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Designing sustainable management option for maintaining diversity and ecosystem function in Mediterranean coppice forests: an ecological approach

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Managing forests in ways that sustain biodiversity and ecosystem functioning represents a major challenge in modern forestry. This is particularly relevant in Mediterranean forests, which are foreseen to experience the greatest proportional variation in biodiversity in the next century, because their sensitivity to changes in land use and climate. Coppice forests are amongst the most widely diffused forests in the Mediterranean region. Those forests have been traditionally managed as coppice with standard, which was historically supported by the demand for fuelwood, animal fodder, crafts, and building materials. Alternative silvicultural options needs to be developed for sustainably managing coppice forests, to allow both wood production, the conservation of biodiversity and the maintenance of ecological functionality in the face of uncertainty.
In the framework of the Project LIFE FutureForCoppiceS we evaluated the influence of different management options (traditional coppicing, natural evolution and active conversion) on understory diversity. The trial was conducted in long term permanent plots established in Tuscany (Central Italy) and Sardinia (Southern Italy). Three European Forest Types (EFT) were sampled: Mediterranean evergreen oak (EFT 9.1); mountainous beech forests (7.3); Turkey oak forests (8.2). The influence of the different management options on overstorey was evaluated in terms of overstorey canopy cover, as estimated using digital cover photography. The influence of management options on understorey was evaluated in terms of understorey canopy cover and understorey diversity, with the latter estimated using various indices of textural diversity (Shannon, Simpson, Pielou) and functional diversity (Functional Dispersion, Functional Richness, Functional Evenness and Functional Divergence).
Results indicated that traditional coppicing leads significantly lower overstorey cover and higher understorey cover than other management options (natural evolution and active conversion). The higher understorey cover enables higher number of species and higher textural diversity in traditional coppicing than other management options, a result of the increased light availability at the forest floor. By contrast, the functional diversity approach indicates that the other options yielded higher functional Evenness and Divergence than traditional coppicing, which instead possessed higher Functional Dispersion. Taken together, results indicated that traditional coppicing produces a change in understorey structure and composition, in which ruderal species with wide ecological amplitude are exhibiting large competition. By contrast, the other management options have favoured late-successional (more habitat-specialist) species, promoting higher niche differentiation. Based on these results we concluded that analysis of understorey should be included in management decision to design sustainable forest management based on ecological criteria.