

# CHALLENGES FOR MANAGEMENT OF RICH *QUERCUS* FORESTS IN EUROPE

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## PURPOSE AND SCOPE

Oak-dominated forests are naturally widespread in Eurasia, supporting high biodiversity and providing important ecosystem services (Gil-Pelegrín et al. 2017). In Europe, there are approximately 20 species of oaks and many of them are foundational species ranking among the most important tree species for biodiversity. Much of their value as habitat for many groups of organisms is attributed to their tolerance to disturbance and light demanding characteristics, long lifespan, and unique wood traits (Mölder et al. 2019). Therefore many oak habitats in Europe are planned to be set aside for conservation purposes. These forests also provide many ecosystem services including quality timber, forage, firewood, recreation, aesthetics, and watershed protection. Oak forests have been closely associated to humans throughout history, and one key for successful restoration and management of oak communities is to understand and utilize their potential for multiple uses. Additionally, oak forests, because of their high resilience to disturbance and environmental stress such as drought, offer a promising alternative for inclusion into management plans addressing increasingly common extreme weather events. Irrespective of their high capacity to provide many conservation values and ecosystem services, declines in oak dominance are occurring in Europe and this is often connected to changes in land use (Petersson et al. 2019). Here, some examples of challenges, implications and possible solutions for management and restoration of rich oak communities in Europe will be presented.

## METHODS AND APPROACH

Central European temperate oak wood production is characterized by long rotations with the aim of producing high-quality timber (fig. 1a). Such forests often contain multiple companion tree species and are rich in biodiversity. Therefore they are targeted for conservation purposes and there is a need to develop multifunctional oak forest management. Another example targeted for conservation purposes are the many types of wood pastures with oak in Europe (fig. 1b). Historically, these have been sustained through a combination of land uses such as: free-range grazing livestock, fodder production, and wood production for special purposes (cork, fodder, and special timber). However, these land uses are in decline in favor of intensified agriculture or forestry and urbanization; therefore it is a great challenge to preserve such habitats. Finally, a typical form of oak-dominated habitat that is in decline is various forms of oak coppice (fig. 1c). These were also widespread in Europe during the last 1,000 years and met social and economic needs in preindustrial Europe, and are normally rich in biodiversity and associated with cultural values.



Figure 1—(a) Production forest with *Quercus robur* in southern Sweden (photo courtesy of Jens Peter Skovsgaard); (b) production of cork from *Quercus suber* woodlands in Spain (photo courtesy of Spanish forestry photo library INIA-SGB 2004 ©); and (c) coppice with standards of *Quercus* spp. in central Italy (photo courtesy of Magnus Löf)

## FINDINGS AND IMPLICATIONS

Oak forests and woodlands in Europe have often been developed and sustained through management systems that are characterized by multiple uses. Over large areas, and during the last 100 years, these systems have been in decline. Simultaneously, they are rich in biodiversity and therefore targeted today for conservation purposes. However, a nonmanagement approach together with other forms of land use (intensified agriculture and forestry and urbanization) will lead to the transformation of these biodiversity rich habitats to other forests types or land uses. Restoration and management strategies with the aim of sustaining and increasing oak dominances should therefore strive to develop methods that can combine different purposes of management. For central and northern temperate oaks, this can be various forms of integrative management practices for forestry and nature conservation. For oak woodlands in central and southern Europe, this can be various forms of combinations of production of both wood and animals. None of this is likely to be achieved without a system of political support measures which allow landowners to receive financial and knowledge support for their production of valuable ecosystem services.

## LITERATURE CITED

- Gil-Pelegrín, E.; Pequero-Pina, J.J.; Sancho-Knapik, D., eds. 2017.** Oak physiological ecology. Exploring the functional diversity of genus *Quercus* L. Vol. 7. Tree Physiology. Cham, Switzerland: Springer International Publishing: 547 p.
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- Petersson, L.K.; Milberg, P.; Bergstedt, P. [et al.]. 2019.** Changing land use and increasing abundance of deer cause natural regeneration failure of oaks: Six decades of landscape-scale evidence. *Forest Ecology and Management*. 44: 299–307.