APPROACHES FOR POST-FIRE MANAGEMENT OF BLACK PINE: Experiences in Spain

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FUNDACIÓN CENTRO DE ESTUDIOS AMBIENTALES DEL MEDITERRÁNEO

- Non serotinous (Lanner 1998)
- Release of seeds late winter/early spring (Skordilis & Thanos 1997)
- (few closed in summer) Cones open at 70-120ºC (Aleppo pine 200-400ºC) (Habrouk et al 1999)
- Seeds sensitive to moderate temperatures (Escudero et al 1999)
- Usually show low post-fire regeneration (Retana et al 2002)
- Since the 1990s 25% black pine forest lost in Catalonia

Pinus nigra subsp salzmannii

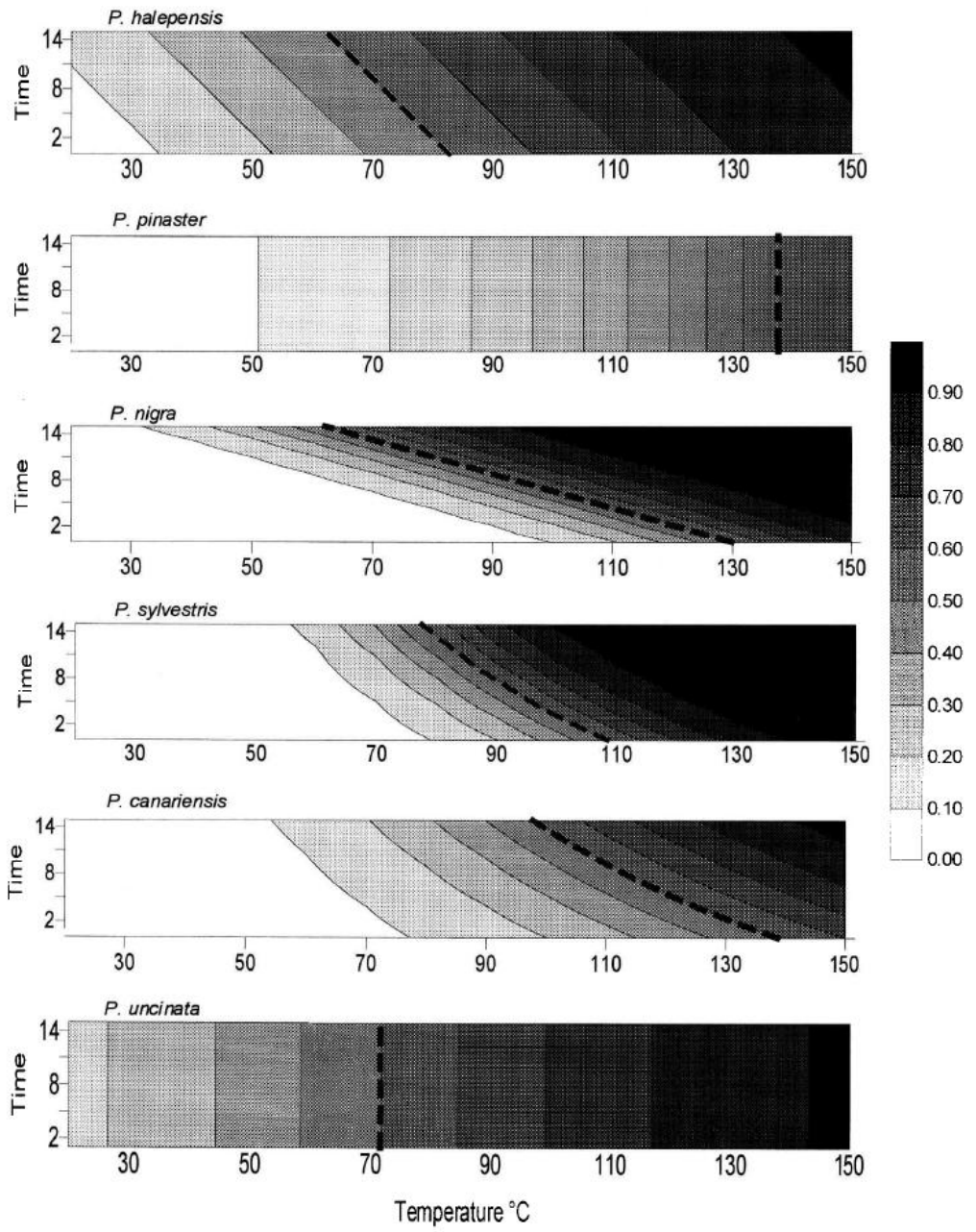
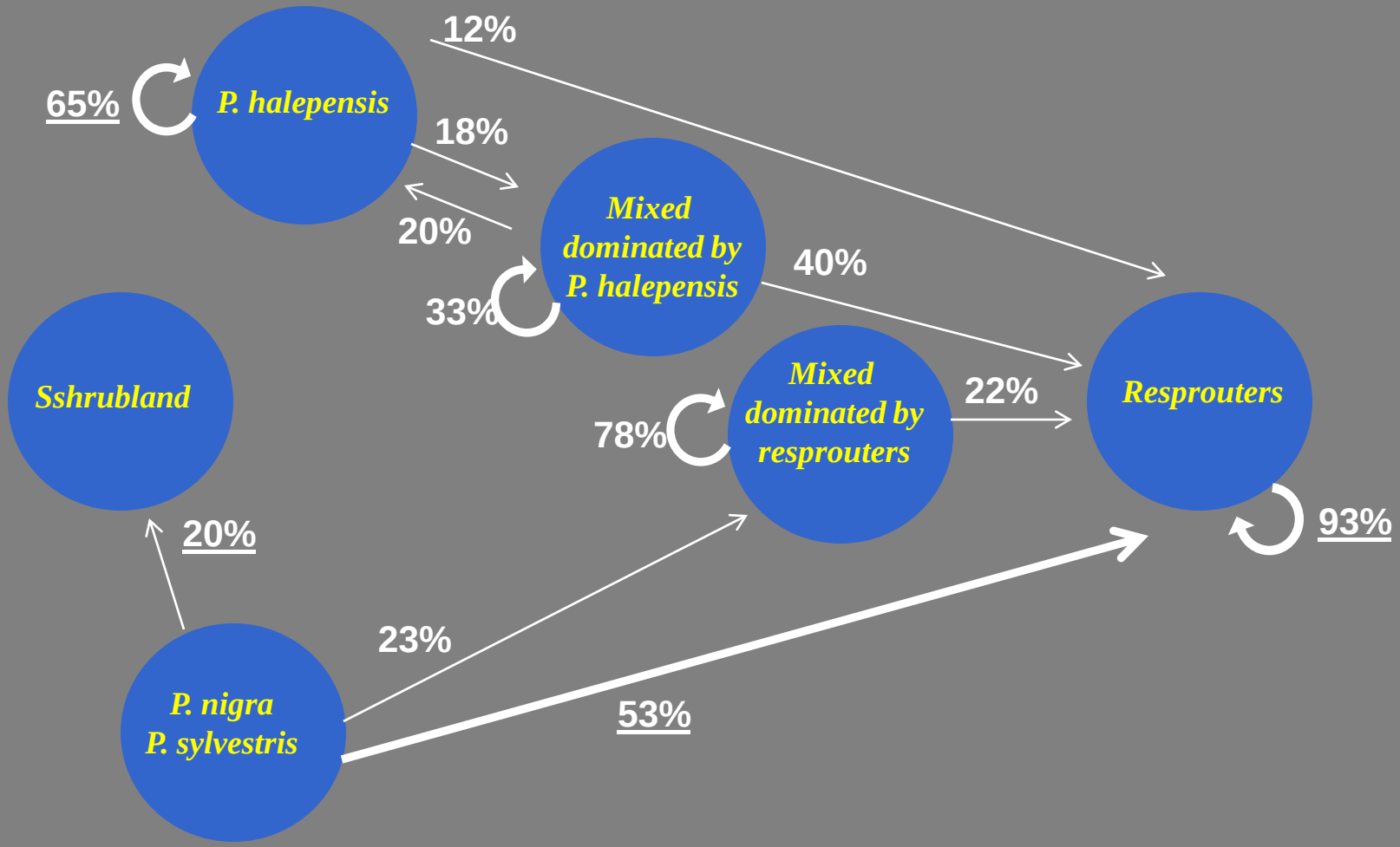


Figure 2. Contour maps of the probability of germination in temperature by exposure time space. Selected models are shown in bold in *table I*. X-axis is the temperature and y-axis is the exposure time during the fire intensity treatments. The isoline of 0.5 probability is in bold, seeds submitted to treatments located to the right of this line have no chance of germination.

Escudero et al 1999

EXCEPTIONS TO AUTOSUCCESSION… SENSITIVE SPECIES



The number over arrows indicate the percentage of plots that change from one community to another after fire

From: Rodrigo et al. 1999

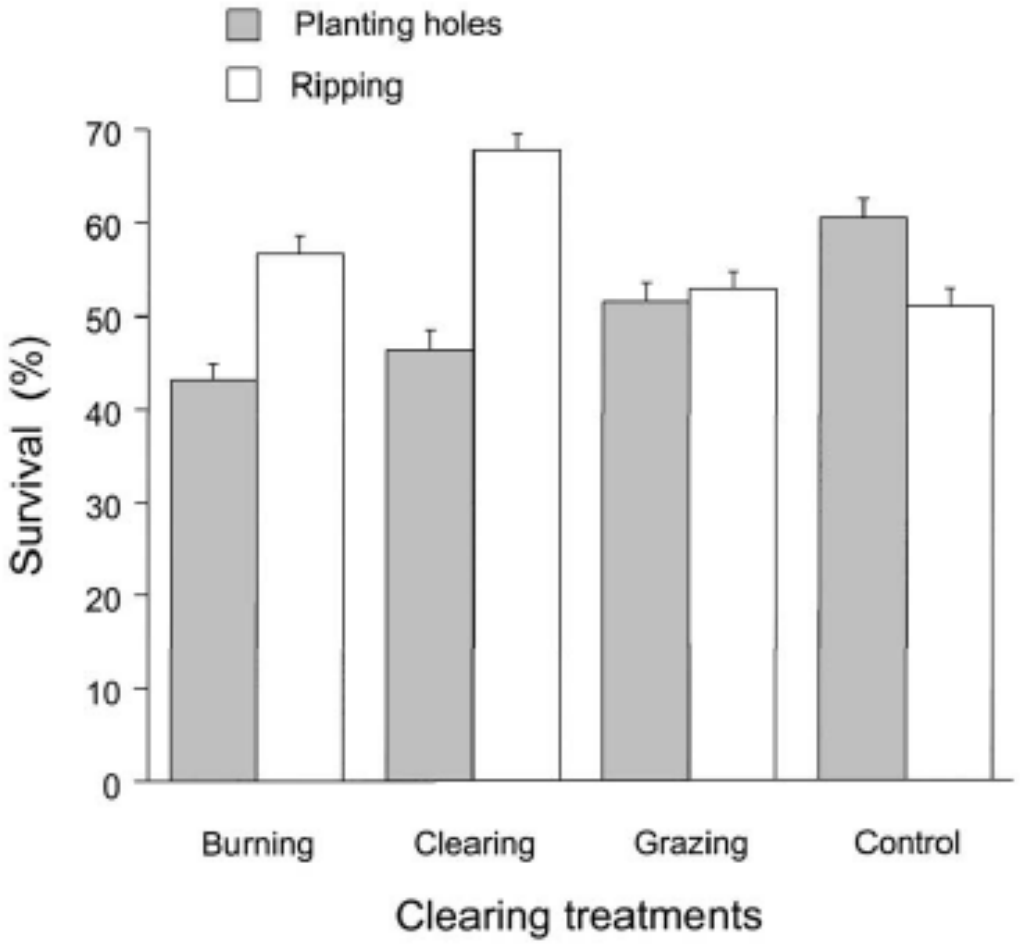
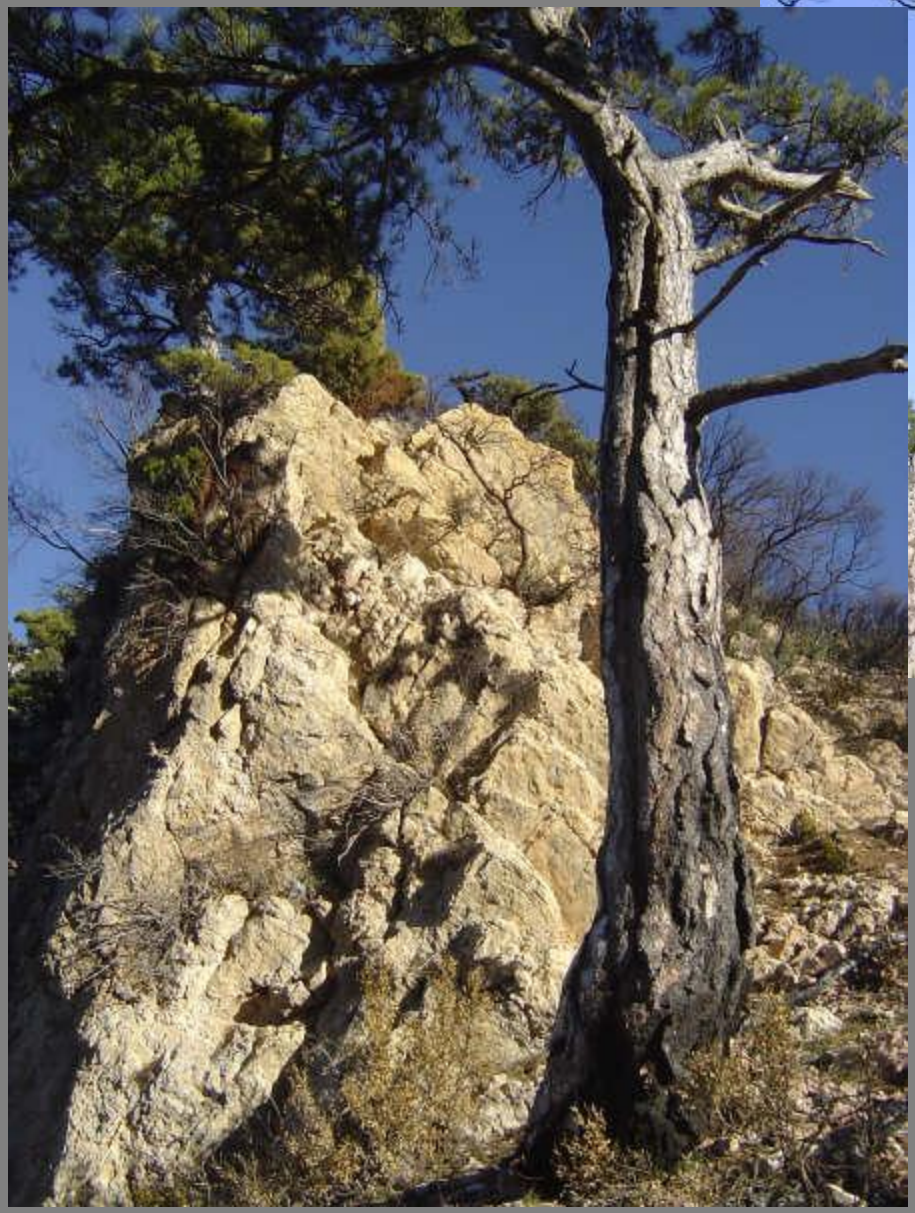


Fig. 4. Variations in seedling survival in plots where vegetation had been eliminated by the different treatments according to the soil preparation methodology used. Vertical bars extend over +1S.E. of the mean.

Espelta et al 2003


Resistant *Pinus nigra* stands
Turmell site (Castellon, E Spain)
Fule et al., 2008



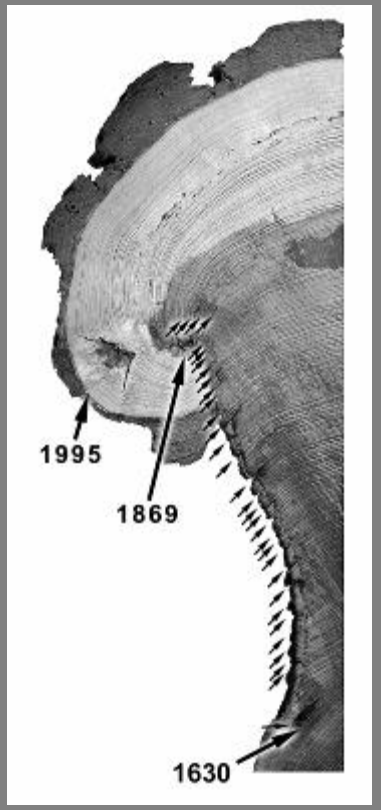
Gerri de la Sal, Lleida

Old trees surviving in cliffs, rocky soils, open woodlands, surface fires

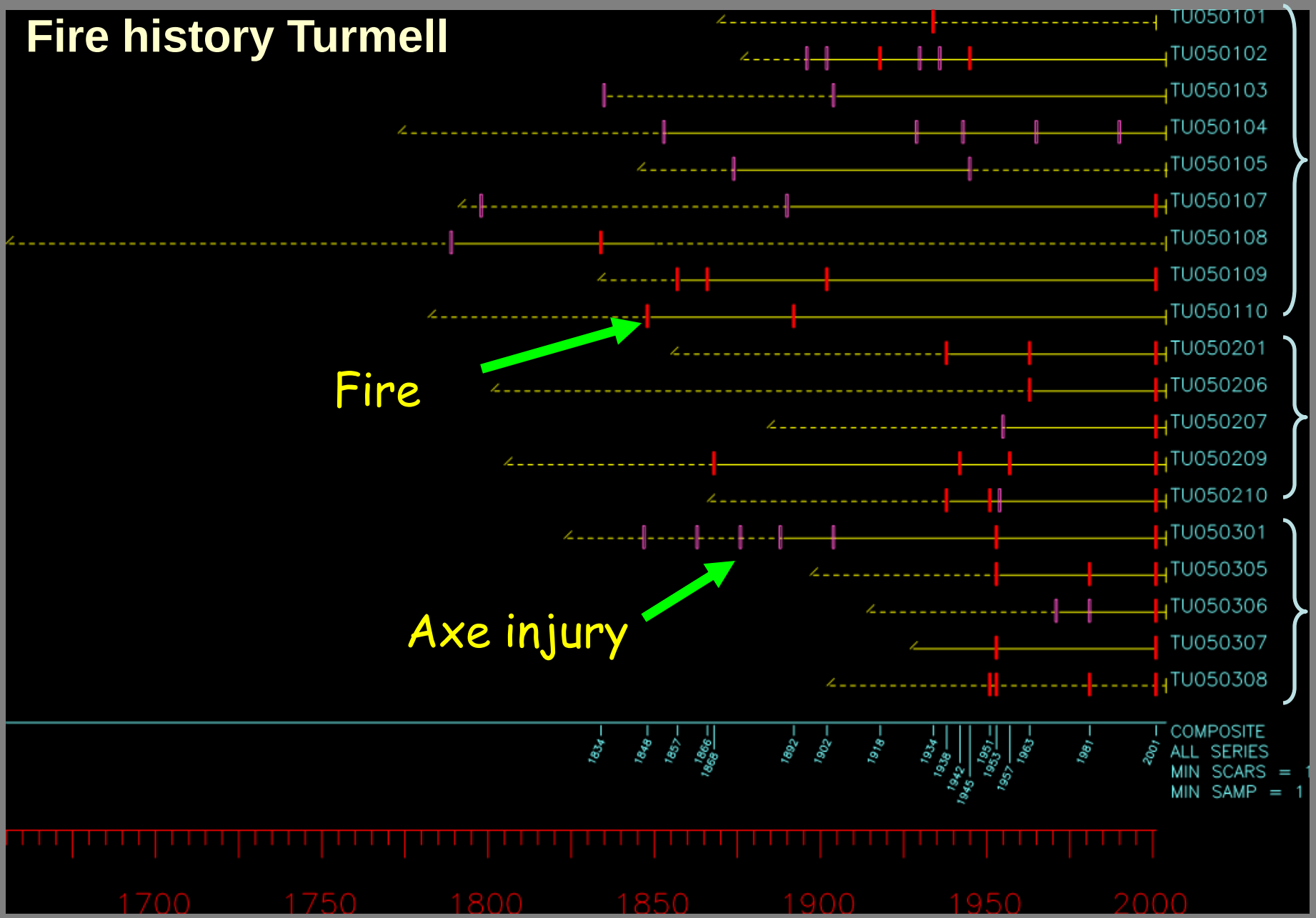
Foto: Dídac Díaz, Coll de Nargó, Lleida

Turmell site after the large fire in 2001

Fire scars



Tree rings allow for dating and establishing the season of fire



Fule et al 2008

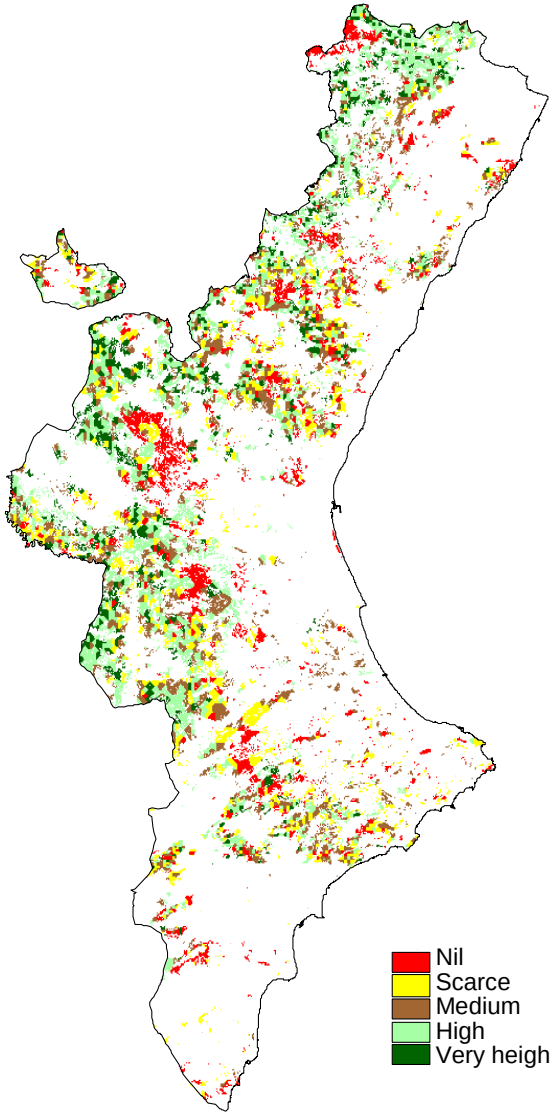
Pinus nigra in Turmell *vs* average data in Catalonia

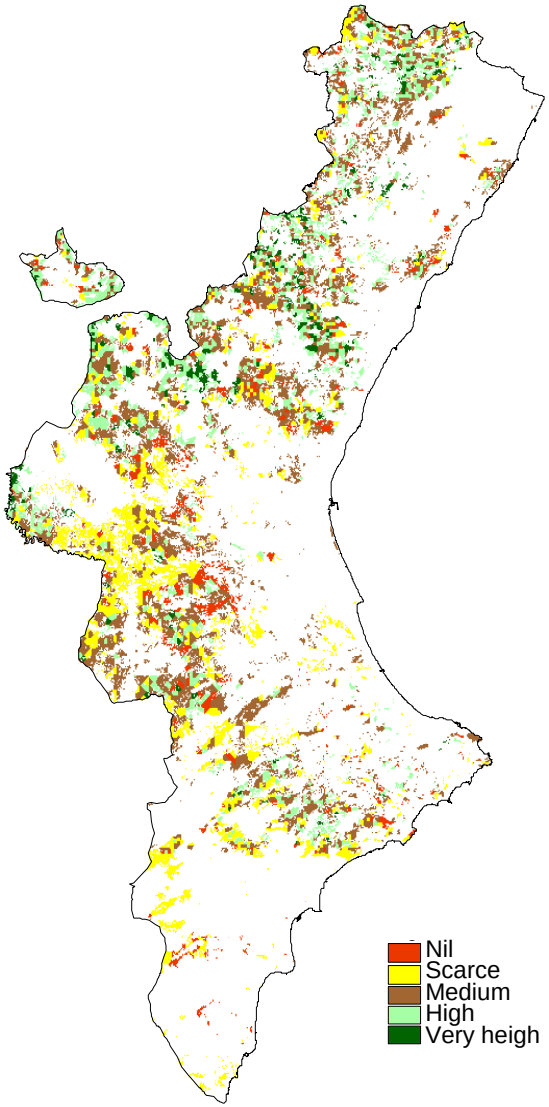
		Turmell	Catalonia
Density	trees. ha^{-1}	483	690
Basal area	m^2 ha^{-1}	27.1	11.7
Mean dbh	cm	26.7	14.7
Biomass	Mg ha^{-1}	**110.0**	**39.1**
Mean tree age	years	**144**	**53**
Maximum tree age	years	**362**	**215**

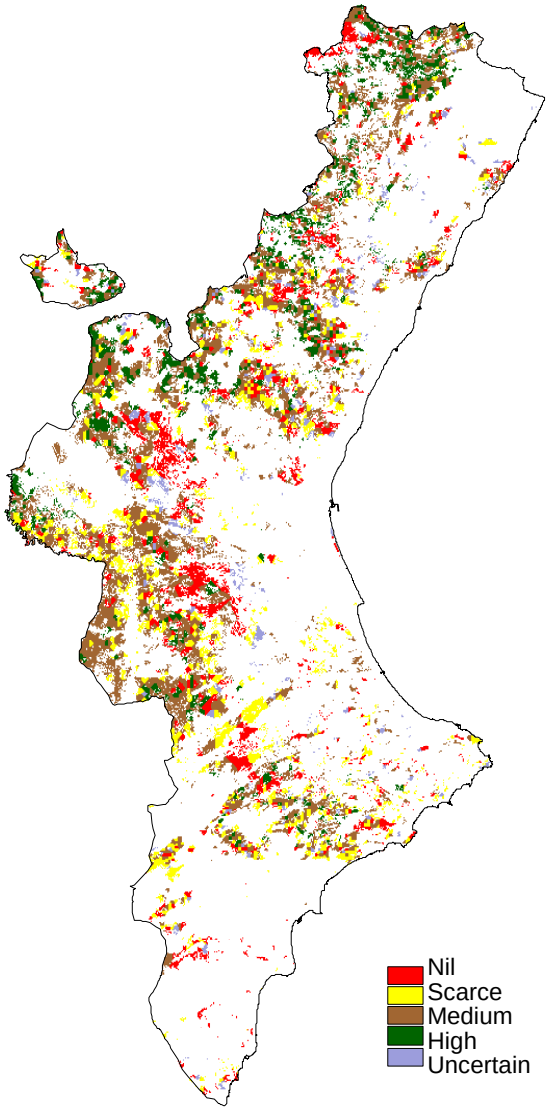
* Forrest Inventory Catalonia, CREAF

STRATEGIES AND TECHNIQUES TO PRESERVE AND RESTORE BLACK PINE FOREST

(under dry climate & shallow soils)

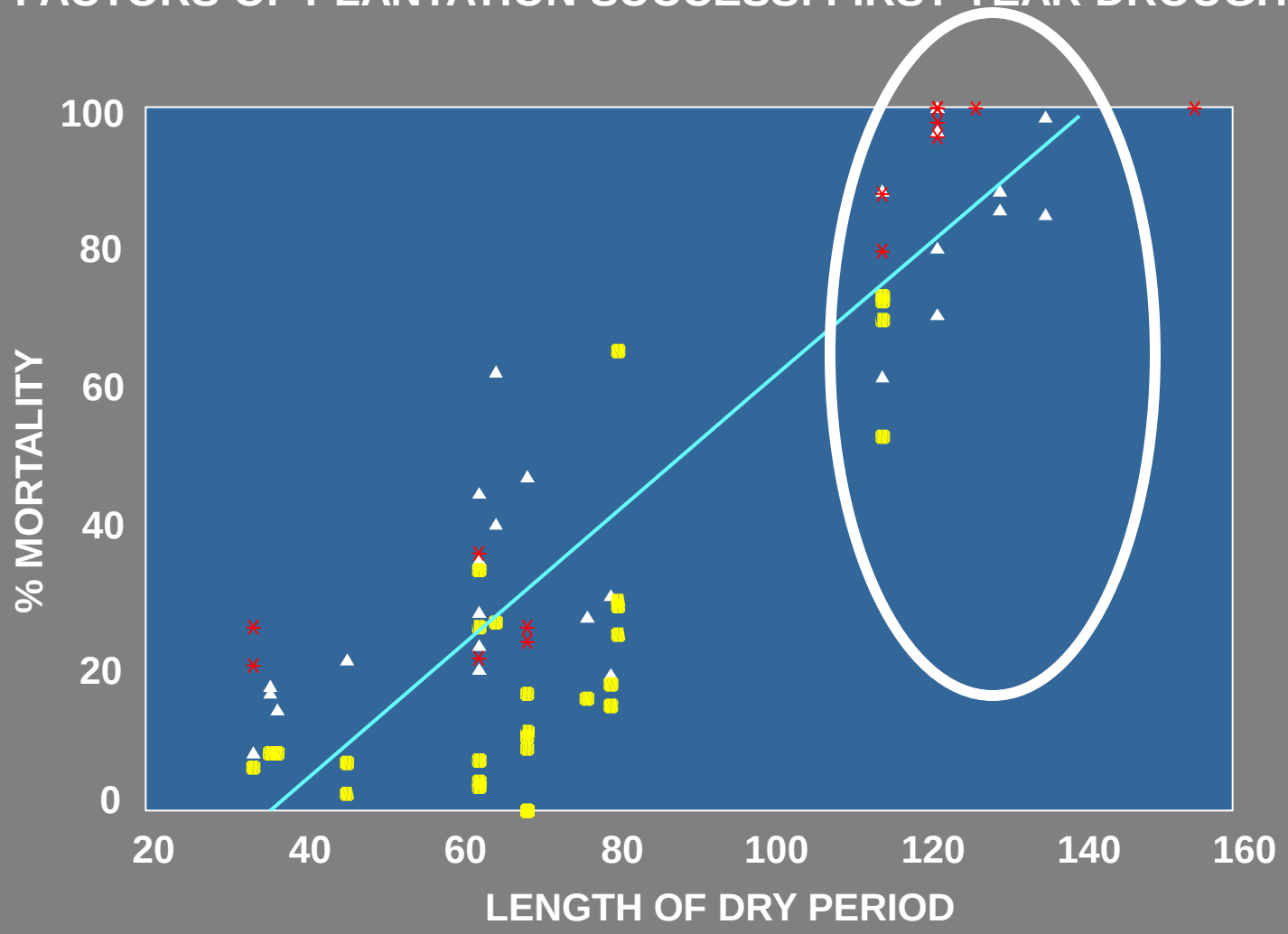






PRESENT REGENERATION & **POTENTIAL REGENERATION** ⇒ **REGENERATION CAPACITY**

FACTORS OF PLANTATION SUCCESS: FIRST YEAR DROUGHT



Pinus halepensis *Quercus ilex ssp. ballota* *Quercus coccifera*

OPTIONS TO IMPROVE PLANTATION SUCCESS

- Species diversification, ecotypes, genotypes, manipulating species plasticity
- Micro-habitat conditioners
- Soil preparation and amendment (threshold limit for most woody species in our drylands: 40 cm soil depth)

In order to:

✓ Overcome transplanting shock

✓Survive dry spells

✓Grow during wet spells

SEEDLING QUALITY

Water manipulation of growing medium: addition of hydrogel and clay in the substrate

The aim is to increase water holding capacity of the growing medium: to provide more available water to seedling after outplanting.

Nº	Substrate types	Label	Mixture (%)	Particle size
1	Control-ESPAFIBRAC-7	CE	-	-
2	Pine bark	PineB	25	M
3	Hydrogel-RP400F	HF-20	20	F
4	Hydrogel-RP400F	HF-40	40	F
5	Hydrogel-BURES	HB-20	20	F
6	Hydrogel-BURES	HB-40	40	F
7	Atapulgite 4/20 (clay)	AAG-10	10	C
8	Atapulgite 20/70 (clay)	AAF-10	10	F
9	Atapulgite 20/70 (clay)	AAF-20	20	F
10	Sepiolite 4/35 (clay)	ASG-10	10	C
11	Sepiolite 4/35 (clay)	ASG-20	20	C

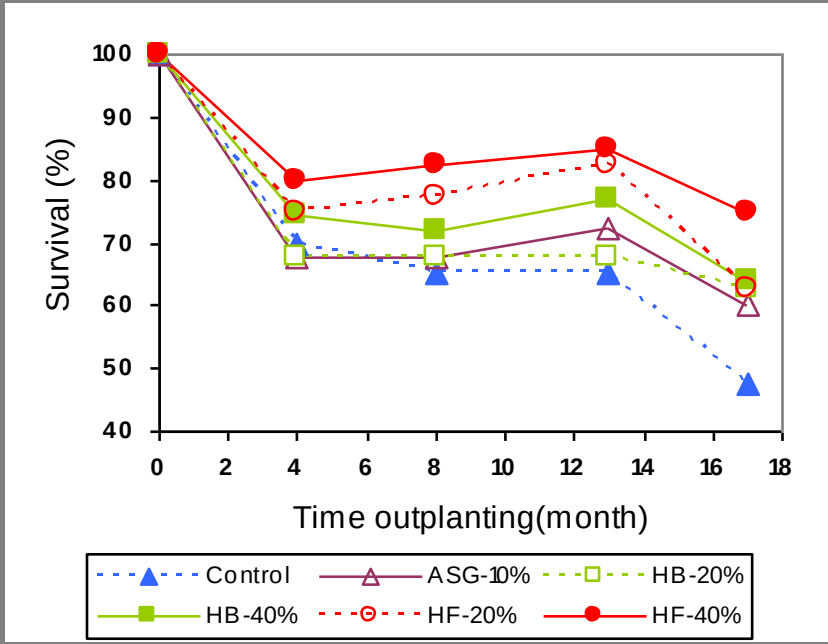
Hydrogels

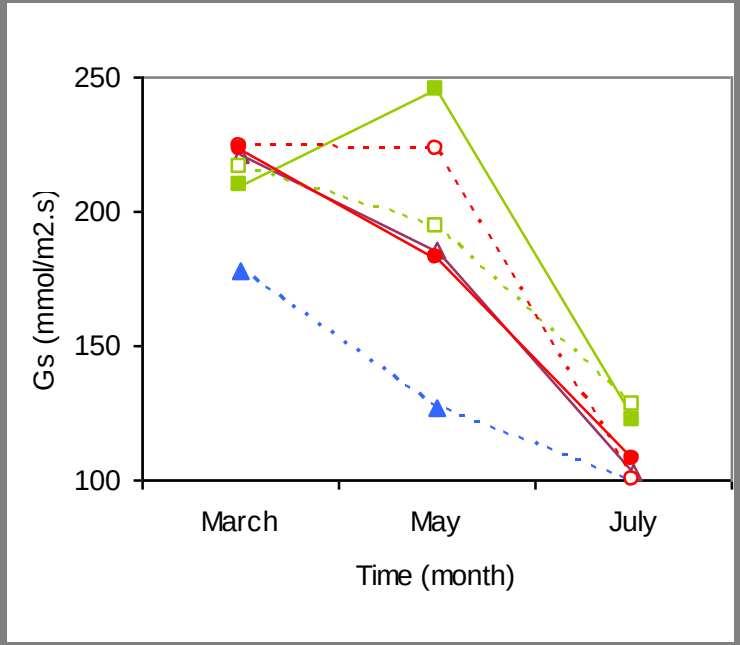
Clays

HYDROGELS

Water manipulation of growing medium: addition of hydrogel and clay in the substrate

Field: survival & gas exchange



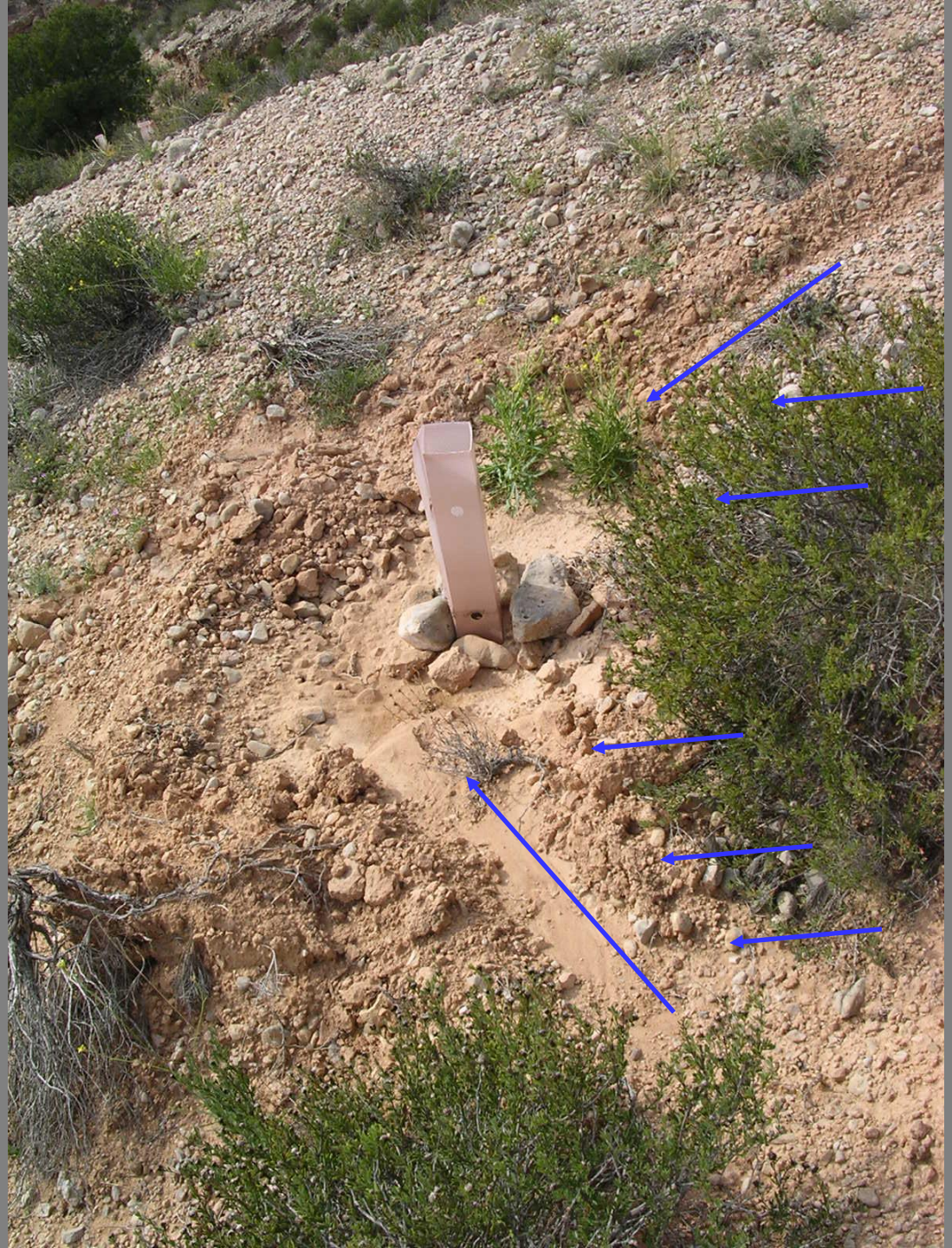


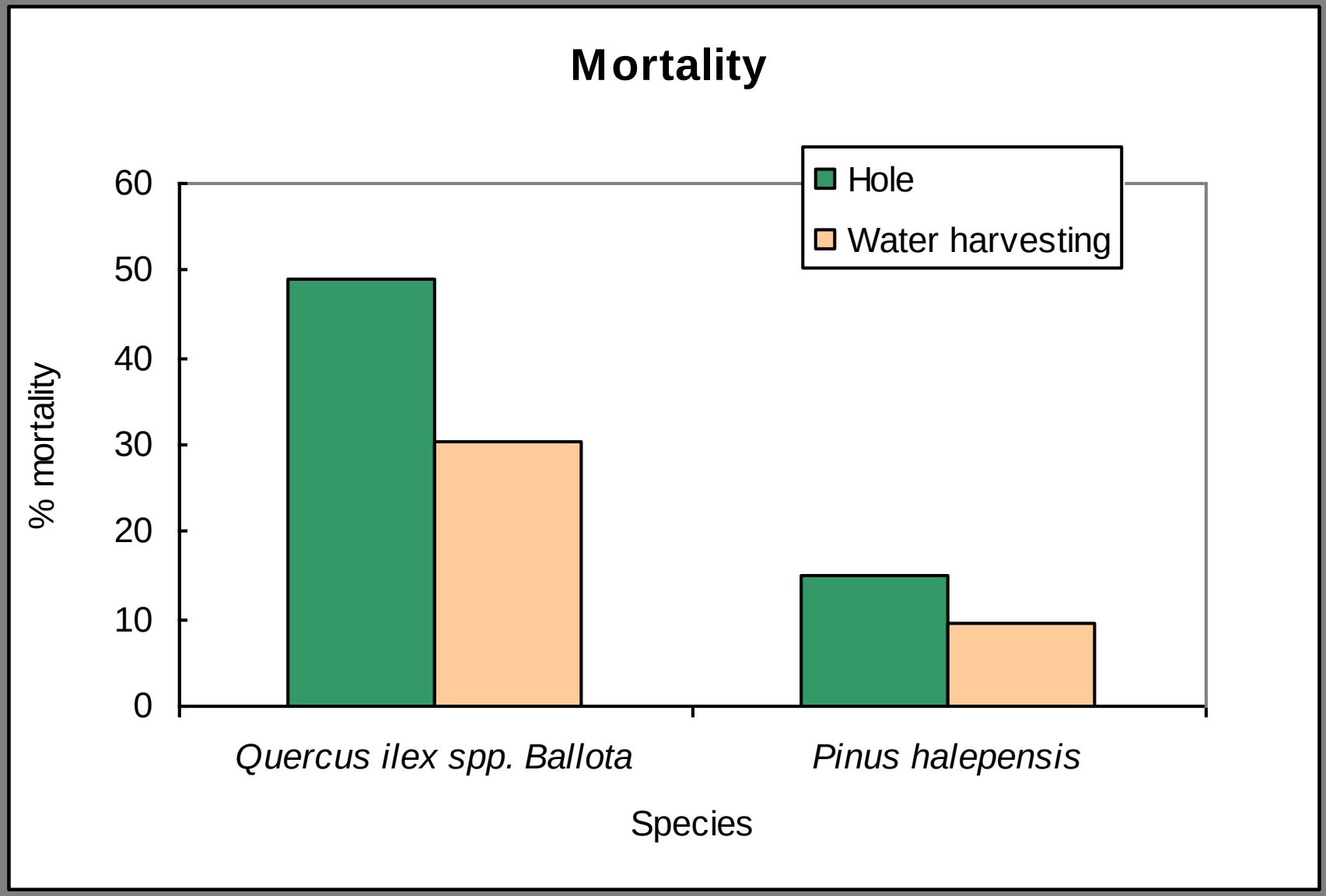
✓ Addition of hydrogels improved survival and gas exchange in the field, mainly with HF-40.

✓ No differences in growth.

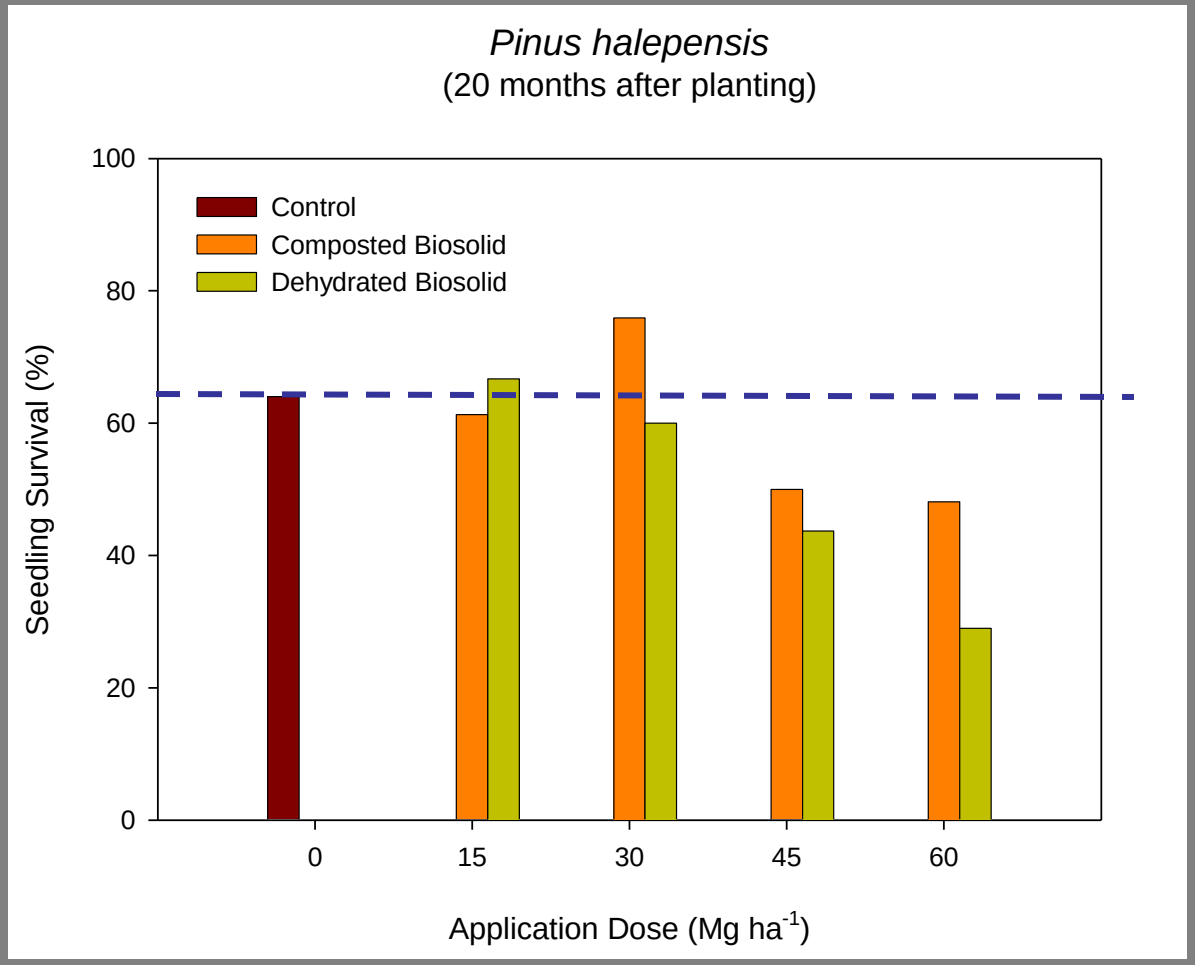
Mechanical hole with backhoe *Spider*

water harvesting



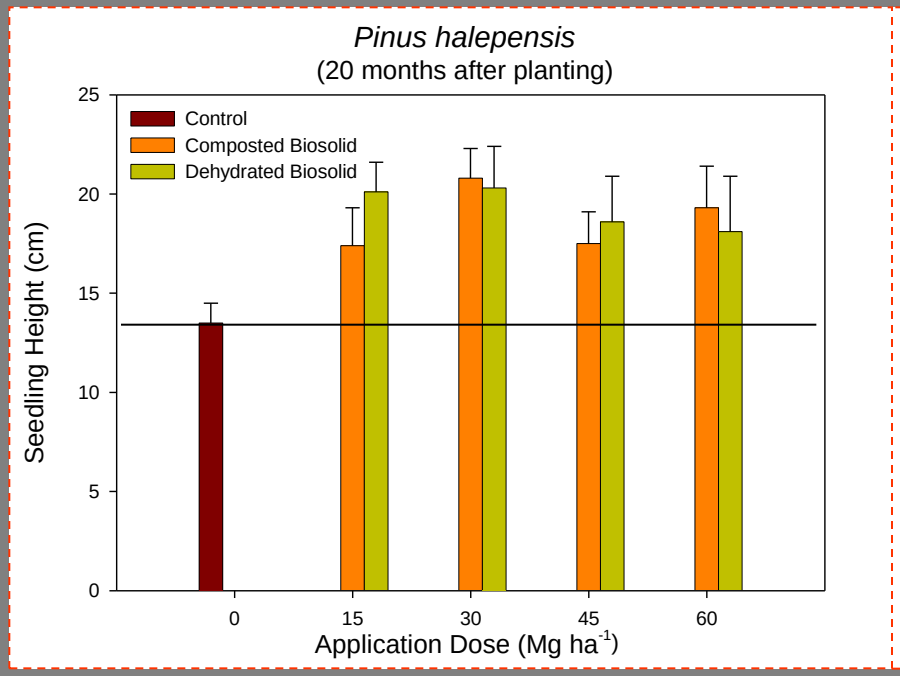

Mortality
Hole
Water harvesting
60
50
40
30
20
10
0
% mortality
Quercus ilex spp. Ballota
Pinus halepensis
Species

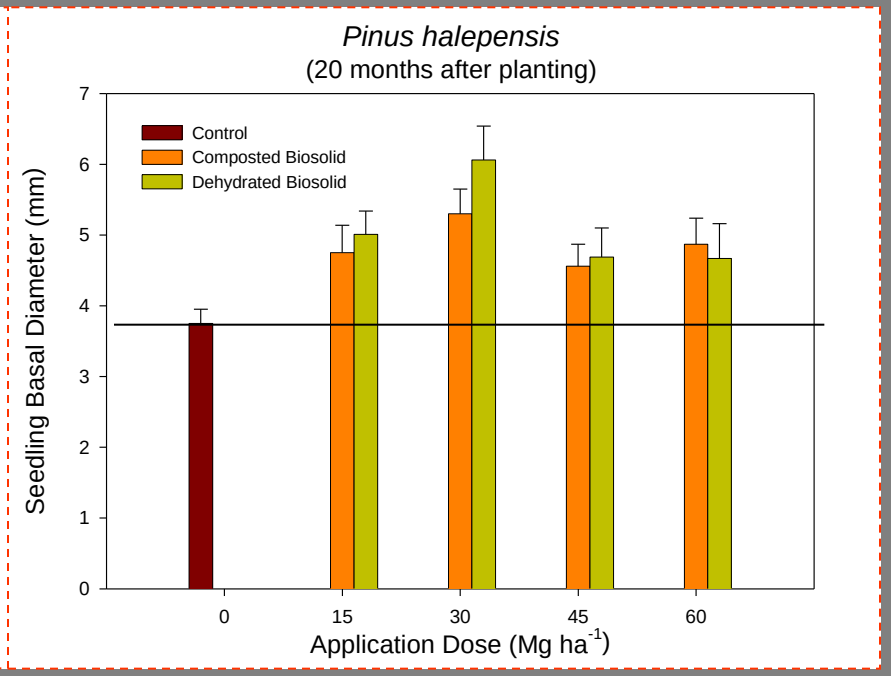
Soil amendments: Biosolids



Valdecantos et al. sumitted

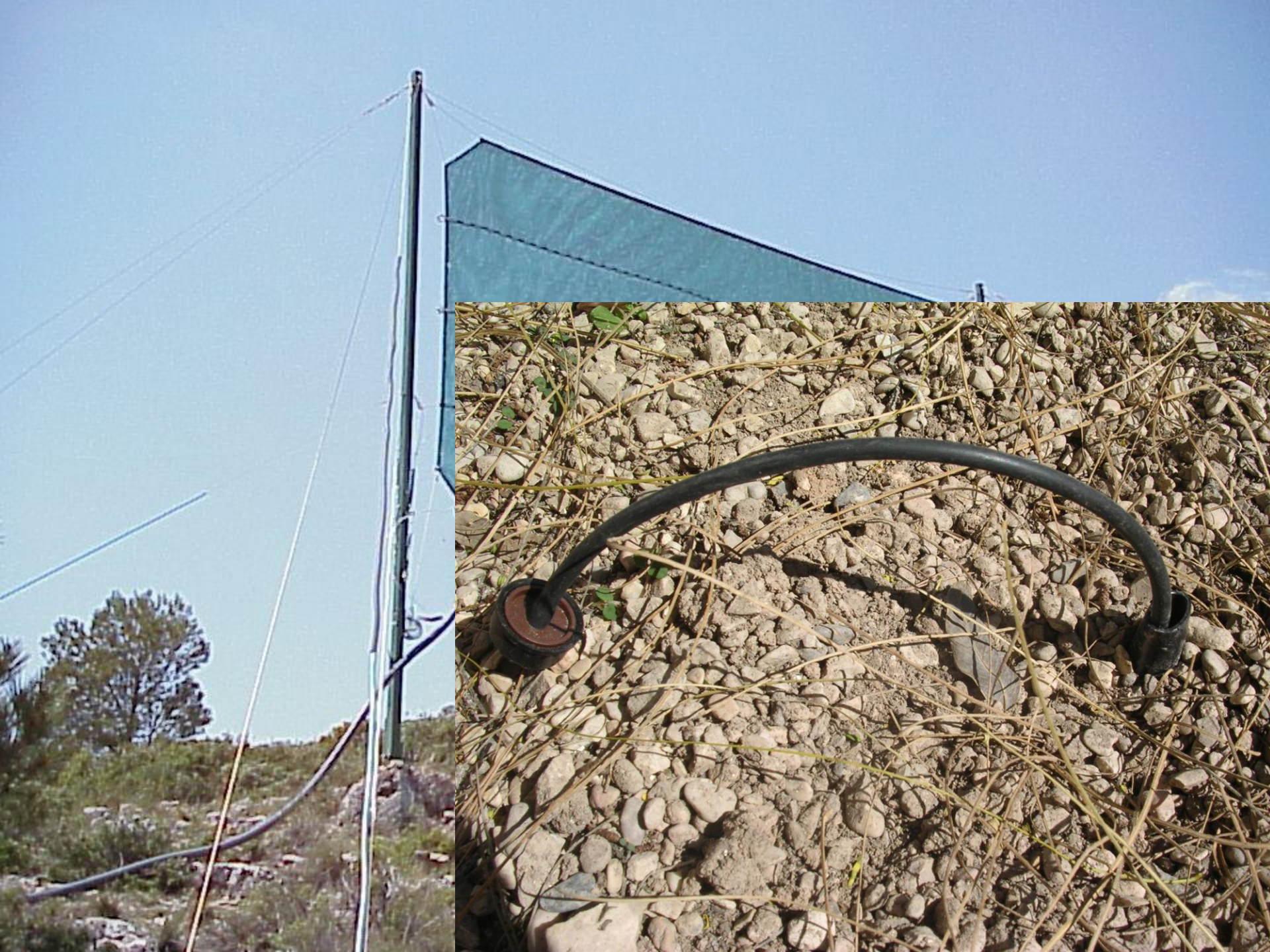
Soil amendments: Biosolids





Valdecantos et al. sumitted

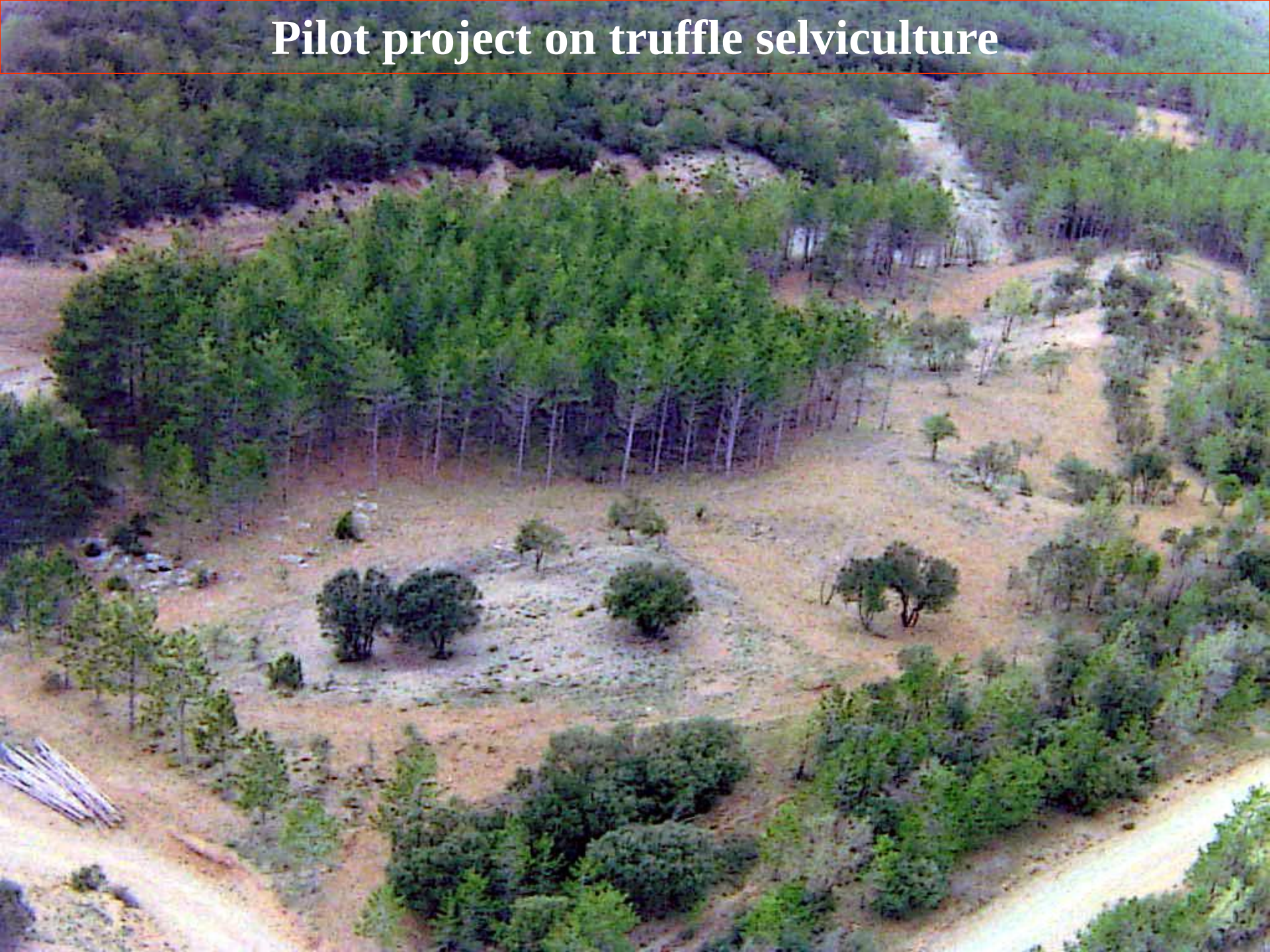
Fog harvesting



COMPATIBILIZING OBJECTIVES ..

e.g. fire prevention & (truffle) production

Pilot project on truffle selviculture




Mycorrhiza


Tuber melanosporum