


ECOLOGICAL DYNAMICS, VEGETATION AND SOIL IN A MESOPHILIC EUROPEAN HOPHORNBEAM STAND DURING COPPICE ROTATION IN CENTRAL-NORTHERN APENNINES (ITALY)




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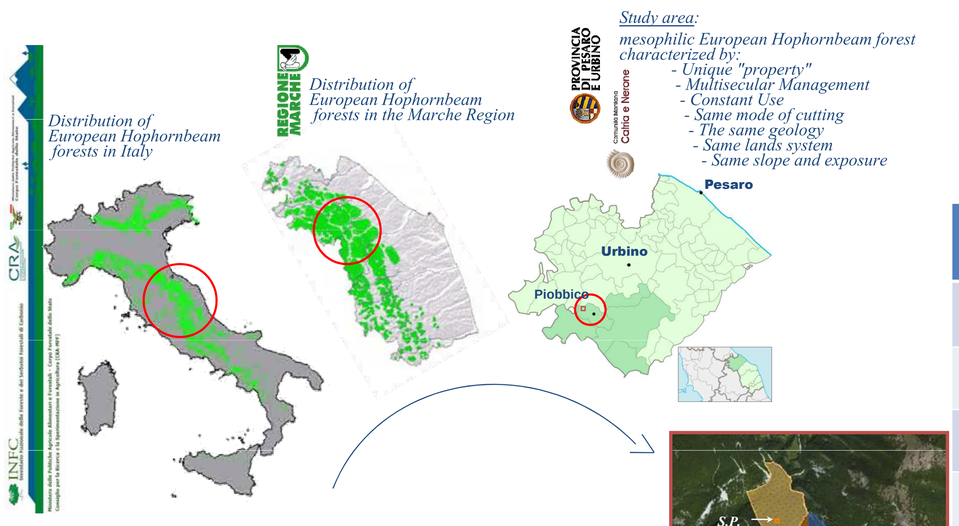
cost European Cooperation in Science and Technology

Coppice Forests in Europe: Ecosystem services, protection and nature conservation
University of Antwerp, Antwerp, Belgium, 15-17 June 2016

Introduction

Although the coppicing is an ancient practice that over the centuries has shaped and characterized, and still characterizes, much of the Italian landscape of low mountains and hills, the coppice forestry has always been considered simple and inexpensive, arousing little interest from scientific point of view. Over the years, however, the way of considering "the forest" has undergone profound changes, especially related to changes in socio-economic and cultural aspects rather than to a deepening of knowledge of the biological and physiological system. The coppicing was criticized for reducing the landscape aesthetic value, impoverishment of the soil and a decreasing of biodiversity.



Goals

The aim of this study was to investigate, by means of a synchronic approach, the effects of the recurrence of this kind of management on the recovery process of a "forest system" in a mesophilic European Hophornbeam (*Scutellario columnae – Ostryetum carpinifoliae*) stand.
This was achieved analyzing the evolution of its various parameters during the rotation cycle and the impact that this type of management has on soil genesis and conservation. We also assessed the degree of naturalness characterizing these stands so to contribute to the knowledge on the dynamics present in the "forest mosaic", which includes all forest management units.

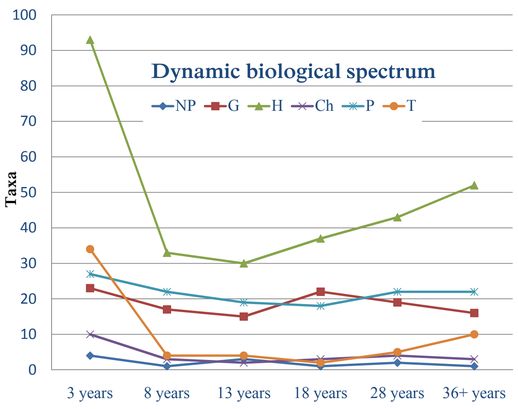
Sample Plot	Coppicing year	Years from the cut	Temporal gap (years)	Altitude (m a.s.l.)	Exposure	Slope	Vegetation (phytosociological association and sub-association)	Soil (IUSS, 2006)
005*	2014/15	0	-	692	N - NW	33°	*Scutellario columnae-Ostryetum carpinifoliae* Pedrotti,Balleli e Biondi ex Pedrotti 1980 *violetosum reichembachianae* Allegrezza 2003	Phaeozems (Rendzic Leptic Phaeozems)
001	2011/12	2	2	773	N	23°	*Scutellario columnae-Ostryetum carpinifoliae* Pedrotti,Balleli e Biondi ex Pedrotti 1980 *violetosum reichembachianae* Allegrezza 2003	Phaeozems (Rendzic Leptic Phaeozems)
002	2006/07	7	5	721	N - NE	26°	*Scutellario columnae-Ostryetum carpinifoliae* Pedrotti,Balleli e Biondi ex Pedrotti 1980 *violetosum reichembachianae* Allegrezza 2003	Phaeozems (Rendzic Leptic Phaeozems)
003	2001/02	12	5	743	N - NE	24°	*Scutellario columnae-Ostryetum carpinifoliae* Pedrotti,Balleli e Biondi ex Pedrotti 1980 *violetosum reichembachianae* Allegrezza 2003	Phaeozems (Rendzic Leptic Phaeozems)
004	1996/97	17	5	692	N - NE	30°	*Scutellario columnae-Ostryetum carpinifoliae* Pedrotti,Balleli e Biondi ex Pedrotti 1980 *violetosum reichembachianae* Allegrezza 2003	Phaeozems (Rendzic Leptic Phaeozems)
005	1986/87	27	10	756	N - NW	33°	*Scutellario columnae-Ostryetum carpinifoliae violetosum reichembachianae* Allegrezza 2003 Pedrotti,Balleli e Biondi ex Pedrotti 1980	Phaeozems (Rendzic Leptic Phaeozems)
006	1977 +	36 +	10+	692	N - NW	33°	*Scutellario columnae-Ostryetum carpinifoliae* Pedrotti,Balleli e Biondi ex Pedrotti 1980 *violetosum reichembachianae* Allegrezza 2003	Phaeozems (Rendzic Leptic Phaeozems)

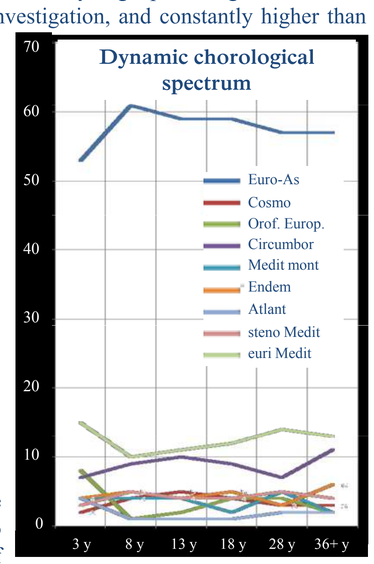
Data and methods

Within the sample plots all diameters and heights were collected, the soil cover has been evaluated for the various vegetational components and quali-quantitative measures on the necromasses present in it were carried out.
Floristic aspects were investigated through the preparation of a local flora and the analysis of floristic components, through biological, chorological, taxonomic spectra and adapting the innovative analisys of the ecological values proposed by Ubaldi (2012); the study of the vegetation was made using a phytosociological analysis and the method of characterization of vegetation proposed by Taffetani and Rismondo (2009). Finally, soil and litter have been described following the method proposed by Shoeneberger et. al. (1998); then these were classified according to the official nomenclature provided by the Word Reference Base for Soil Resurces (IUSS, 2006).

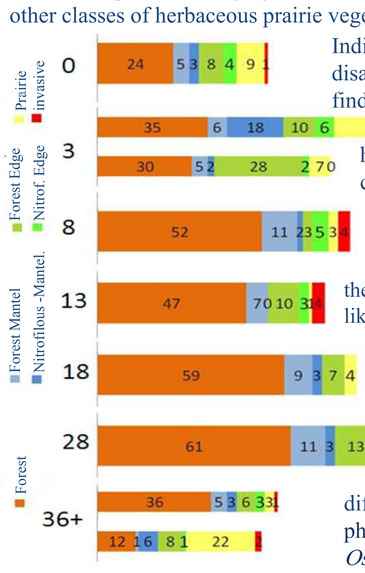
Results and discussion

Data emerging from the interpretation of the biological spectrum revealed a large percentage of geophytes (16%), which, although spread a bit in all climates, in high percentages are an excellent indicator of forest ecosystems not too disturbed. This situation was confirmed and sustained in the chorological spectrum, which shows a fairly high percentage of endemic species (5%), constant throughout the period under investigation, and constantly higher than the percentage of the cosmopolitan species (3%).



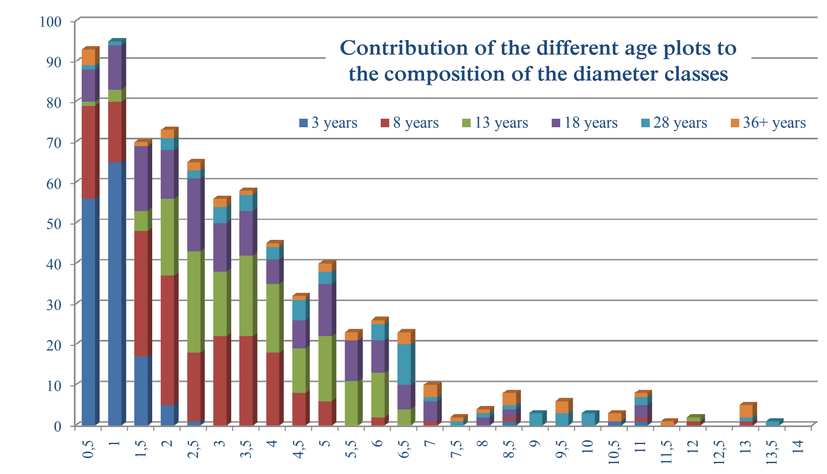


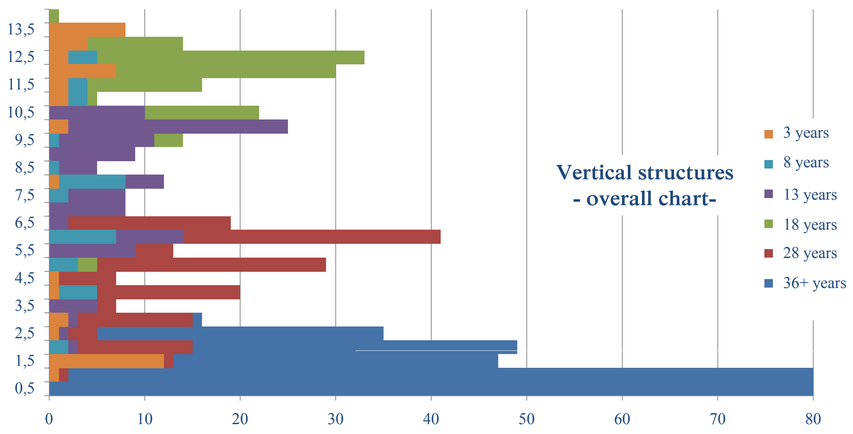
Also interesting are the results of the application of the method developed by Taffetani and Rismondo (2009), which allows to measure the impact of management activities and to observe changes that follow, highlighting the ecological structure through the division into c lasses of vegetation. The most consistent floristic component have been attributed to the phytosociological class of *Querco-Fagetea,* but numerous species belonging to the forest mantles (*Rhamno-Prunetea*) and elements of many other classes of herbaceous prairie vegetation remain during the rotation. The analysis also

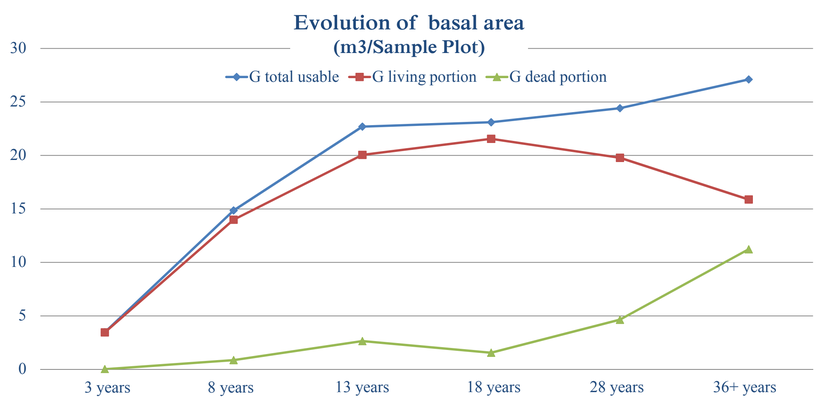


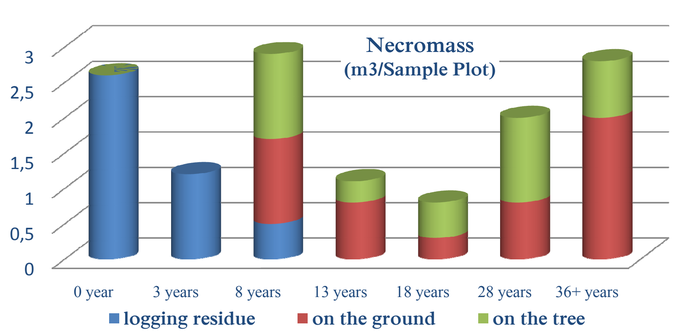
Classes of vegetation - Graphic summary -

Indicated that many closely forest entities that seem to disappear in the years immediately after cutting, in reality find refuge in the areas of contact with the stumps in which appropriate microsite situations have to be realized. The absence of *Stellarietea mediae* class or other invasive plants is indicative of a flora that characterizes a system in perfect dynamic equilibrium with the activities in progress. The study has furthermore clarified that the main origin of the grass species in the first period after the cut is most likely due to the germination of seeds in the soil seed bank linked the favorable conditions that are realized with periodic uncovered, which characterizes this forest management. The phytosociological study, although related to forest management units of different ages inside the rotation (which are characterized by chronological and structural differences), attests membership of all areas to the same phytosociologic association (*Scutellario columnae-Ostryetum carpinifoliae*) and sub-association (*Violetosum reichembachianae*).

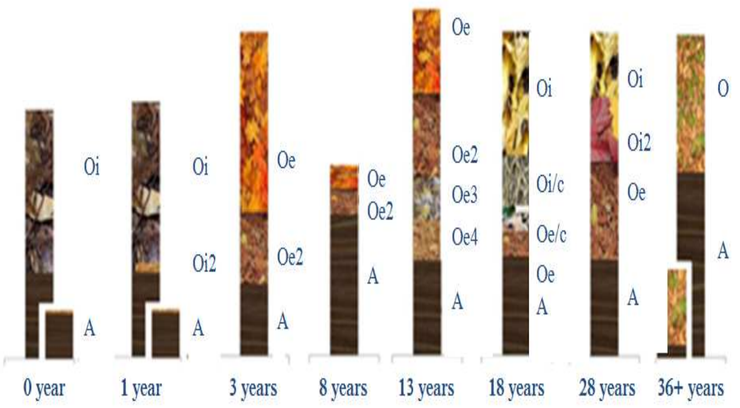








Finally, from the dendrometric point of view, the evolution of the vertical structure and diametric distribution as well as the social dynamics of the sprouts show a system sensitive and reactive to microclimatic changes and wildlife disturbances.
Same marked dynamism was found in the study of litter, which highlights the presence of adapted soil micro- and meso-fauna still under study.
Above comments are confirmed by the modest homotonia evidenced by similarity index (Jaccard index) that Ubaldi (2012) considers as an indicator of fairly well setting cenosis where the ecological selection represented by the cut act as a fundamental environmental factor.
Critical situation in the dynamism is instead recorded with the overrun of the rotation, where the conditions of uncovering are linked to snags and crashes with consequent soil loss and strong changes in floristic components, as confirmed by the vegetation study: in fact, the examined stand, although falling in the same phytosociologic association, shows different dynamism compared to other areas so as to result the most statistically distant from the typical vegetal composition of association among the studied areas.



Litter & organic horizzon

Conclusion

The considered cenosis are not depressed or damaged by the traditional coppice management, which, instead, shapes and selects them.
Moreover the mosaic forest that these areas constitute, creates a variety of situations and ecological niches able to host a flora whose number of valuable species is high when compared with the average situations found in the literature (Del Favero et al, 1999 & 2000 - IPLA, 2001) for other forest categories. This should lead to re-evaluate the importance of this forest type.
In addition, this management allows increasing areas with ecological conditions analogous to those of the forest edges, essential for the maintenance of species with high floristic interest, the presence of which is strictly linked to the perpetuation of the coppicing, as well as for maintenance of high levels of biodiversity (Peterken and Francis, 1999; Del Favero, 2001; Riondato et al., 2005).

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