4.4 TREATMENT OF PRE-EXISTING VEGETATION

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4.4.1 Text

Land use changes during the 2nd half of the 20th century have favoured the expansion of forests, woodlands and shrublands on abandoned agricultural land and pastures throughout the Northern Mediterranean basin (CARMEL and KADMON 1999, DEBUSSCHE et al. 1999, ALADOS et al. 2004).

In contrast, in areas affected by intense degradation, distant from propagule sources or subjected to spells of unfavourable climatic conditions, recovery has not been achieved after decades of abandonment (ALCANTARA et al. 1997, ALBALADEJO et al. 1998, PUGNAIRE et al. 2006).

As a consequence, large areas in the northern Mediterranean basin are currently covered by grasses (as in the case of abandoned agricultural fields), and patches of shrubs and grasses within a matrix of bare soil.

Grasslands, degraded shrublands, dense shrublands and overstocked forests represent contrasting situations in terms of community dynamics and ecosystem restoration.

Old-fields are frequently colonised by herbaceous vegetation.

Dense herbaceous cover may prevent the establishment of woody species, and temporarily hamper succession (PEÑUELAS et al. 1996, SANCHEZ and PECO 2004).

Maintaining the herbaceous cover may be a suitable restoration goal when fire control is a major concern (PEREVOLOTSKY et al. 1998, DELGADO et al. 2004).

Grasslands may also promote biodiversity, protect the soil and improve soil conditions (LE HOUÉROU 1993, HODGSON et al. 2005).

Fostering succession may involve suppressing grasses by using herbicides and mechanical methods (PEÑUELAS et al. 1996, STERNBERG et al. 2001).

In degraded semi-arid shrublands, low plant cover may be unable to carry fire.

The main objectives of restoration in these areas are soil protection, regulation of hydrological fluxes, and increase in biodiversity and C sequestration capacity.

These can be achieved by bringing in grasses, shrubs and trees (CORTINA et al. 2004).

Extant vegetation may be disturbed at a small scale, in order to favour the establishment of wanted species, but this may not be the best option when it can be used to facilitate seedling establishment (see section 5.2.6).

At a large scale, the maintenance of plant cover and ecosystem functional status in degraded shrublands, even if poor, is highly recommended.

Attention should be paid to the creation of a vegetation mosaic that may prevent fuel build-up and keep large-scale wildfire risk low.

Shrublands often colonise abandoned agricultural lands and grasslands (NE'EMAN and IZHAKI 1996, CARMEL and KADMON 1999, BONET 2004).

Under dry sub-humid conditions they can be highly productive as compared to other Mediterranean ecosystems, creating dense thickets in a few years.

They are highly efficient in protecting the soil and improving soil fertility (CERDA 1997, CORTINA and MAESTRE 2004), and they provide suitable habitat for rodents, birds and insects (HERRERA 1988, LOPEZ and MORO 1997, LOMBARDI et al. 2003).

But succession may be arrested in dense shrublands (TRABAUD and LEPART 2001, PONS and PAUSAS 2006), and high fuel accumulation may increase fire risk (BAEZA et al. 2006).

Post-fire conditions are highly dependent on the abundance of resprouting species (VALLEJO 1996).

Shrublands dominated by obligate-seeder shrubs (e.g., *Ulex parviflorus*, *Rosmarinus officinalis* and *Cistus* spp.) may pose a higher risk of degradation than shrublands dominated by resprouters such as *Quercus coccifera*, *Pistacia lentiscus* and *Rhamnus lycioides*, as re-establishment of plant cover after fire may be too slow to protect the soil against autumn rainstorms (DE LUIS et al. 2001).

Shrubland management may involve fuel load reduction in defined areas by clearcutting, chaining, roller-chopping, herbicide application and prescribed burning (KEELEY 2002, BAEZA et al. 2003, ETIENNE and RIGOLOT 2004).

Of those, clearcutting may be the most suitable for Mediterranean shrublands because of the balance between potential for vegetation control, costs, selectivity, social acceptance, and lack of deleterious effects such as contamination and soil degradation.

But a comprehensive analysis of these techniques has not been carried out to day.

Slash retention may help to protect the soil, increase moisture availability, incorporate organic matter and nutrients, and retain sediments and seeds (TONGWAY and LUDWIG 1996, LUDWIG and TONGWAY 1996, HASTINGS et al. 2003).

Shrubs capacity to resprout after cutting can be reduced with repeated disturbance (LLORET and VILA 1997), which may help to decrease maintenance costs.

Clearings may enhance the establishment of target species (CORTINA et al. in press), particularly less flammable resprouting species which may confer further resistance and resilience against fire.

They may also improve habitat conditions for fauna, particularly by increasing the shrubland-open land ecotone (COLLINS and URNESS 1983, FERNÁNDEZ et al. 2003).

Proper clearing design reduces erosion risk, and facilitates access for later maintenance works and wildfire management.

Dense forests represent a different situation.

They may originate from plantation, spontaneous colonization of old-fields and grasslands, and coppice abandonment (DEBUSSCHE and LEPART 1992, LLEDÓ et al. 1992).

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Dense tree populations may be particularly sensitive to drought (Ogaya et al. 2003, Skov et al. 2004), and show limited productivity (Ducray and Toth 1992), and low tree recruitment (Espelta et al. 1995).

Fuel build-up and increased continuity may promote stand replacing fires (Zimmerman 2003), but it should be noted that fuel accumulation, beyond certain level, may not be a major deterrent of wildfire (Keeley and Fotheringham 2001), and short-term reburning is becoming increasingly common (Vázquez and Moreno 2001).

Creating vertical and horizontal discontinuities in fuel accumulation may help to reduce fire risk and propagation (Vélez 1990).

Thinning, fuelbreaks and buffer zones around populated areas are suitable approaches (Ne'eman et al. 1997, Finney 2001, Keeley 2002, Leone and Lovreglio 2005) that have been applied at management scales in some areas (Plana et al. 2005).

Prescribed burning of the understorey has also been recommended (Leone and Lovreglio 2005).

But it should be kept in mind that sylvicultural treatments are not a *panacea* against fires, particularly under severe fire weather conditions (Pérez and Moreno 1998, Keeley 2002).

Openings may enhance regeneration and positively affect biodiversity (Bergès 2004, WWF 2006).

Grazing can be an efficient cost-effective way to maintain openings (Perevolotsky et al. 1998, Delgado et al. 2004, Abdelmoula et al. 2004).

The reduction in forest cover may also affect the water balance (Bellot et al. 1999), but further research is needed to elucidate the role of different plant covers on hydrological cycles, particularly at large scales (Meir et al. 2006).

Recent increases in the frequency and extension of forest fires have been attributed to the extension of conifer plantations.

It is not evident that the increase in pine forest has been a major driver of this process (Vélez 1986, Piñol et al. 1996).

Resprouting hardwoods, however, may confer higher resistance and resilience against fire than conifers (Johnson 1975, Diaz-Delgado et al. 2002), and thus their plantation has been recommended (Vallejo 1996; WWF 2006).

4.4.2 References

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