in a mosaic landscape formed by crops, pastures and forests, often fragmented and with low density (with trees separated and without much presence of scrub) which were used to make timber and wood. These forests suffered from fires already caused by lightning or by human negligence.

However, fires could rarely spread through wild surfaces, since the lack of continuity of forest spots or the low density of trees and vegetation under the umbrella did not allow to generate fires of great size or high intensities with big flames able to burn the crowns of the trees, which at the same time were easier to control. Sometimes it was usual to let the fire burn, because it helped to reduce scrub and regenerate the pastures (unless it was near to affecting villages or crops).

In many Mediterranean regions, the degradation of the soil after years of livestock and forestry overexploitation and the high risk of erosion have led to the reforestation of the lands, with great success. Whales, entire river basins, urban settlements, crops and even tourism have benefited from this enormous effort.

During the last century, several changes in society are affecting directly on forests and on the risk of wildfire. The rural exodus, abandonment of fields and pastures, the transition to the fossil-based energy model and the lack of profitability of the Mediterranean timber in a globalized market, it has allowed the natural reforestation and expansion of forests. This in itself should not be negative, and it's allowing to recover the forest area and associated biodiversity, sometimes, to a levels that has not been recorded in hundreds of years.

The difficulty comes out when this process occurs in a disorderly manner on forests that had been managed before. Without any element that selects or eliminates vegetation, forests are densified, appearing many small trees with small diameter touching each other and competing for the resources (light, water and nutrients).

The undergrowth grows without the herbivorous effect of livestock, nor the presence of natural fires caused by lightning which controlled the growth. At overall, the forest becomes more vulnerable to pests and dangers, to drought, to the possible effects of climate change and, of course, to high-intensity forest fires that are capable of burning entire trees in a vicious circle. In these new forest conditions, the wildfires acquire a new magnitude and degree of intensity and virulence, as they have sufficient accumulated and available fuel to burn. This generates wildfires with a huge power and with a huge capacity for propagation and destruction. Also they are very hard to be extinguished, leaving a highly damaged ecosystem.

Therefore, while fire is an inherent part of many of the Mediterranean's cultural ecosystems and landscapes, the changes in uses that lead to a loss of the agricultural mosaic and the accumulation of forest fuel in forests are the cause of the great forest fires which burn high surfaces in high intensity. This could be a reflection and also a consequence of the current relationship forests and society.

The important social, economic and environmental impacts of great wildfires face risk managers, including forest managers, firefighters and territory uses managers, to a new dimension of the phenomenon that must be approached in an integrated way. Apart from having an effective extinction system, without acting on the propagation capacity and the vulnerability of people and property, it will not be possible to effectively reduce the risk of wildfires.

The cause that a fire generates a great wildfire corresponds essentially to the conditions of the environment and the capacity of response of the extinction devices. In this case, apart from the topography and meteorology more or less favourable to spread the flames, the amount and distribution of forest fuel is the most determining factor. This will be mainly influenced by the continuity of the wooden mass and the distribution of the vegetation within the forest.

Dense forest formations, with continuous vegetation strata, are capable of generating high-intensity fires burning through the crowns of the trees and even propagating through fire sparkles over long distances and generate a secondary focus that becomes part of the fire. Great wildfires in a mosaic landscape can create fires capable of skipping fields and continuing propagating. However, if the forest landscape does not have as much fuel load, the spread of the fire is easier to control.

The development of preventive measures as the reduction of fuel, improvement of the access, the ability to self-protect housing, the emergency plans of municipalities and inhabited areas, the best preparation and provision of the means of the system, the extinction and correct coordination of the actors involved in the emergency management highly improve the response capacity. Their priority is always to protect people and goods first. Often the extinction bodies must disregard the fire to protect the people and houses from the flames, a situation that favours the free spread of the forest fire promoting its growth and reach. Thus, if the propagation risk is not handled properly, the situation could turn into incontrollable at any moment, regardless of its origin.

While not acting on the territory's capacity to generate and sustain fires beyond the capacity of extinction, the only way to avoid the potential of large fires will be acting on fuel loads. That means generating resistant forest structures to fireworks, distributed throughout the landscape and in areas close to vulnerable elements.

New knowledge about certain patterns of fire behaviour, which are repeated according to the meteorology and topography of the site, allow us to identify more strategically where we must

act on the vegetation and to anticipate the movements of the fire when it occurs. In fact, promoting the consumption of agricultural products (for the maintenance of the mosaic landscape) and forestry (boilers of biomass, wood, woods, livestock at the undergrowth) is the most effective way to have landscapes adapted to fire disturbance and "quench" fires before they start. On the contrary, without acting on the fuel at a landscape scale and reducing the vulnerability of settlements, the technological limit of means of extinction is the risk threshold that as a society we must assume.

Therefore, from an ecological point of view, it's not always necessary to associate the fire with a damaging and negative element for the forest. It will depend essentially on its intensity and frequency, and if it can compromise the ecosystem's recover ability or environmental services such as control of the erosion that forests offer. Precisely the loss of forest cover makes soil extremely vulnerable to erosion, especially if there are episodes of torrential rain after fires (for example, the cold drops in autumn). However, naturally, burnt land is often occupied by several plants and shrubs adapted to the effect of flames, either by the germination of the seed bank or the regrowth of vegetation.

In addition, in the Mediterranean cultural landscape, the fact that many of the forests often grow in old farmland also limits the erosion of the soil. However, if the fire frequency in the same place is high enough to condition the recovery of vegetation, soil degradation and desertification processes can begin. In the case of low intensity fires that do not affect the crowns of the trees, the effects on the soil are minimal. It will be necessary, therefore, to guarantee the ecosystem's ability to recover vegetation cover on burnt land.

Once again, low-intensity fires, beyond certain black marks at the base of trees, have no more effect on the landscape level, and even they help to generate types of forests where it's easier to travel and make use of them at recreational level. There's also no negative economic repercussions and it can increase the land productivity through the elimination of competition or allowing more presence of ruminant species and other herbivores able to be hunted.

In high intensity fires on productive pines, we will have to wait for the recovery of the adult forest to be able to go back to the wood exploitation. On the other hand, burnt wood may also be sold, though, normally, at a lower price. The cork trees, even regrowth, suffer a serious damage since the blackened bark from which the cork is extracted loses a lot of its value. The pick-up of mushrooms and hunting, for example, can be seriously affected by a great wild fire.[1]

[1] Plana, E.; Font, M.; Serra, M.; Borràs, M.; Vilalta, O. 2016. El foc i els incendis forestals al mediterrani; la història d'una relació entre boscos i societat. Cinc mites i realitats per saber-ne més. Projecte eFIREcom. Edicions CTFC. 36pp. TRANSLATION: *Fire and forest fires in the Mediterranean region; history about the relationship between forest and society. 5 myths and truths to know.*

Forest Management Recommendations at Nacional Level:

Sustainable Forest Management is the administration and use of forests in such a way that it maintains its biodiversity, productivity, regeneration capacity, vitality and its potential to fulfil, now and in the future, relevant ecological, economic and social functions at local, national and global level, without causing damage to other ecosystems. To carry out this management, the most indicated and effective is to have a forest management instrument (FMI), which is a document that aims to provide to the land owner all the necessary information and the planning of the actions for the correct forest management of the land. There are different types of FMI according to the characteristics of the forest, in order to adapt them to each one. Apart from providing the owner with this ability to act within the parameters of the SFG, these documents also provide a set of very important fiscal and management advantages.

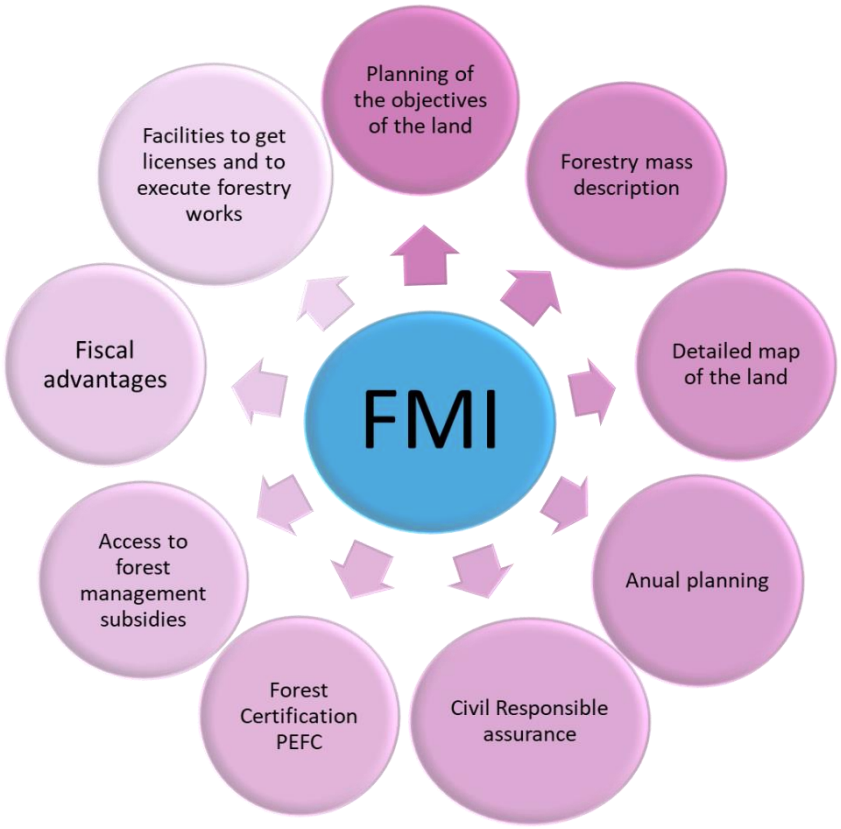


Figure 1. Forest management instruments and its benefits. From Erasmus+ Eforown project.

In Catalonia, the Guidelines for Sustainable Forest Management of Catalonia (ORGEST) have been developed, which are multifunctional guidelines for the management of forests that aim to establish management models for the masses according to the selected objectives, and to achieve the integration of the rest of the objectives of sustainable forest management. ORGEST is based on the identification and definition of forest typologies and the definition of silvicultural models. For each one, management models have been established which show the set of actions to be carried out in the forest mass.

In the Catalan territory there are the following recommendations:

1. Forestry typologies in Catalonia:
    a. Wooden typologies in Catalonia.
2. Support Indicators and parameters for the sustainable forest management:
    a. Great wildfire risk integration into the forestry management.
3. Forestry management models:
    a. Fir wood.
    b. Common ash, silver birch, European aspen and hazelnut tree woods.
    c. Sessile oak, Pedunculate, Pyrenean oak and African oak woods.
    d. Stone pine woods.
    e. Conifers plantations.
    f. Scot's pine woods.
    g. Aleppo pine woods.
    h. Holm-oak woods.
    i. Pyrenean oak woods.
    j. Austrian pine woods.
    k. Chestnut tree woods
    l. Beech tree woods.
    m. Cork tree woods.
    n. Management models for mushrooms production in Scot's pine woods.
4. Cartography:
    a. Pure and mixed formations in Catalonia based on the Spanish Forestry Map.
    b. Map of the lithological types of importance based on the Geologic Catalan map 1:50.000.
    c. Map of types of wildfires in Catalonia.
    d. Many other related cartography and data.

2. Methodology to identify strategic management spots (strategic areas).

Fire is an intrinsic element of the Mediterranean climate, and the forest has evolved in this context. In the Atlantic climate, softer and more humid, fires are less frequent disturbances.

In the current context of climate change, both conditions of vegetation (drought stress) and meteorology (high temperature, low humidity, strong winds) are generating more episodes where all factors favour the development of forest fires. High intensity fires (Large Forest Fires - GIF) are also more numerous and caused by a large amount of combustible material. In fact, due to the change in uses, plant growth is the result of the undergrowth recolonization.

There are two main resistance strategies from species to fire:

- **Resistance:** being able to withstand the fire and stay alive.
- **Resilience:** being able to recover the space after the fire, with a rapid regeneration from resistant seeds, seeds from unburned areas or from regrowth of undead plant parts.

The cork oak uses a resistance strategy. This species has a very thick and insulating crust that allows it to withstand high temperatures, thus protecting gems. This allows it to easily bounce back after a fire.

The white pine uses a resilience strategy. This species has some serotine pineapples that open and release seeds when they are exposed to a source of heat (for example, a fire). Since fire eliminates all competition, these seeds can germinate more easily and cover large areas shortly after a fire.

<u>Typology of fires according to the propagation pattern:</u>

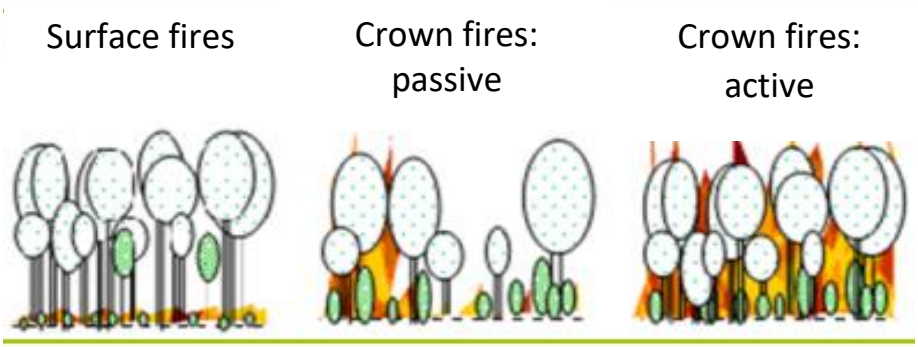


Figure 2. Most common fires typology according to the propagation pattern: Source. Piqué et al (2011).

There are different types of forest fires according its propagation pattern:

Undergroud fire: under specific conditions like those characterizing peat bog ecosystems, fire spreads through the underground organic matter and roots. Even though flames are not visible, the fire can stay active for long periods.

Surface fire: the flames are spread through the fuel located at the surface and through the taller undergrowth.

The active crown fire is the one that represents the greatest threat. It generates high fire intensities, launching massive secondary fires and flame lengths at a very high fire propagation speeds.

Torching fire: fire spreads from the surface strata and into the crown of a single tree or small parcel of trees.

Crown fire: initiated as a result of the convection heat transmitted by surface fire to the Crown of the trees (Van Wagner, 1977). It includes two subgroups:

- **Passive:** the tree crown burns individually; the heat of convection is not enough to keep the propagation between crowns.
- **Active:** fire spreads through the tree crown and also through the surface continuously. It needs the convection heat to keep this spread between the cups.

New types of great wildfires due to climate change reasons:

Large high intensity forest fires due to extreme aridity already take place. Many mountains are suffering from very extreme climatic conditions and begin to be outside of their optimum climatic range. This means that the vegetation is very dry and, therefore, very available to burn. This type of forest fire has been seen, for example, in Fort McMurray, Canada (2016) and in Las Maquinas, Chile (2017).

Forest-fire structure relationship and incidence of forest management in the fire behaviour:

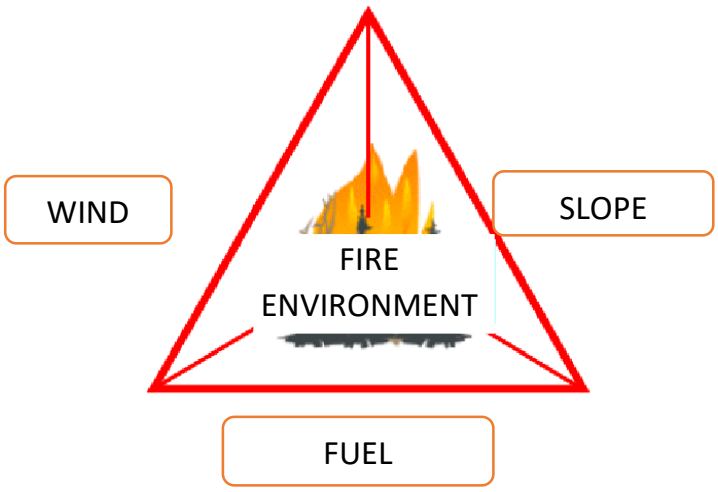


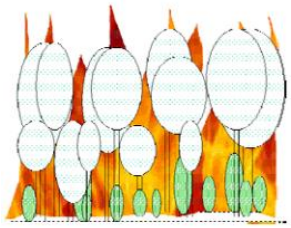
Figure 3. Fire triangle.

Of all the factors conditioning the behaviour of fire (fire triangle), only fuel can be modified to reduce the risk of large forest fires.

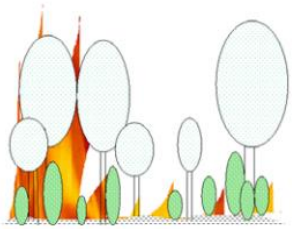
With forest management, a forest can be configured with discontinuities between layers of vegetation necessary to prevent (or hinder) the passage of surface fire to the crown of the trees with the most frequent environmental conditions.

The structures where fire cannot generate the necessary conditions to become a layer fire are structures of low vulnerability (type C). The objective of forest management is to integrate forests into this structure C. The way to do it will be different depending on the species and the location of the forest. High vulnerability structures (type A) are the most unfavourable case, where propagation to layers is very likely. And the intermediate case (type B) are structures that generate passive fires of layers under normal environmental conditions.

A structure



B structure



C structure

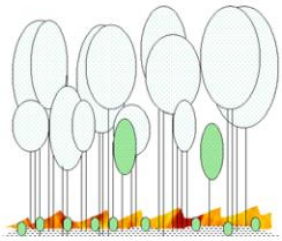


Figure 4. Different fire structures.

Different types of fuel in the forest:

Air fuel: formed by the crown of the trees of the dominant or codominant stratum of greater height.

Fuel of scale: air fuel of a height greater than 1.30 m which is not part of the dominant or codominant stratum. It includes small trees, shrubs, lianas or fallen trees.

Surface fuel: air fuel, not exceeding 1.30 m. It can be thickets, herbaceous vegetation, branches, fallen trunks, silvicultural remains.

Main silvicultural treatments for fire prevention:

Thinning: The objective is to reduce competition between tree feet and generate vertical and horizontal discontinuity between tree crowns. The most common thinning is the low thinning which extracts the dominant feet and generates a greater vertical discontinuity, maintaining the tree cover and not favouring the scrub.

Brush out: it allows the reduction of the surface and fuel of scale mass and generates vertical discontinuity with the crowns (the undergrowth will be less dense). Thinning is usually selective (biodiversity) and of intensity variable according to initial discontinuities.

Selection of sprouts (sprout species): The objective is the partial reduction (more or less intense) of the regrowth with the objective of reducing competition between feet and generating vertical and horizontal discontinuity and promoting a well-developed tree canopy.

Pruning: The lower branches of the feet are removed to raise the crowns and generate a greater vertical discontinuity. It has to be done only when pruning decreases, the vulnerability of the structure, it's not a general recommendation.

Slash managing: The objective is to accelerate the incorporation into the soil of the plant material resulting from the silvicultural actions, and at the same time avoid increasing the vulnerability of the stand. The concrete technique is a cost-efficiency choice always following the specific regulations on fire prevention (for example: leaving 20 m free from slash for each band of the main roads).

Figure 5. Image before and after the treatments.

The principal techniques are:

- To cut the logging residues into small pieces. The slashes of branches, trees and bushes of more than 5 cm of diameter are cut into pieces of less than 1 m and left to the ground without making accumulations larger than 50 cm.

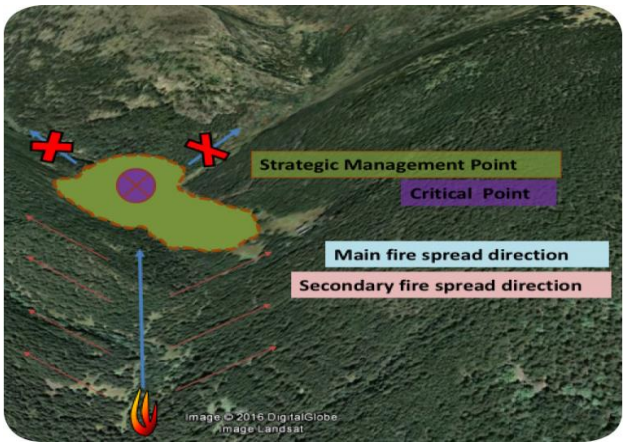
- To stack and burn the slashes. The residues are put in places without continuity with the trees or the bushes and burnt in a controlled way, until their elimination. Specialized personnel and additional fire prevention and extinguishing measures are required. Alternatively, the residues could be burnt extensively to the stand, with greater planning and execution efforts by highly specialized personnel.

- Chipping or shredding the slashes, at stacked or at extensively way. The accessibility and mobility of the machinery, as well as the cost, limits the application of this technique.

Figure 6. Wood residues after a clear cutting.

Fire prevention planning and efficient treatment location:

The territory planning is key element to an efficient prevention of large forest fires. One of the most used tools for territory planning to prevent potential fire damage is fire simulators, for example, FlamMap, FARSITE or WFA. The simulations help to anticipate the behaviour of future fires and therefore to locate those areas where it may be more interesting to invest in management efforts in order to prevent high intensity fires and potential great wildfires.



Strategic management points (SMP): Locations where the modification of the fuel and / or the preparation of infrastructures allow the extinction services to execute attack manoeuvres to limit the potential of a great wildfire. For each type of fire, opportunities are generated with common characteristics and, consequently, SMPs with similar locations, objectives and characteristics.

Figure 7. Location of a Strategic Management Point. Plana, E., Font, M., Serra, M., 2016. FOREST FIRES, Guideline for communicators and journalists. eFIRECOM Project. CTFC Editions. 32pp.

Management Promotion Areas (MPA): Locations with large areas where active forest management is a priority. It can have a specific or multiple objective (production, recreational, cultural, etc.) but the basic objective will always be the risk reduction of the great wildfires (potential losses). These areas are not directly related to extinguishing manoeuvres, but they are useful to reduce the propagation capacity of a fire and indirectly generate a larger range of fire control opportunities. A MPA can change the overall behaviour of a fire.

Fire simulators are tools for decision making, but they do not generate ideal solutions. Experience and knowledge about fire behaviour is essential to understand the simulator results and, therefore, to decide the efficient location of forestry prevention actions.

Prediction of future forest fires by means of analysing the historical ones:

Analyzing fires occurred in the past in a determined region can be useful for predicting future fires and their development, even though the prediction task is extremely demanding. Differently from floods, fires do not affect a defined area such as a basin or a watershed. Moreover, they do not occur in recurring periods like those determined by storms' regimes. Fires spread freely over the land where fuel is available. Moreover, their ignition, spread and extinction are influenced by anthropogenic factors. This makes difficult the estimation of a fire's likelihood in a specific place. The prediction is based on a combined study of local topography and weather conditions. A given fire in a determined place evolves following spread patterns similar to historical fire events that occurred in a location with same topography and weather conditions. Fire's intensity varies depending on fuel moisture. The only sure statement that can be made about a fire is that a high fire risk (usually due to human causes) and a wide fire spread capacity (a function of the fuel load, distribution and moisture) increase the chance that large fires occur. Identifying the "fire type" to which a specific fire event belongs to allows to predict the development of the specific fire, with the goal of designing efficient prevention and extinction strategies tailored on the fire' characteristics. Three "fire types" can be defined according to the fire spread drivers, namely the factor with more influence on the development and spread of the fire:

Topographic fires: the spread drivers are the reliefs and the local winds (mountain or valley breeze).

Wind driven fires: wind direction dominates the spread direction.

Convection fires: heavy fuel load is responsible of the fire spread. When we know the specific location and the "fire type", we can identify the "Strategic Management Points", areas where fuel treatments are needed in order to ensure safety and efficiency of extinction efforts. In these areas fuel treatments are envisaged as an opportunity to promote a lower fire behaviour (get fire into the suppression capacity) and ensure safer fighting operations.[2]

The controlled burns as a tool for fuel reduction and consequently the risk of great wildfires:

The controlled burns are a forest management technique to aid in the suppression and mitigation of forest fires by burning the accumulated fuel material of different origin (either naturally or the residues of a treatment). These burns are made under specific weather conditions. Those responsible for executing them know at any moment how the fire is behaving and how it will behaviour in its course. This technique, directed by trained and competent personnel, is safe and efficient.

[2] Plana, E., Font, M., Serra, M., 2016. FOREST FIRES, Guideline for communicators and journalists. eFIRECOM Project. CTFC Editions. 32pp.

Two remarkable key points:

- They can be an alternative to conventional treatments (hand tools or machinery).
- They can be done directly with a forestry objective or in combination with conventional silvicultural treatments, such as thinning or pruning.

Advantages:

- High yield (ha/wage) and high value (€/ha).
- The controlled burns are comparable to a natural disturbance, intrinsic in the Mediterranean ecology, but happened under controlled conditions.

Disadvantages:

- They can generate dense smoke that can cause problems near urban areas.
- An inherent risk of forest fire must be assumed. The preparation of the action area and the means of extinction support are essential.

3. Global organisation of the wildfire prevention in the Catalan society and at EU level.

Sustainable forestry documents in Catalonia:

A sustainable forest management plan is a forest management instrument that aims to provide key information of the suitable actions for the correct forest management of a property within a period from 15 to 20 years, but with the option to extend it later. This document should guarantee the following:

- Improvement, sustainability and multifunctionality of the forest systems.
- Creation of an adequate forest division of the land.
- Consideration and integration of land management plans, mainly in the field of control and prevention of forest fires.
- Introduction of silvicultural techniques to guarantee the regeneration of the tree mass and minimize the risks of erosion and fire.
- Definition of the infrastructures to improve the realization of the exploitation, and the management to be carried out in the following years depending on the forest typology of each plot.

This is regulated by the Forest Ownership Centre, depending directly from the Catalan Government.

Different Forestry Management Instruments in Catalonia:

Forest Management Instruments are documents suitable for all types of forest. For this reason, there are different types of documents according to each specific conditions. There are currently five types of forest management instruments in Catalonia:

- Forest Management Project for public lands higher or equal to a 250 hectares.
- Forest Improvement and Management Technical Plan for public or private lands higher than 25 hectares.
- Forest Management Simple Plan for public or private lands equal or lower than 25 hectares.
- Joint Technical Plan for a Forest Improvement and Management for public or private lands sharing a forestry coherent territorial frame.
- Forest Management Plan at Municipal or Extra Municipal level for all the lands under the same municipal territory or even at wider scale, but always on its totality.

Main actions undertaken in relation to forest fires prevention, monitoring and restoration at eu level:

- Directorate General of Environment.

Many specific forest fire prevention regulations were emanated as of 1992 by DG Environment. In 1998 the Commission's Expert Group on Forest Fires was created with the aim of exchanging information concerning lessons learned and forest fire prevention practices and developing as well as maintaining the European Forest Fires Information System (EFFIS). EFFIS is jointly managed by the EU Joint Research Centre (JRC) and the DG ENV, and aims to provide EU level assessments for situations before and after fires, to support fire prevention through risk mapping and to promote preparedness, firefighting and post-fire evaluations.

- Directorate General of Agriculture and Rural Development.

This DG has been supporting the financing of fire prevention and restoration actions through rural development programs until 2006. In 2007 a new regulation on rural development came into force, which among other aims had the goal of providing the legal basis for supporting the restoration of forests and fire prevention activities. The new regulation also requests Member States to classify areas according to fire risk in their forest protection plans as well as setting the measures for preventing fires and for restoring damage from fires in the areas characterized by high or medium risk.

- Directorate General of Humanitarian Aid and Civil Protection.

Every year before the beginning of the forest fire season, the European Commission's Emergency Response Coordination Centre (ERCC) organises meetings joined by representatives of all European Member States that are joining the EU Civil Protection Mechanism to exchange information on the state of preparedness related to the occurrence of forest fires. EU Civil Protection Mechanism was set up on 2001 to enable coordinated assistance from the participating states to victims of natural and man-made disasters in Europe and elsewhere. Over the summer period, the ERCC is in contact on a weekly basis with the representatives of the countries that are at high risk of forest fires. When forest fires occur and when national capacities to respond are exceeded, European countries can show solidarity by providing assistance in the form of water-bombing aircrafts, helicopters, fire-fighting equipment and personnel. To provide a joint and coordinated response, countries frequently channel assistance and exchange of real-time information through the EU Civil Protection Mechanism. The EU Civil Protection Mechanism was activated more than 55 times (including prealerts and monitoring requests) since 2007 to respond to forest fires within and outside European borders.

- Directorate General of Research.

DG Research has supported forest fire research since the late 1980s with the aim of strengthening research activities and initiatives in various fields related to forest fires. An example of the action of this DG is the FIREPARADOX Project which had the overall goal of developing a scientific and technical basis for integrated land and fire management practices and policies.[3]

Main legal frame for forest fires prevention, extinction and restoration in EU context:

-Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD).

-Council Decision of 20 December 2004 amending Decision 1999/847/EC as regards the extension of the Community Action Programme in the field of civil protection.

-Commission Regulation (EC) No 2121/2004 of 13 December 2004 providing some detailed rules for the implementation of the Forest Focus Regulation.

-Proposal for a Regulation of the European Parliament and of the Council concerning the Financial Instrument for the Environment (LIFE+). 29.9.2004, COM (2004) 621.

[3] Plana, E., Font, M., Serra, M., 2016. FOREST FIRES, Guideline for communicators and journalists. eFIRECOM Project. CTFC Editions. 32pp.

-Communication from the Commission “Financial perspectives 2007 - 2013” 14.07.2004, COM (2004) 487.

-Communication from the Commission “Reinforcing the Civil Protection Capacity of the European Union”. 25.03.2004, COM (2004) 200.

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[4] Plana, E., Font, M., Serra, M., 2016. FOREST FIRES, Guideline for communicators and journalists. eFIRECOM Project. CTFC Editions. 32pp.

4. Summary of the key concepts:

- The Mediterranean basin is an area ecologically adapted to forest fires. The vegetation of the Atlantic zone does not have the same adaptations or the same fire resistance and resilience capabilities.

- Climate change has generated a greater frequency of climatic events favourable to the development of great wildfires, a trend that is rising all around Europe. The combination of drought, wind and low humidity, together with more abundance of vegetation due to changes in uses (rural abandonment) causes high intensity fires and a bigger propagation capacity, generating fires that often exceed the extinction capacity.

- Only one factor (the fuel) can be intervened to influence the behaviour of the forest fire. For this reason, it's key to know those forest structures which can lead to a wildfire (tree crown active fire), and those which can resist its effects. Thus, forest management must be aimed to generate and maintain forestry structures of low vulnerability to tree crown active fires.

- Preventive silviculture is the most widely used tool to prevent extreme fire behaviour. To increase the efficiency of these treatments (thinning, pruning, residues management, etc.), it's required to previously know the types of fires affecting one specific area. The treatments must be designed and located according to the extinction strategy pre-established by those responsible for firefighting.

- Controlled burns is a fuel management alternative to reduce the risk of great wildfires.

5. References:

To know and learn more:

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