The ecosystems studied in the frame of Fire Star project

M. Cohen and J.C. Valette

Institut National de la Recherche Agronomique
Unité de Recherches Forestières Méditerranéennes
Equipe Prévention des Incendies de Forêts
20 Avenue A. Vivaldi, 84000 Avignon, France
Phone : (+33) 4 90 13 59 55, Fax : (+33) 4 90 13 59 59
e-mail : cohen@avignon.inra.fr - valette@avignon.inra.fr

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Introduction

The purpose of this paper is to point out the conclusions of the work done in the frame of Fire Star project about the expectation of the end-users of the Fire-Star system. It is based on the deliverable d2-01 (Cohen & Rigolot, 2002). The word end-users designate here managers and offices involved in the management of wildland-urban interfaces (WUI) and in the reduction of fire hazards. The European funded project Fire Star (EVG1-CT-2001-00041) has the following objectives:

- Assessment of the fire danger on WUI
- Support to fuel management on WUI
- Assessment of wildland fire effects onto "targets" of the WUI (fire fighters and inhabitants; buildings).

This project is clustered with the other European funded project WARM.

In the first two parts, we detailed the final products that end-users are expecting and the first hypothesis about their content. Then, we presented the selected ecosystems, the structure of the interface itself, and other factors we will study during the 3 years of the project. The combination of all these factors constitutes the Fire Star study-cases. A conclusive table summarises all these study-cases, detailing the selected modalities for each factor.

What final products the end-users are expecting?

The main ideas that had emerged from the end-users about their needs are the following. They wished:

- An attractive tool to communicate and convince managers or local authorities of managing the WUI. It would help to improve the way to apply regulation;
- An on-line catalogue, free of charge, directly based on simulations run during the 3 years of the program, in which they could find all the data collected, simulated and interpreted;

- A module that could help technicians in their extrapolation or interpolation of results from the simulations;
- A software or a set of models that could be handled by study offices to produce management guidelines in WUI situations very different from study cases of the catalogue.

Ecosystems and species selected to fill in the catalogue

Among all the proposals made on the project, the consortium decided finally to work on six different community types. The community types had been selected among the woodlands and shrublands that are mostly represented in the Mediterranean region. We aimed also at constituting a catalogue as various as possible in terms of tree and shrub structure. Therefore, from garrigue to adult pine stand, from maquis to mixed conifer and hardwood stand, the community types selected were supposed to give an overview of the diversity of structures in Mediterranean wildland.

The second part of the selection concerned the choice of the species involved in the study cases. This choice was made with the will to describe the ecosystems that were typically found in the wildland-urban interfaces of each European contractor.
In the same time, each team of the consortium decided what kind of ecosystems she will describe and with which priority. For the trees, we tried to give an idea of their expected height to make the search of field location be more easy. Table 1 gives the results of our selection in terms of community types and expected species related to them. It also matches countries with the ecosystems they will study during the project.

Table 1: Ecosystems studied by country

Community type	**Species**		**Country**
	Trees	**Shrubs**	
GARRIGUE (<1m)		*Chamaespartium tridentatum* *Erica umbelata*	Spain
		Quercus coccifera	France
MAQUIS (1-2m)	sparse trees *:* 10 % of *Pinus pinaster* (2 to 4 m)	*Ulex europeus* *Ulex minor* *Erica cinerea*	Spain
Mixed ADULT PINE STAND	*Pinus halepensis* (15m) *Quercus ilex* (6 to 8 m)	*Rosmarinus officinalis* *Thymus sp.*	France
Pure ADULT PINE STAND	*Pinus pinaster* (8 to 10m*)*	*Ulex sp.* *Chamaespartium tridentatum*	Spain or Portugal
Low and dense PINE STAND	*Pinus pinaster (*4m*)*		Portugal
COPPICE	*Quercus ilex* (4 m)	*Rosmarinus officinalis* *Thymus sp.*	France

Treatments on fuel vegetation over the wildland-urban interface

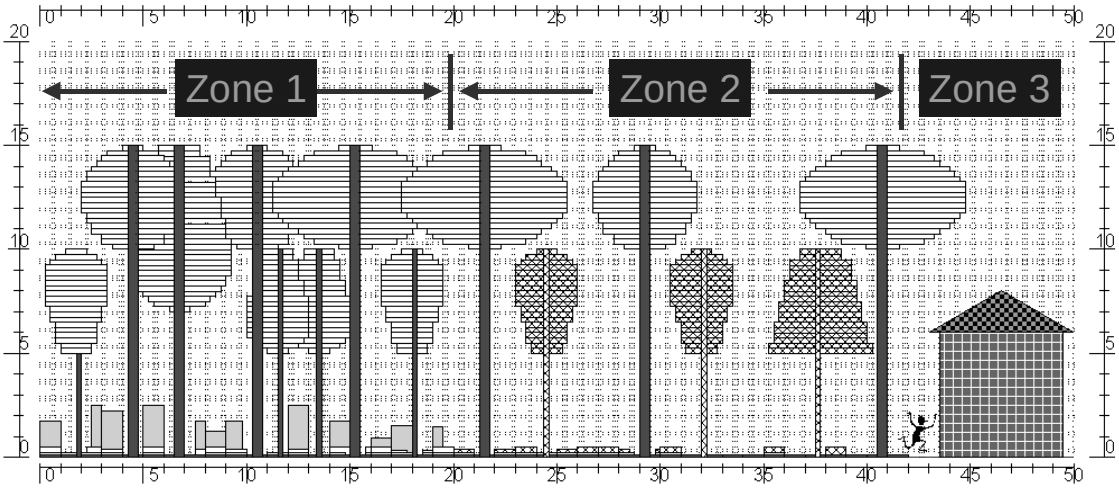

Figure 1: The three zones of the studied domain

As it represents a control before any intervention on the interface, the initial structure of the "untreated" wildland was also described for all community types. Considering the interface itself (zone 2), we selected 3 factors which were assumed to have great impact on fire behaviour and propagation. Each of them will be studied under two modalities. These factors were:

- tree cover (low 30% and high 75%),
- shrub volume (low 500 and high 2500 m^3/ha),

In order to reduce the total number of study cases, we did not cross all the modalities together. We selected a sub-set of cases to be studied in priority and to do so we applied for instance the principle of compensation among tree and shrub layers. Thus for ecosystems with trees, two combinations were studied, depending on tree cover and shrub cover:

- 75% tree cover and 500 m^3/ha for shrub volume (corresponding to an annual bush clearance). For a low and dense pine stand (community type n°5), maximum tree cover will be only 50 % and minimum 25%.
- 30% tree cover and 2500 m3/ha for shrub volume (the maximum threshold considered as acceptable).

These combinations represented a compromise that is sometimes needed in a context of wildland-urban interfaces where sociological constraints as to be taken into account. Either an owner accepts to cut a lot of trees in his property and he can be less strict on the frequency of bush-clearance; or he wants to leave more trees and he has to compensate it by clearing the shrub layer almost every year.
For the other ecosystems (like garrigue or maquis), the two levels for shrub volume will be studied.

If more simulations can be run, it will be interesting to have some details about shrub structure:

- everything is cut homogeneously,
- versus 10% ornamental shrubs are maintained thanks to manual selective clearing).

However, this factor did not constituted yet a priority in our work.

The width of the interface was also defined to 100 m. This distance came also from a compromise between the possibility of the simulations in terms of calculation domain, and the expected width which will be significant to create an effective interface.

Selection of other factors influencing fire behaviour

Some other factors among those that influence the fire behaviour will be studied. Three levels for the slope will be simulated: none, weak slope (15° or 30%) and steep slope (30° or 60%) combined with a high wind speed (ambient wind about 40 km/h), considered to represent a very severe risk. Table 2 summarises all the combinations of modalities and factors selected to constitute the study cases.

Moreover, end-users also required testing different levels of wind or slope for a given ecosystem. Wind effects would be simulated on ecosystems with trees. These simulations could be used at the end of the project to make some interpolations.

Conclusion

Table 2 summaries the selected study cases. From the description of the selected ecosystems, the consortium selected the experimental plots that are studied in the frame of Fire Star. The description and the modelling of the fuel of these plots will enable to run some numerical simulations of a fire propagating in these plots that will be recorded in the catalogue. In this catalogue, end-users will find some recommendations and rules to help the management of WUI in some of the most important Euro-Mediterranean ecosystems.

References

Cohen M., Rigolot E. 2002 – FIRE STAR decision support system requested services: end-users needs and selected scenarios. FIRE STAR : a decision support system for fuel management and fire hazard reduction in Mediterranean wildland - urban interface. CEC Commission of the European Communities Directorate General for Agriculture Bruxelles (BEL) ; INRA Centre d'Avignon Unité de Recherches Forestières Méditerranéennes (FRA). Deliverable D2-01. 6p.

Table 2 : Selected study cases

ECOSYSTEMS			FUEL TREATMENT IN ZONE 21	SLOPE	WIND
Community type	Trees	shrubs	Tree cover – shrub cover– shrub structure		S¨PEED
1. GARRIGUE (<1m)		*Chamaespartium tridentatum* *Erica umbelata* *Quercus coccifera*	- **Initial structure = zone1** - **Phytovolume 500 m3/ha** - Phytovol 500 m3/ha x 10 % shrubs remaining - **Phytovol 2500 m3/ha** - Phytovol 2500 m3/ha x 10% shrubs remaining	- none - weak - steep	strong 40 km/h (maximal risk) (several values in one case – ecosystem with trees-)
2. MAQUIS (1-2m) with sparse trees	*10 % of Pinus pinaster (2 à 4 m)*	*Ulex europeus* *Ulex minor* *Erica cinerea*	- **Initial Structure = zone1** - **Phytovol 500 m3/ha** - Phytovol 500 m3/ha x 10 % shrubs remaining - **Phytovol 2500 m3/ha** - Phytovol 2500 m3/ha x 10% shrubs remaining		
3. Mixed ADULT PINE STAND	*Pinus halepensis (15m)* *Quercus ilex (6 to 8 m)*	*Rosmarinus officinalis* *Thymus sp.*	- **Initial Structure = zone1** - **Tree cover 75% x Phytovol 500 m3/ha** - **Tree cover 30% x Phytovol 2500 m3/ha**		
4. Pure ADULT PINE STAND	*Pinus pinaster (8 to 10m)*	*Ulex sp.* *Chamaespartium tridentatum*	- **Initial Structure = zone1** - **Tree cover 75% x Phytovol 500 m3/ha** - Tree cover 75% x Phytovol 500 m3/ha x 10% shrubs remaining - **Tree cover 30% x Phytovol 2500 m3/ha** - Tree cover 30% x Phytovol 2500 m3/ha x 10% shrubs remaining		
5. Low and dense PINE STAND	*Pinus pinaster (4m)*		- **Initial Structure = zone1** - **Tree cover 50% x Phytovol 500 m3/ha** - **Tree cover 25% x Phytovol 2500 m3/ha**		
6. COPPICE	*Quercus ilex (4 m)*	*Rosmarinus officinalis* *Thymus sp.*	- **Initial Structure = zone1** - **Tree cover 75% x Phytovol 500 m3/ha** - **Tree cover 30% x Phytovol 2500 m3/ha**		

1 Modalities in bold letters are those which would be studied in priority

Close this chapter