

Guidelines for Land Managers

The FOREST FIRE

context



Principles and
recommendations from the
CASCADE project, with
contributions from land users
and land managers

Principle 1: Minimizing fuel load and connectivity reduces fire risk



- ✓ Reduce highly flammable biomass
- ✓ Create bare strips within forest to hinder spread of fire and ease fire-fighting operations

A forest can have very different fuel loads, fuel connectivity and flammability while remaining healthy and valuable*.

Reducing the fuel load means removing dead trees and decreasing the density of living trees in the canopy.

Reducing the fuel connectivity means increasing the patchiness of the forest**, increasing the size and number of open areas and also increasing the distance between canopy and understory by cutting the taller shrubs and removing smaller trees.

Land management options include **selective forest clearing** (1) and **fuel breaks** (2) and **preventive forest intervention** approaches (3).



*Managed (left) and unmanaged forest (right) with different fuel loads and consequent fire risk



**Cropland (top) and fuel breaks (right) decrease the connectivity of the forest, reducing the fire spread and facilitating access for fire fighters

Sources:

- (1) Selective forest clearing to prevent large forest fires ([SPA010](#)), Selective cutting ([ITA008](#))
- (2) Fuel breaks ([ITA007](#), [SPA009](#), [POR001](#))
- (3) Preventive forest intervention approaches ([A_POR001](#), [A_SPA002](#))



Principle 2: Diversity of species reduces flammability, as well as outbreaks of pests, and thus leads to reduced fire hazards. In particular, promoting resprouters facilitates recovery after fire.



- ✓ Avoid afforestation with single or flammable species
- ✓ Sustain and increase diversity of endemic plants
- ✓ Avoid removing resprouters
- ✓ Plant resprouters in favourable places (northern slopes, humid spots)

Mediterranean forests in fire prone areas are at present dominated by seeder species (those regrowing from seeds after fire), especially where afforestation with Pines was implemented*. These are very flammable.

Resprouters (those regrowing from the roots after fire) are less resistant to drought and germinate with more difficulties than seeders. But they increase the capacity of the forest to recover after fire, especially if conditions in the first year are not favourable for seed germination.



*Typical seeder (left) and resprouter (right) species of the Mediterranean

Promoting a diversity of tree species and understory cover reduces forest flammability, because each reacts differently to fire. Increasing diversity of vegetation also reduces the impact of plant specific diseases that can in turn increase flammability, because sick and dead plant material are drier and thus more flammable.

Whenever removing vegetation (e.g. during logging, clearing, firebreak creation) beneficial species (e.g. resprouters) should be maintained (5, 6).

Land management options include **afforestation with diverse species** (4)** and **selective forest clearing** (1)***



**Diverse afforestation area with Holm Oak and other resprouter species (left)

***Forest with reduced density of trees after selective clearing (right)



Sources:

- (4) [Selective clearing and planting experiment to promote shrubland fire resilience \(SPA011\)](#)
- (5) [Shrubland under selective clearing and planting for fire risk reduction](#)

Principle 3: Sufficient soil cover shortly after a fire reduces risk of soil erosion



- ✓ Keep or reach a minimum of 50-60% of soil cover



Vegetation has an important role in preventing soil erosion* thereby retaining nutrients and thus maintaining soil fertility (7). CASCADE studies have also highlighted that a reduction in vegetation promotes a long-term decrease in soil fertility (8). Avoiding soil and fertility loss is also important for recovery of vegetation after fire.

*Plant holding the soil through its root system

Soil cover can consist of living vegetation or dead plant residues**, (e.g. from logging) However, there is a risk that this material may spread plant and animal diseases and pests such as nematodes, and also increase the fuel load (9).



**Dead plant residues increase soil cover but also the risk of pest and fire



To simultaneously reduce the risk of fire and avoid soil erosion, a vegetation cover of 50-60% should be maintained, especially in fuel breaks or cleared areas.

Land management options include **mulching after fire** (10) and maintaining soil cover in **fuel breaks** (2)^{***}.

^{***}Forests managed to reduce density of vegetation (top) and connectivity (right) while keeping a minimum of soil cover



Sources:

- (7) [Afforestation with Pinus Halepensis after the fire of 1979 \(La Molinera\) \(SPA012\)](#)
- (8) [Mayor A. G. et al. \(2016\). Fire-induced pine woodland to shrubland transitions in Southern Europe may promote shifts in soil fertility. Science of The Total Environment](#)
- (9) [Traditional post-fire logging](#)
- (10) Mulching after fire ([POR003](#), [POR004](#))



The CASCADe Project study sites across southern Europe

These guidelines were developed within CASCADe Project WP7 with contributions from land users and managers in all the study sites

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