sylva nova

Forest Management & Consultancy

FOREST MANAGEMENT AS A TOOL TO PREVENT FOREST FIRE AND TO RESTORE AFTERWARDS

A well-managed forest achieves simultaneously ecological, social and production functions such as protecting the environment and biodiversity, regulating the climate, contributing to our health, providing wood, improving the landscape…

In order to have healthy forests capable of performing all these functions in a symmetrical manner, Sylva Nova adopts sustainable forest management plans based on the long term, avoiding clear-cuts and promoting thinning instead, favouring permanent cover and irregular growth, focusing on the protection and integration of natural regeneration, discouraging the spread of pests and encouraging a diversity of species perfectly adapted to the soil and local conditions.

In the context of climate urgency, Sylva Nova is even more concerned about the increasing number of forest fires. Unfortunately, there is no magic solution for fighting them, but there are some relevant forest management practices to apply, both before and after fires.

Let's thus focus on the stand structure and forest management practices to keep forest fires under control.

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FIRES AS A NATURAL AND USEFUL DISTURBANCE FOR FOREST ECOLOGY

Fire has many faces. For people and for ecosystems, fires can be harmful, beneficial, or benign, depending on where and how they burn.

After all, fire is an important part of forest ecology: as a natural disturbance, it changes resources, substrate availability, and physical environment, creating environmental heterogeneity and *growing space* (e.g. clearing out dead bush and senescent trees and making space for new growth).

Fire can reduce survival and height increment in tree saplings by physical damage of plant tissue, but it can also increase survival and height increment by reducing competition from grasses and helps to control insect and disease damage.

In ecosystems controlled by fire (the so called "*Black World*", Bond (2005)) many species have evolved in the presence of fires. They are classified in two main groups:

Active pyrophytes

which can regenerate after a fire even if damaged, using:

- vegetative regeneration (re-sprouting from roots such as Ceratonia siliqua, Rhamnus alaternus, Arbutus unedo or Quercus pyreneica)


- serotinity (developing cones which protect the seeds, and which are opened by the heat of fires such as Pinus halepensis, P. pinaster, P. brutia etc.)


Passive pyrophytes

which use insulation (bark thickness) and high moisture content to increase their protection against any oncoming fires. They resist particularly when fire passes over quickly, and hence can out-compete less resistant plants which are damaged. (e.g. Sequoiadendron giganteum, Quercus suber – Cork oak).

In this way, fire selects certain fire resistant and resilient species which otherwise would not be able to dominate in other undisturbed ecosystems. Indeed, in the absence of disturbance, a site tends to be dominated by a few very competitive species, e.g. forest species able to reproduce under their own cover.

While ecosystems with intermediate levels of disturbance (e.g. low severity fires) tend to have a greater number of species with a mixture of pioneer, mid successional and climax species (*intermediate disturbance hypothesis*).

FIRES AS A DANGEROUS DISTURBANCE FOR FOREST ECOSYSTEM AND HUMAN SAFETY

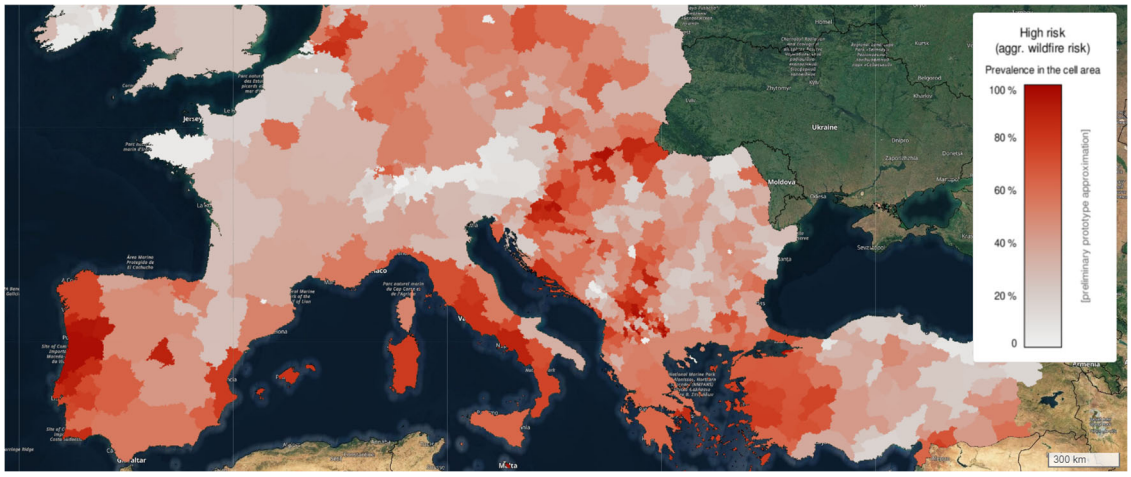
Increasing drought, heat waves and abandoning of rural areas and forestland (because no longer economically viable) created an abundance of dry fuel ready to burn with an ignition: lightning, accident, or human negligence. This has led to more extreme fire behaviour which spread uncontrollably, making fire management even more complicated.

These massive megafires spread for days, even weeks causing the release of large quantities of CO2 emissions, significant environmental damages, affecting local economies and sometimes even endangering human lives.

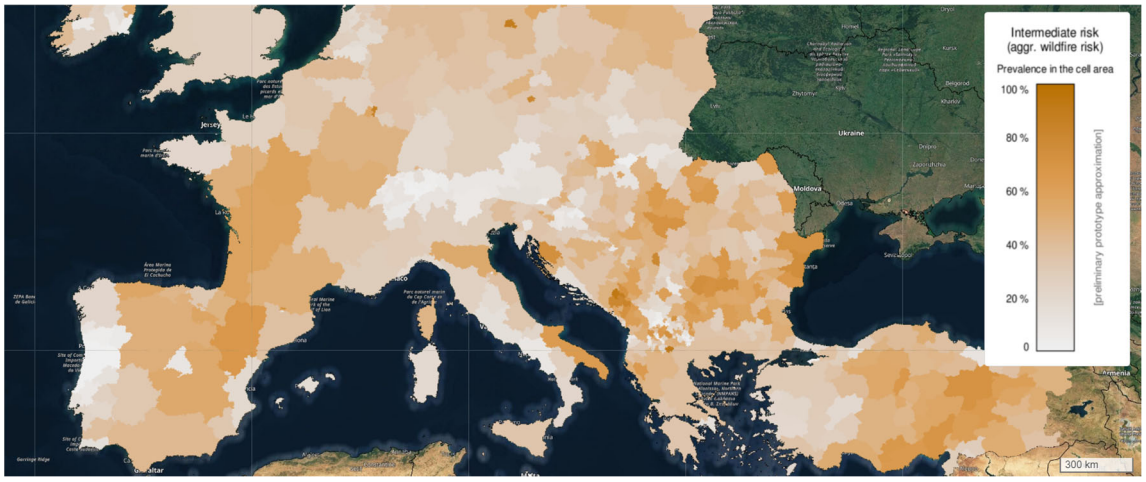
The higher frequency and above all intensity of forest fires in recent years is a direct consequence of the speed with which climate change is rapidly advancing.

The European countries most affected by forest fires are up to now southern France, Greece, Italy, Portugal, and Spain, but an expansion of fire-prone areas and longer fire seasons are projected in most European regions.

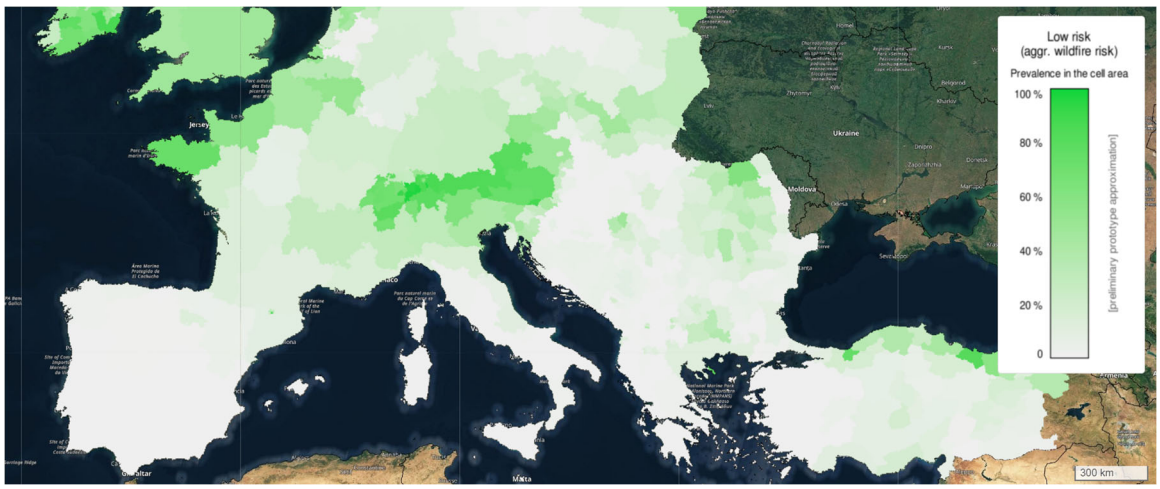
a)



b)



c)



a) High wildfire risk - b) Intermediate wildfire risk- c) Low wildfire risk
Source: EFFIS - European Forest Fire Information System
(https://effis.jrc.ec.europa.eu/apps/fire.risk.viewer/)

Predisposition factors:

- Drought
- Heat waves
- Steep slopes (Rapid fire spread, promotion of spotting phenomena)
- Wind (Increase in oxygen supply, flame inclination, convection heat transport promoting the spread of the fire and the increment of its intensity)
- Dense forests
- Ladder fuel (when vegetation of different heights is close enough to allow a surface fire to become a crown fire)
- Outbreaks
- Windstorms
- Tree ageing

} Greater presence of dead wood = more fuel available

FOREST MANAGEMENT TO PREVENT FOREST FIRES

The real challenge now is to prevent the occurrence of high severity forest fires **acting on the stand structure** and avoiding the creation of *ladder fuel*[1] which would allow a surface fire to evolve to a crown and more intense one.

The aim is to reduce the fuel to keep the forest fire under control at the ground level and therefore avoid intense burning and large-scale wildfires. How?

- **Thinning to reduce the forest density** and use the timber for furniture so that the carbon will remain stocked in the wood, or use of the firewood in most efficient ways.


- **Convert** dense flammable forest with resistant and adaptive species to wildfires.
- **Creating firebreaks** which will slow down the fires and facilitate the forest rangers' actions.
- **Using prescribed forest fire** as low burning fires helps the forest to become more resistant to high severity burns later on.


- **Avoid working in the dry season with mechanical machines** in the forest where the forest fire risk is high.
- **Improve forecasting** working on algorithms to anticipate the location and the timescale where forest fires are more likely to occur.
- **Using alarm sensors** in the forest, which will be able to warn the population in the surroundings of the concerned forest, and the forest experts to act.

[1] ladder fuel is defined as live or dead vegetation or a combination of both that provides vertical and horizontal continuity allowing surface fire to progress into the shrub or tree canopy layer.

FOREST MANAGEMENT AFTER FOREST FIRE

The post-disturbance actions will be largely linked to the size and intensity of the fire which influences the availability of propagules (biological legacies).

What should be done?

- Where it's possible **leave snags and logs** important for nutrient cycling, water retention, to discourage erosion phenomena, as habitat provision (e.g. snags as nesting for birds), to increase the success of the natural regeneration (e.g. logs as protection from atmospheric agents) and many others.
  In case of high risk of pest outbreaks salvage logging the burnt dead trees as soon as possible to avoid doing so when natural regeneration is in its growth phase and could be damaged.
- **Identify** the marginal areas of the burnt zone to measure the possible availability and migration of seeds.
- **Analyze the *biological legacies*** (quantity and quality of residues and organisms that have survived the disturbance), which are essential elements for the future. These are often the essential points at which ecosystems affected by large-scale disturbance begin to recover.
- Depending on the extent of the damage and the analyses carried out, it will then be decided whether to **wait for natural regeneration or to start planting trees**:
  - **Work with the natural regeneration** if present, consists in selecting the target trees, cutting shrubs (such as erica arborea which would compete for natural resource with the target trees, create a thick dense layer facilitating the spread of fire), promoting them to grow in height and pruning low branches.

  - **Planting trees** (after at least 3-5 years to let the natural dynamics to act) **as support to the natural regeneration** by simulating natural dynamics (using early and late successional species), helping the soil to restore itself in a shorter time, which is especially important in difficult situations (e.g. steep slopes), avoiding loss of organic matter, soil erosion, release of CO2 stocks into the soil and the creation of poor habitats that will be difficult and costly to restore in the future.

HOW CAN SYLVA NOVA HELP THE OWNERS?

Sylva Nova, as an experienced forest and management consultancy company, can help both private and public owners before and after fires.

Before: to implement **preventive measures** in all the management process especially where fire risk is high.

After: to **restore and reforest damaged forests** making them more resistant and resilient.

With its local partners, Sylva Nova has already managed many projects in countries affected by forest fires:

- **Stand replacement** of monocultural forests (which encourages the spread of fires by producing inflammable oils) with mixture forests of native Broadleaves (e.g. Quercus suber, Quercus ilex, Quercus pyreneica, Arbutus Unedo in Portugal) and coniferous species (e.g. Pinus pinaster). This replacement does not only prevent forest fires, but also improves the biodiversity in term of flora and fauna thanks to the restoration of natural native habitat.
- **Restoration of burned forests** through plantation and/or promotion of natural regeneration in Portugal, Spain and Italy, restoring the environmental, economic, social and landscape functions of these forests.

- **Research in restoring after forest fires**
  After witnessing the huge fire that affected around 30,000 hectares of pine forest in Gironde in July 2021, Sylva Nova decided to invest part of its business in forest fire research.


Sylva Nova therefore decided to purchase 19 hectares of neglected forest (including 12 hectares burned in 2007 and not yet restored) in St Germain d'Esteuil (Medoc - France) to be used as a laboratory to monitor and test best silvicultural practices to prevent and restore after forest fires.

Several of these practices are already used in this "field laboratory" such as:

- **Increase the diversification** of the future forest by planting a mix of broadleaf species in addition to the few naturally regenerated and planted trees of Pinus Pinaster, which is a fire-adapted species and remains the main species for composing the forest as it is the most suitable species for the specific soil and climate conditions of the site (important also for sylvicultural, economic and cultural reasons).
- **Fragmentation** of the plots to interrupt the continuity of the forest, creating open areas important to prevent intense wildfires.
- **Decreasing the density** of present forest through a dynamic thinning.

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To know more about wildfires:

- A journey through sustainable wildfire risk prevention :
  https://www.youtube.com/watch?v=3tS1jeipLPE

- Why certain naturally occurring wildfires are necessary :
  https://www.youtube.com/watch?v=cNVZEVq3KzY

- Why They're Getting Worse :
  https://www.youtube.com/watch?v=gN-T6NDWQ1g