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A37

# Soil Protection in Sloping Mediterranean Agri-Environments Lectures and exercises



INSTITUTO POLITÉCNICO  
DE BRAGANÇA

# Landcover changes in Mediterranean landscapes of Greece: implications for fire and biodiversity issues

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**Keywords:** Mediterranean habitats, landcover patterns, plant diversity, socio-economic changes, climate change

## The structure of Mediterranean landscapes - The natural history of the Mediterranean landscapes

The landscapes of the Mediterranean Rim have a distinctive character that arises from their physiography and the long history of human development. The Mediterranean region has a basin and range topography surrounding the Mediterranean Sea, as a consequence of which it has variable geomorphological conditions. Various geological substrates are closely alternating, producing a variety of soils. The prevailing climatic conditions, although falling in the general pattern of the Mediterraneanity, vary considerably, even over short distances. This physical background creates a mosaic of landscapes, which supports a broad array of habitats and a high number of species. It is broadly accepted that all Mediterranean type ecosystems evolved under the influence of environmental stresses, primarily summer drought and low soil nutrient availability. Furthermore, Mediterranean climate ecosystems of the world have been under the periodic influence of natural hazards, such as fire and tectonic instability. Consequently, the plant communities of these systems have been forced to cope with all these environmental factors and natural perturbations. In particular, Mediterranean plant communities have evolved response mechanisms to cope with fire. These mechanisms are expressed through the morphological, physiological and phenological adaptations of the plant species (Arianoutsou, 1998). However, fire, as an environmental natural hazard, does not have the same regime in all five Mediterranean climate regions of the world (Rundel, 1998). In South Africa, for example, fynbos vegetation of the Cape region usually burns at intervals of 10-15 years (van Wilgen *et al.*, 1992), while in California and in the Mediterranean Basin natural frequencies are usually 30-50 years or more

N. Evelpidou & T. de Figueiredo (eds.) *Soil Protection in Sloping Mediterranean Agri-Environments: lectures and exercises*. Instituto Politécnico de Bragança, Portugal, 2009

(Trabaud & Prodon, 1993; Rundel & Vankat, 1989). The Mediterranean Basin has also experienced marked climate changes during the Quaternary, which has had profound effects on plant community structure and speciation (Cowling *et al.*, 1996).

### **Plant diversity in Mediterranean landscapes**

Many references indicate that the Mediterranean rim is ranked first of the five Mediterranean regions of the world in terms of the plant species diversity (Cowling *et al.*, 1996). It hosts approximately 25,000 vascular plants (Cowling *et al.*, 1996), a large number of which are range-restricted taxa. A great portion of these plants is now considered as threatened. Greece has approximately 6,000 plant taxa, a remarkable degree of endemism (~20%) and a high number of plant taxa considered as threatened (900; 600 of them endemics) (Georghiou & Delipetrou, 2000; Kokkoris & Arianoutsou, 2001).

### **Man and the Mediterranean Landscapes**

The Mediterranean Basin was settled by humans very early. Consequently, Mediterranean-type landscapes have long ago experienced the human impact. Indigenous agriculture and animal husbandry have been practiced here for more than 10,000 years (Le Houerou, 1981; Naveh, 1998), in combination with deforestation practices and fire management. Plant community structure and diversity patterns have therefore evolved under the influence of this interaction. These patterns were kept in a dynamic equilibrium at least until the Second World War (Caravello & Giacomini, 1993). Since 1950, major changes have occurred to the economies, the livelihood and hence the landscapes of the Mediterranean countries. Initially, there were extensive rural migrations followed by agricultural intensification from the introduction of new farm machinery, new strains of cereals and tree crops and extensive application of fertilizers. The invention of new irrigation techniques made possible the use of hilly areas, so agriculture spread further. The European Community set the next milestone in this process by setting the general framework within which agricultural activities should unroll.

### **Current trends in landscape changes in Greece**

The dynamic equilibrium between humans and the Mediterranean environment lasted until 1980 and resulted in a remarkably rich landscape. However, land abandonment, tourism development, population concentration along the coast, and the building of extended transportation networks characterized the last two decades of the 20<sup>th</sup> century (Burke & Thornes, 1998). Common Agricultural Policy (CAP) set by the European Union is also part of the puzzle. The accelerated socio-economic changes encountered during these two decades are causing major changes in the landscape patterns and the biodiversity they

support (Arianoutsou, 2001). Further to this direct human influence, climatic factors, such as high temperatures and long dry periods, which alter the water status of the vegetation, may also cause dramatic changes in the landcover patterns by imposing fire events over extended landscape units (Arianoutsou, 2007).

This paper will review the current situation in the European Mediterranean ecosystems in relation to the changes they are undergone. The main drivers of these changes are related to: i) depopulation of rural areas, because of the better employment opportunities people find in the urban centers, ii) the abandonment of traditional practices in the rural areas, because of their depopulation and shift in the list of production priorities, iii) increase of the recreational and ecological value of wildland, iv) expansion of wildland –urban interface. The study-cases provided will focus on those drivers by providing evidence of the land-use changes occurred and will discuss the implications that these changes might have for the long established patterns of plant diversity and fire regime.

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