



Girona – Fire Flocks, grazing systems to reduce wildfire severity

C25

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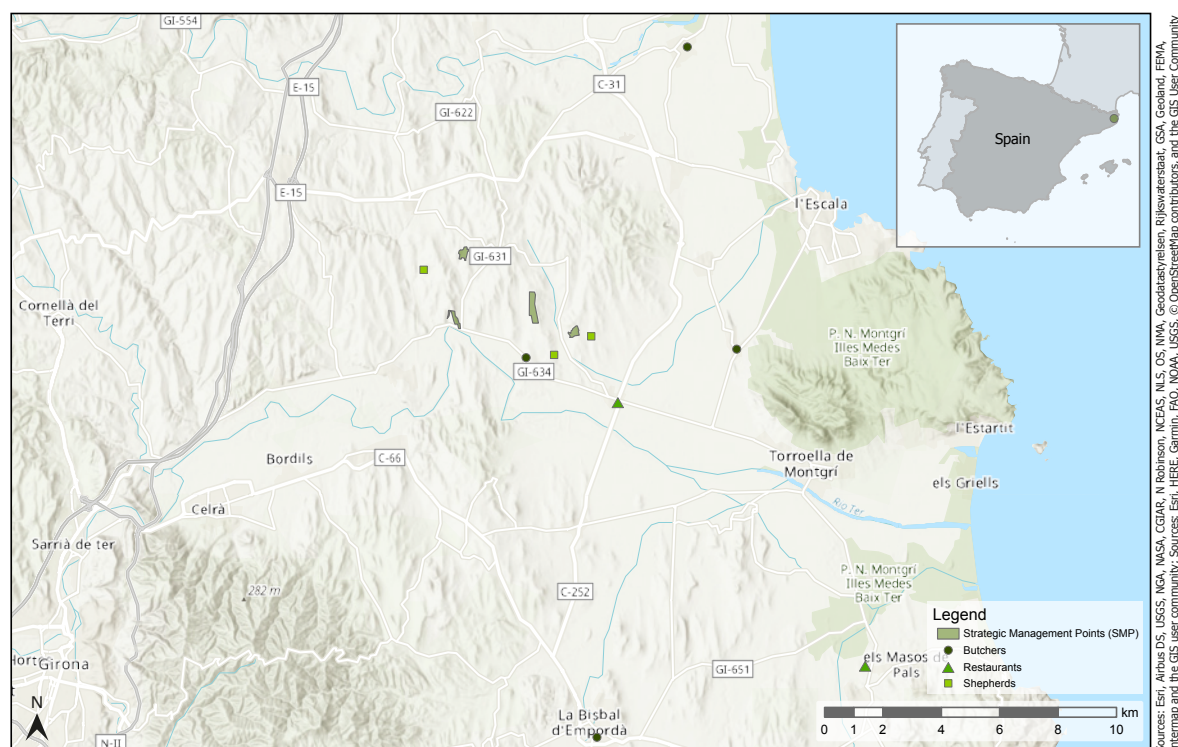
Context, legal frame and ownership structure

Forest history, land uses and cultural heritage

The landscape in the majority of the Catalan region (northeastern Spain) is the result of rural abandonment during the last century (fig. C25.2). The reduction of traditional uses, mainly extensive livestock and multipurpose forestry (timber, woodfuel,

charcoal or resins) has allowed regeneration of secondary vegetation characterised by proliferation of shrubby and bushy species. Moreover, the landscape has suffered a process of homogenisation with thousands of continuous hectares of highly fire-prone forests.

These unmanaged forests are under an increasing vulnerability to wildfires because of climate change. A small number of wildfires are responsi-



< Fig. C25.1. The proud shepherd Eugeni (Verges, Baix Emporda), who sells sheep to the restaurant Mas Pi (Photo: Diego Espada).

Statement

“Our mission is to reduce the risk of wildfires while creating a livelihood for rural areas through grazing. The extinction of a wildfire is the answer, but not the solution. The solution depends on a sustainable management of forests and landscapes promoting bioeconomy that allow and include rural development.”

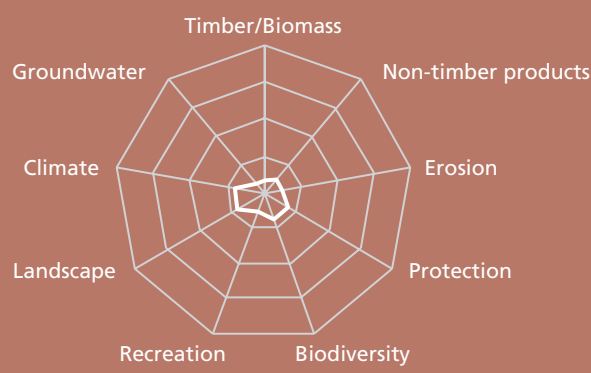


Table C25.1. General information on the forests included in the Fire Flocks project.

Forest community	<i>Pinus halepensis</i> forests (42.4 ha), <i>Quercus ilex</i> forests (1.5 ha), crops (2.8 ha), shrublands (0.9 ha), grasslands (0.2 ha)
Total forest area	48.11 ha
Main management types	Grazing
Total volume	131 m3/ha (before treatment)
Annual growth	Unknown
Annual Use	Unknown
Deadwood (standing and lying)	Unknown
Altitude	29 to 101 m
Ownership	100 % private
Geology	Limestone
Protected area (total)	0 ha
Nature protection area (Natura 2000)	0 ha
Protective function	10 ha

ble for most of the burnt area (only 11 fires were accountable for 88 % of the surface burnt by 4800 fires last 8 years). These large forest fires represent a growing risk for society, as firefighting services are unable to face them, despite the high budgets and investments allocated.

Of all type of forest fires, crown fires pose the greatest threat to fire control, and burn with greater intensity than surface or torching fires¹. Traditional direct control of crown fires is impossible because the fire behaviour characteristics are extreme, i.e. high heat intensity, long spotting distances, large flame lengths, and rates of spread (Scott and Reinhardt 2001). In a continuous landscape under extreme weather crown fires evolve fast to megafires.

Fuel reduction treatments such as thinning, prescribed burning or grazing can be used as tools to reduce fire risk and severity. Fuel treatments modify species composition, structure, availability, distribution, fuel moisture, and surface-wind behaviour (Graham *et al.* 1999). The aim of these treatments is generally to reduce the fuel load so that, if a wildfire takes place, it will spread more slowly and with less intensity, and be less severe and easier to control (Piqué and Domènech 2018). To achieve this aim while ensuring that forests are resilient against wildfires, fuel treatments should consider one or more of the following four basic principles (Agee and Skinner 2005): reduce surface fuel, increase the height to the live crown, decrease crown density, and keep large trees of resistant species.

¹ Normal fires burn under 5000 kw/m. Crown fires can burn above 10000 kw/m. If they become plume dominated, then they become megafires achieving more than 30000 kw/m, with major impacts in all ecosystems.



Fig. C25.2. Typical landscape with many different structures in the Val Ager (Photo: Xavier Puig).

However, the effectiveness of a fuel treatment depends on its location in the landscape. Landscape planning allows the establishment of 'firesmart' landscapes with forest structures and spatial distribution patterns that contribute to difficult the spread of crown fires and facilitate the extinction of forest fires (Fernandes 2013). Strategic Management Points (SMP) are bands of low fuel or auxiliary bands anchored to paths that allow the extinguishing system to concentrate resources more safely and efficiently (Costa *et al.* 2011).

Silvopastoralism can be a useful tool for the sustainable management of Mediterranean forests from a biological, social and economic perspective; in fact, the future of Mediterranean agroforestry is built on the recognition of its multifunctional role (Casals *et al.* 2009). Silvopastoralism is a common practice with high benefits for society (landscape conservation, fire risk management, and the production of high-quality meat and dairy) and reduces and controls the amount and continuity of the vegetation mainly from the surface layer. However, the presence of shepherds and their sheep and goats have become more and more rare, leading to an increase in fuel loads in forests, and the expansion

of fire-prone forests. Thus, the presence of livestock in woodlands has become a shared interest for land owners, farmers, firefighters, environment rangers, and businesses wanting to sell food products with an added value. All of these factors motivated the project 'Fire Flocks' (Ramats de Foc, Rebaños de Fuego, <https://www.ramatsdefoc.org/en>, funding Agency: Fundació Daniel y Nina Carasso).

In the stands that have been abandoned for several years, with high amounts of fuel (fig. C25.3), a first intervention using mechanical treatments is usually required, in order to prepare the area and allow the entrance of the livestock. Subsequent to the initial mechanical intervention, grazing is a useful, and economically profitable, way of reducing the fuel loads.

The project area is in the province of Girona, northeastern Spain (42.061179 N, 3.046056 E) (see map). It is mainly composed of Aleppo pine with an understory of mastic and kermes oak, and the stands are dense, young and structurally similar. Before the forest was adapted to traditional pastoral regimes that included low intensity fires and the land cover was tolerant to natural fires caused by lightning.



Fig. C25.3. Typical forest stand that has been abandoned for years and contains high loads of burnable material and how the forest may look after grazing (Photos: Jesus Arades).

Aims of the Fire Flocks project

The overarching objective of the project is to create fire resistant landscapes through the continuity of extensive livestock farming. Thus, the specific objectives are to graze the undergrowth forests and shrublands, as a means of reducing the amount of fuel (vegetation) within the forests and create open spaces between forested areas. The project also aims to promote the bioeconomy in rural areas, valorizing the shepherd profession, the livestock, and the products from the livestock. The project also aims to create a certification for products produced from the herds that are kept with the aim of contributing to the control of fire.

Economics

The project is still in a pilot phase, but there has already been some assessment of the economic impact. The available data correspond to the period between January and June in 2017 and 2018. There has been an increase of 12 % in sales of meat from butchers, and an increase of 40 % in the number of restaurants participating in the pilot phase of the campaign.

Moreover, grazing also reduces the costs of fire management for society. Although, as mentioned, stands maintained with grazing need an initial mechanical treatment; thereafter, grazed stands become economically profitable, as they reduce the costs needed to maintain forests with low fuel loads. Thus, the maintenance of the fire flocks SMP would cost around 1200 €/ha over a 5-year period if done with mechanical means (57 600 € for the 48 ha treated).

Ownership structure

The land ownership is all private (48 ha, 100 %). A shepherd can use their own land, or other land if they sign a lease agreement with the holders of the long-term forest tenure rights (typically 5 years).

The land was abandoned about 15 years ago. Historically forests in the area were used to collect wood for individual purposes (at the farm or house level), and land was and still is made up of micro-private properties, with an average area of less than 1 ha.

Legal frame

According to the Spanish forest code there is a right of free public access to forests (private and publicly owned) but the use of non-wood product forests,

which include grazing is not included as part of the code. Grazing is regulated by regional forest management plans that fix the livestock capacity of a certain area.

Management

There is a lack of information and guides about grazing in Mediterranean sites as a measure to reduce fuel loads. For each type of pastoral forest in Catalonia, Taüll and Bages (2016) analysed the cover of herbaceous and shrub layer, the palatability of the different species, and the pastoral potential. However, the guide considers that *Pinus halepensis* stands with an undergrowth of *Pistacia lentiscus* and *Quercus coccifera* have no pastoral potential because of their low palatability for the animals (sheep and goats).

The Fire Flocks programme seeks to reduce fuel loads and to break continuity of the vertical and horizontal vegetation layers. The predefined understory vegetation control targets are the following: (1) to graze 90 % of the annual biomass growth of the herbaceous layer, and (2) to graze 60 % of the annual biomass growth of the shrub layer. Thus, the aim is to create discontinuities (both vertical and horizontal) in the fuel loads. For each shepherd, Fire Flocks designs a 5-year pastoral plan in which the number of animals and the number of grazing days per year are defined. The needs for feed supplements are also considered.

Services

Fire Flocks brings together public and private agents interested in the continuity of silvopastoralism, by aligning their various needs, and articulating a production and consumption chain of food products from herds. The chain adds value by decreasing the fuel load, and therefore the fire risk in woodlands (as determined by the Catalan Fire Service or the Agriculture Department).

With Fire Flocks, shepherds release their livestock in forests with predefined understory vegetation control targets (fig. C25.4). However, in comparison to grazing in open pasture, grazing in forests often carries additional effort and a reduction in herd productivity. As reported by Taüll and Bages (2016), the pastoral potential for this type of forests is low or very low.



Fig. C25.4. Goats and sheep grazing in the forest. The animals provide different services and deliver different products (Photos: Diego Espada).

The Artisan Butchers Guild of Girona counties works on adding value to the products of the participating farmers, through a label that certifies the herds' fire risk management tasks. Customers will thereby know that eating Fire Flocks products delivers social benefits, i.e. contributing to the ongoing viability of local extensive (rather than intensive) livestock farms, preserving forests, and reducing fire risk.

Agents involved

The Fire Flocks project aims at generating fire resistant woodlands and increasing the continuity and viability of extensive livestock farming (given its double task in food production and landscape conservation). Therefore, it is important to strengthen the links between wildfire management services, farmers, local butchers, and restaurants.

Wildfire management services identify woodlands that are strategic in fire propagation dynamics (SMP), and describe what results are expected through silvopastoralism, for an effective change in fire behaviour in the area.

Extensive livestock farms graze the SMP with their animals (sheep, goats or cows), following a grazing plan that will allow the aims of the plan to be achieved.

Butchers and restaurants sell meat and dairy products from flocks under the Fire Flocks label, and explain the added value behind them to their customers.

Final customers become part of the fight against wildfires through the regular consumption of Fire Flocks products, and support the continuity of extensive livestock farming in our forests.

Products with the Fire Flocks label

Fire Flocks is the marketing label displaying the added value of products from flocks. Consumption of local meat and dairy contribute to reduction of fire risk, and therefore to conservation of forests (fig. C25.5). A growing network of butchers from the Artisan Butchers Guild of Girona counties, and restaurants offer Fire Flocks products. The final product consumers are the end of this value chain. The consumption of Fire Flocks products can be the flame that maintains the viability of the grazing livestock in Mediterranean forests.

Our shepherds and pastures:

The extensive livestock farms involved in the Fire Flocks project are located close to SMPs, and also to the final consumer (see map).

At the moment, Fire Flocks is a pilot test project involving three shepherds:

- Judit is a young female shepherd who produces goats for meat. She has 150 animals of a local goat breed (Cabra Blanca de Rasquera) highly adapted to Mediterranean forest and producing distinctive and highly appreciated meat. Judit's flock graze in two strategic areas close to her farm. To graze in Fire Flocks plots, Judit is using fences which allow animals to eat forest available feed and slowly reach the objectives of the grazing plan previously defined. Her commercialisation strategy before Fire Flocks was direct selling to the public, but now thanks to the Fire Flocks project, Judit has new clients (butchers) interested in her products. Pau is a young male shepherd with two types of flocks: goats for milk and



Fig. C25.5. Products from the Fire Flocks Project. Goat meat processed by local butchers and marketed in local restaurants, and Yogurt and cheese sold in local shops (Photos: Diego Espada).

sheep for meat. He runs the business together with his father. From the goat milk they produce fresh yoghurts and different types of fresh cheese such as 'mató' and 'recuit'. Their sheep meat is highly appreciated, and they sell to restaurants and butchers. He mainly uses sheep, together with part of the goat flock, to graze the area. Around 400 animals graze different fenced plots of 3 ha over several days and at different times of the year, basically when there is food available. With this strategy the high number of animals have a major impact on the forest ground vegetation, and the grazing plan objectives are easily achieved. As part of the Fire Flocks project, Pau now is selling to new butchers, and sales, especially of goat milk products, have increased since his products have had the Fire Flocks label.

- Eugeni is the oldest shepherd of the Fire Flocks pilot test. He is a traditional shepherd, who grazes his flock of 700 animals (sheep and goats) every day around the farm, combining fields and forest. He produces sheep meat for a family restaurant and for butchers. The strategic area coincides with the grazing area used by Eugeni, and thus no fences have been needed. He maintains his traditional practices and has integrated some of the recommendations from the Fire Flocks projects to reach the grazing plan objectives. In the family restaurant, customers can choose Fire Flocks lamb from the menu and a local butcher is selling his lamb, and the contribution the sheep make to fire risk control is explained to customers. The restaurant, especially, has noticed an increase in sales thanks to being part of the Fire Flocks project.

With the start of the project, five new 'shepherd-butcher' partnerships have been created. These partnerships are of vital importance to convey the message and the social and environmental commitment behind the project and allow the butchers themselves to have tools and knowledge to explain to clients (society) the importance of preventing fires through responsible consumption and proximity.

Conclusion

The project is now evaluating the pilot test phase, and planning to consolidate in the pilot area and expanding to the entire region of Girona, and later to other areas in Catalonia.

On one hand, Fire Flocks is detailing the validation method which will certify performance of the grazing plan and allow shepherds to become part of Fire Flocks. The validation method must include field visits to certify the operations and assess factors according to observations and measures which will help the final decision on the grazing impact on the forest vegetation and, therefore, fire risk control.

On the other hand, around 30 shepherds in Girona have expressed interest in being part of the Fire Flocks project. At the moment the project is working with them to: (a) select the grazing strategic areas, (b) define the grazing plan, and (c) list the butchers and restaurants where the products can be sold with Fire Flocks labels. Shepherds have expressed three main motivations to join Fire Flocks: (a) access to land, (b) added commercialisation value, and (c) recognition of its work in relation to silvopastoralism and the management of the risk of fires. Together with the Artisan Butchers Guild of Girona counties, Fire Flocks is describing the regulations for the Fire Flocks label use. That will be the base of the agreement between shepherds and butchers in relation of the use of Fire Flocks label.

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